BECOMING A FEMALE ENGINEER: SEX ROLE SELF CONCEPT AND SEX ROLE ATTITUDES IN OCCUPATIONAL CHOICE AND SOCIALISATION

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ABSTRACT

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BECOMING A FEMALE ENGINEER: SEX ROLE SELF CONCEPT AND SEX ROLE ATTITUDES IN OCCUPATIONAL CHOICE AND SOCIALISATION

Previous research on women entering technology has focussed on eminent women in science, suggesting that they are distinguished by masculine characteristics and close relationships with their fathers. More recent research on women entering non traditional occupations has suggested the importance of the mother as a role model in career choice and socialisation.

The present research explored sex role self concept and sex role attitudes in a longitudinal study of two groups of young women being trained as techicians in engineering. Female engineers were compared with four groups: male engineers, female friends from school, women in business studies and women in nursery nursing. Regional comparisons were also made between subjects in London and in Birmingham. Measures used in the research were the Bem Sex Role Inventory and the MAFERR Inventory of Feminine Values.

When they began training female engineers did not differ significantly from either their female friends or male engineers in their levels of perceived femininity or masculinity. However, female engineers (regions combined) were significantly more likely to be classified as androgynous than subjects in any other group and were significantly less likely to be classified to be classified as feminine sex typed than other female subjects. After two years' training, female engineers showed significant increases in femininity, and the differences between female and male engineers increased.

Female engineers did not differ from their female friends or women in nursery nursing in their sex role attitudes and ideals; however, women in business studies had significantly more traditional attitudes than other female groups. As in previous research using the MAFERR, female engineers believed that men had a significantly more traditional view of an ideal woman than an ideal woman actually described by male engineers. Over time female engineers and women in business studies became significantly more profeminist in their sex role attitudes.

Contrary to prediction, female engineers showed less dramatic changes in sex role self concept and sex role attitudes than women in business studies. Results of the experimental studies are discussed in terms of Bem's (1985) gender schema theory and several theories of attitude change. Practical implications of the research are explored, and suggestions are offered for how to recruit more female engineers.

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PREFACE

Background of the Research

The programme of research described in this thesis grows out of a practical experiment. In 1976 the Engineering Industry Training Board (EITB) began a special programme for training women as technicians known as the 'Girl Technician Scholarship Scheme'. When the Scheme began, women represented less than two per cent of the workforce of technicians in the engineering industry (EITB, 1984). In addition, women who were employed as technicians were likely to be concentrated in a narrower range of jobs and to have received less formal training than their male colleagues (EITB, 1983a).

The Scholarship Scheme was designed to increase the numbers of women being trained as technicians directly by sponsoring the training of young women as technicians and indirectly by publicising the programme, so that the results of the experiment were available to a wider audience, including industry, parents and schools. The programme was seen by the EITB as providing an important source of well qualified people to meet the projected short fall of technicians predicted for the late 1980's and early 1990's (EITB, 1979). In their description of the Scholarship Scheme, the EITB described the programme as having three major aims:

1. "to recruit girl school-leavers and provide them with the necessary education and training in order to prepare them for employment as technicians in the engineering industry

2. to demonstrate to girls, parents, teachers and careers advisers that engineering is a suitable career for girls, and to encourage girls with the education necessary to prepare them for careers in engineering

3. to demonstrate to engineering firms that girls can be as effective as boys in technician roles and to encourage employers to recruit more girl trainees in their annual intake." (EITB, 1983a, p. 35)

During the Scheme's operation between 1976 and 1980, 142 young women were recruited to the Scheme and 104 women completed the first two years of technician training. The Scheme operated in two regions of the country, London and Birmingham and included three intakes of young women, who began training in 1976, 1977 and 1978. When the young women had completed two years of training on the Scheme, the EITB assisted them in finding employment as technician trainees in companies which would allow them to complete their training. [1] Subsequent research on the young women participating in the Scheme has shown that the majority of those who successfully completed the first two years of training subsequently gained employment as technicians (EITB, 1983a). [2]

The author first heard about the EITB programme in the spring of 1977 and gained permission from the EITB to conduct a programme of research which would monitor the progress of the 1977 and 1978 intakes of girls to the programme. The data collection was begun in September, 1977 and was concluded in December, 1980. The research was funded by the EITB and the Social Science Research Council. [3]

Aims of the Research

The research was planned primarily as a source of feedback and guidance for training staff involved in the operation and planning of the training scheme. The researcher's role was that of an applied psychologist and outside observer. During the period of data collection the author met with EITB training staff at six-monthly intervals to discuss preliminary findings and practical implications of the research. Some of these findings are presented in a Final Report to the EITB and EOC/SSRC Joint Panel. This report entitled, Getting On in Engineering (Newton & Brocklesby, 1982a) is included in the Supplementary Material. Additional findings on this sample have been published in academic papers and articles on the background and psychological characteristics of female engineers and on the choice of engineering as a career. [4]

The research programme had two closely related sets of aims which have been labelled: 'Practical Aims' and 'Academic Aims'. The aims in each category are listed below:

Practical Aims (Information for the EITB)

1. to provide information about the school background of young women entering the Scheme which might be useful for recruiting schoolgirls and selecting young women as technician trainees
2. to provide information about how the young women learned about the Scholarship Scheme

3. to provide information about the operation of the Scholarship Scheme which might prove useful in modifying the Scheme for future years

4. to describe some of the implications of the different patterns of training used in London and in Birmingham.

Academic Aims

1. to explore family and school influences on women entering engineering at technician level and to compare the findings with previous research on women entering engineering and science

2. to describe initial self perceptions and changes in sex role self concept and sex role attitudes during the first two years of subjects' training

3. to suggest theoretical and practical implications of the findings.

This thesis deals primarily with the research described under 'Academic Aims'. Additional information on the school qualifications of the subjects is presented in the paper "Female Engineers: How Different Are They?", which is included in the Supplementary Material. Although some of the data collected to satisfy the 'Practical Aims' will be mentioned in the thesis, the majority of this material is beyond the scope of the thesis.

Acknowledgements

I am grateful to the many people and organisations whose assistance and support enabled me to carry out the research described in this thesis. The Social Science Research Council funded the early portions of the research, whilst the Engineering Industry Training Board provided both financial support and practical assistance in organising the research and collecting the data.

I am particularly indebted to Jean Fish, who organised the fieldwork and tracked down subjects who would otherwise have been lost from the sample. I am also grateful to Janet Taylor, who offered valuable support on several fronts. She interviewed subjects, coded data and helped to sort out the mountains of data which threatened to overwhelm me. She also contributed many useful insights from her own research on supervisors and male workmates of female techncians.

Other people who made important contributions include Jayne Southern, who entered all the data on the computer; Roger Eglen, who wrote the statistical package for analysing the data; Colin Hargreaves who carried out the analyses of variances which Roger's programs couldn't do; and Sandra Jones, who drew the figures, proof-read manuscript and who kept reminding me there was 'an end in sight'.

Invaluable academic support came from my supervisor, Geoffrey Stephenson and from David Legge and Malcolm Burnip. Academic and emotional support came from Alan Rector, who lived through it all, cooked excellent meals and read 'yet another draft of Chapter X'.

Finally I must thank the 308 young women and men who participated in the research. Their cooperation and interest made the research possible.

Footnotes

[1] Technician training requires approximately four years. Companies sponsoring a trainee's education and training usually offer the trainee employment as a technician after satisfactory completion of training. However, this progression to the status of regular employee is not automatic, and many young women in the sample were concerned about whether they would be employed as technicians. Some implications of this ambiguous status are discussed in Chapter Eleven.

[2] An EITB survey of 49 young women who entered the Scholarship Scheme in 1976 and 1977 showed that 61% were working as technicians in an engineering company. An additional 14% were still undergoing training or were full time students of engineering, 6% were working as technicians in fields other than engineering, and 18% were working in other fields or were not in paid employment. It should be noted that these figures may overestimate the percentage of trainees who were employed as technicians.

The figures are based on the results of a postal questionnaire, which achieved a response rate of 71%. Although this response rate is quite reasonable for a postal questionnaire, it seems likely that a higher proportion of non respondents than respondents were not employed as technicians. [For further information about this survey, see EITB (1983a) The Technician in Engineering, Part 4. Employment, Education and Training of Women Technicians. Watford: EITB.]

[3] The EITB's support was in the form of a research grant to the author and Professor G.M. Stephenson. The EITB also provided interviewers to assist in gathering data during the initial phases of the research. In November, 1978 the author took up a lecturing post at Hudderfield Polytechnic. The EITB provided the author with a grant to employ a research assistant to assist in data analysis during the year 1980-1981.

Additional support for the research came from a programme grant from the Social Science Research Council to Professor G.M. Stephenson. This grant covered the author's employment as a Research Officer from 1975-1978 and also provided for some of the research assistance necessary to collect the data.

Further research describing some aspects of the girl technicians' experience at work during their third and fourth years of training was funded by a grant to the author from the Equal Opportunities Commission and Social Science Research Council Joint Panel on Women and Underachievement.

[4] See the following articles by the author: (1980b) The case for girls in engineering. View, 1 (2), pp 17-18; (1980) Into work: Continuity and change. In R. Deem (ed) Schooling for Women's Work. London: Routledge Kegan Paul. pp. 98-111 (with Keil, E.T.); (1981a) Who says girls can't be engineers. In A. Kelly (ed) The Missing Half. Manchester: Manchester University Press. pp.139-149; (1982a) Getting on in Engineering: Becoming a Female Technician Final Report to the EOC/SSRC Joint Panel and to the EITB (with Brocklesby, J.); (1983a) Deciding on engineering: Implications of a non traditional career choice. EOC Research Bulletin, No. 7, Summer; in press, Female engineers: Femininity Re-defined? In J. Harding (ed) Perspectives on Gender and Science. Brighton: Falmer Press; in press, Who becomes an engineer?: Social psychological antecedents of a non traditional career choice. In A. Spencer & D. Podmore (eds) In a Man's World: Essays on Women in Male-Dominated Professions. London: Tavistock.

Additional material on this sample of female engineers has also been contained in the following papers presented at academic conferences: (1980a) Women's work in engineering. Paper presented at the International Social Psychology and Social Policy Workshop. University of Kent, April, 1980; (1981b) Interpersonal strategies used by female technicians. Paper presented at the British Psychological Society Conference, Occupational Psychology Section, University of York, January, 1981; (1983a) Only one or two? Social and psychological implications of research on female engineers. Paper presented at the British Psychological Society Conference, Social Psychology Section, University of Sheffield, September, 1983; (1984) Female engineers: How different are they? Paper presented at the Conference on 'Girl Friendly' Schooling, Manchester Polytechnic, September, 1984.

The results of a pilot study using repertory technique are reported in a working paper presented as part of the Final Report to the EOC/SSRC Joint Panel and the EITB: (1982b) Personal Worlds: A Comparison of Female Technicians and Secreteries using Repertory Grid Technique. (with Brocklesby, J.). Additional information about the Scholarship Scheme, which incorporates some of the author's work has been published by the EITB in two reports on women engineers: EITB (1983a) The Technician in Engineering, Part 4: Employment, Education and Training of Women Technicians. Watford: EITB and EITB (1984) Women in Engineering. Occasional Paper No. 11, Watford: EITB.

INTRODUCTION

The Rationale for the Research

Very few women become engineers, and women who consider engineering as a career often face reactions of doubt and disbelief from their families, friends and future colleagues. One of the questions which is often asked either explicitly or implicitly is about their femininity: 'How can a woman remain feminine in an environment which is so strongly dominated by men, both in numbers and in values?' A recent film about women engineers entitled, "What's a Girl Like You...?" [1], accurately reflects the concern that many people feel about women in engineering. There is a strong popular feeling that a woman must be very tough and masculine to survive as an engineer.

Recent initiatives designed to increase the numbers of women in science and technology have challenged this stereotype and have raised important questions about how women are represented in these fields. These programmes have generally assumed that the masculine image of science and technology is a important factor in women's career decisions about these fields. In seeking to bring about change, most programmes have been concerned with modifying this masculine image and making science and technology more relevant to women's interests and experience. They have encouraged pupils to question traditional definitions of sex roles and have suggested that science and technology are important to both sexes.

A key feature of two of the best known experimental programmes-- GIST and EITB's Insight -- has been to provide attractive role models of women scientists and technologists. [2] The assumptions underlying this strategy are clear. Most people expect the female scientist or engineer to be tough, aggressive and masculine. They often assume that she will have radical views about equality between the sexes. By presenting woman who do not fit the popular stereotype, these programmes have encouraged girls to see science or engineering as possible careers for themselves.

The picture of the female scientist or engineer as being masculine and holding unconventional views on women's roles is not only a popular conception but is also strongly reflected in the academic literature on women in science and technology. The female scientist or technologist has often been viewed as deviant and her interest in and commitment to her work have been seen as compensating for problems with feminine identity. However, with the revival of feminism in the 1970's and the growth of feminist scholarship, this stereotype is being challenged, and a more complex picture of women in science and technology is emerging.

The present research is concerned with three aspects of feminine identity: sex role self concept, sex role attitudes and sex role ideals. [3] These features of feminine self definition are seen as important factors in enabling or preventing women from considering non traditional careers. It will be argued that the masculine image of science and technology is widely shared by both sexes and by scientists as well as non scientists (Weinreich-Haste, 1979). Therefore, we need to explore women's perceptions of their own femininity and masculinity and their sex role attitudes and ideals, if we are to understand why some women choose and others reject the highly masculine field of engineering.

The present study is one of the few studies of female engineers, focussing on issues of feminine identity and career choice. The only other comparable study known to the author is Yanico and Hardin's (1981) longitudinal study, comparing sex role self concept in female students of engineering and home economics at a large American university. However, the current study differs from Yanico and Hardin's work, both in its choice of subjects and type of training being pursued. Yanico and Hardin's sample were observed over a four year course of university study, which would enable them to enter the engineering industry at graduate level. In contrast, subjects in the present research were almost two years younger, having left school at 16 and entering an industrially based course of training, which would prepare them to work at technician level. The difference between the American and British settings is also important, since Britain holds a more negative societal view of engineers and has shown a much slower increase in the proportion of female engineers in the last ten years (Bullivant, 1983).

Plan of the Thesis

Section One of the thesis is entitled, "Theory and Methodology". It provides the theoretical context for the experimental studies, outlines the issues being studied and describes the procedures used in the experimental studies. Chapter One presents a selective review of the literature on women entering non traditional occupations, especially women in science. Chapter Two reviews the literature on women in engineering. Chapter Three describes the design and methodology used in the experimental studies and includes the theoretical justification for the groups selected and measures used. Chapter Four details the procedure used in the experimental studies.

Section Two represents the core of the thesis and includes the results of the six experimental studies. As shown in Figure 1.1, it is organised in terms of the two measures used: the Bem Sex Role Inventory (BSRI) and the Male Female Role Research Inventory of Feminine Values (MAFERR). The chapters are organised in the same order for each measure, beginning with an introductory chapter (or chapters), summarising relevant research using the same or similar measures and discussing theoretical and methodological issues associated with the measure. Chapter Five deals with the sex role self concept as measured by the BSRI, and Chapters Nine and Ten cover sex role attitudes and ideals as measured by the MAFERR. Each introductory chapter is followed by a controlled comparison between female engineers and their friends in London and Birmingham, with Chapter Six presenting results on the BSRI and Chapter Eleven covering the comparable results on the MAFERR. Chapters Seven and Twelve examine sex role self concept and sex role attitudes and ideals in some comparisons between women in business studies and women in nursery nursing with female engineers and their friends in London. The remaining two chapters in this section, Chapters Eight and Thirteen, offer comparisons between sex role self concepts and sex role attitudes and ideals of male and female engineers in London and Birmingham.

Section Three of the thesis provides an integration of the results of the experimental studies with previous research on female engineers and women in other non traditional occupations. Chapter Fourteen includes a theoretical summary of the major findings of the research, relating them to the experimental hypotheses. It points up some shortcomings in current formulations of sex role self concept and sex role attitudes and suggests directions for further research. The chapter concludes with a discussion of some of the practical implications of the research, particularly as they affect recruiting and retaining women in engineering.

Figure 1.1

Organisation of Section Two of the Thesis

CHAPTER	MEASURE	CONTENT
Five	BSRI	Review of Literature; Hypotheses for Studies One, Two and Three
Six	BSRI	Study One. A Controlled Comparison of Female Engineers and Female Friends in London and Birmingham
Seven	BSRI	Study Two. Women in Business Studies and Women in Nursery Nursing: Some Partial Comparisons with Female Engineers and Female Friends in London
Eight	BSRI	Study Three. A Controlled Comparison of Male and Female Engineers in London and Birmingham
Nine	MAFERR	Review of Literature on Sex Role Attitudes
Ten	MAFERR	Review of Literature on Sex Role Ideals; Hypotheses for Studies Four, Five and Six
Eleven	MAFERR	Study Four. A Controlled Comparison of Female Engineers and Female Friends in London and Birmingham
Twelve	MAFERR	Study Five. Women in Business Studies and Women in Nursery Nursing: Some Partial Comparisons with Female Engineers and Female Friends in London
Thirteen	MAFERR	Study Six: A Controlled Comparison of Male and Female Engineers in London and Birmingham

The results of the main statistical analyses used in the six experimental studies are reported in the chapters describing those studies. Additional analyses and further information on the main analyses are reported in the appendices accompanying each chapter. For ease of reference the appendices are numbered so that the numbers correspond to the chapter numbers for each of the experimental studies, e.g., Appendices relating to Chapter Six are numbered 6.1, 6.2 and so on.

Footnotes

[1] This film is distributed by C F L Vision, Chalfort Grove, Gerrards Cross, Buckinghamshire SL9 8TN.

[2] GIST stands for Girls Into Science and Technology. This was an action research project funded by the Equal Opportunities Commission, the Social Science Research the Department of Industry and Shell U.K. The project was designed to explore why girls underachieve in physical science and technical subjects at school and to examine the effectiveness of various interventions. Further information on the project is available in the final report on the project (See Kelly, Whyte and Smail, 1984 and Whyte, 1985.)

The Engineering Industry Training Board (EITB) began a series of "Insight" programmes in 1979. These were residential programmes lasting from three days to one week, designed to encourage high calibre girls (currently studying mathematics and physics) to consider engineering as a career and to opt for a relevant degree course at university or polytechnic. Further information about "Insight" is available in the EITB (1983b) Occasional Paper 10, "Insight: A review of the Insight programme to encourage more girls to become professional engineers". Information about "Insight" and other EITB programmes to encourage women to become engineers is available from the EITB, 54 Clarendon Road, Watford WD1 1LB.

[3] The terms 'sex role self concept' and 'sex role orientation' appear to be used interchangably in the literature on the BSRI. Although the term 'sex role orientation' is more frequently used, I feel that there is a problem with the term confused with the notion of 'sexual orientation'. Therefore, I have used the term 'sex role self concept' throughout the thesis.

SECTION ONE

THEORY AND METHODOLOGY

CHAPTER ONE

THE CONTEXT OF THE PRESENT RESEARCH: AN OVERVIEW OF PREVIOUS RESEARCH AND A SELECTIVE REVIEW OF RESEARCH ON WOMEN IN NON TRADITIONAL OCCUPATIONS

Introduction

To understand the questions explored in the present research, it is necessary to place it in the context of previous research on women in non traditional fields, especially research on women in science and technology. The chapter falls into three sections. The first section considers the scope of previous research on women in science and technology. It looks at the research questions posed about women and science and the levels of explanation and models used to answer these questions. It also details some of the shortcomings of previous research, contrasting two models of women's achievement and suggesting problems in interpreting the research literature and generalising from the research literature to the research described in the thesis. The second and third sections of the chapter provide a selective review of two streams of research: studies of 'eminent' women and studies of non traditional women. Both groups of studies are seen as offering important comparisons with studies of female engineers. The studies of 'eminent' women reviewed are concerned primarily with outstanding women in science, whereas the studies of non traditional women encompass a broader range of careers although the majority of studies consider choice of or involvement in a male-dominated career.

The Scope of Previous Research on Women in Science and Technology

Most research on women in science and technology is primarily concerned with the basic question, 'Why are there so few women in science?' and with the subsidiary question, 'Why are so few eminent scientists women?' Such research has frequently been conducted with a clear concern for its policy implications, so that answers to these questions are seen as providing a rationale for either maintaining or changing the existing ratio of the sexes in science and technology. [1]

Explanations for the predominance of men in science occur at three levels: structural, group and individual. Each of these levels tends to be identified with a specific discipline or theoretical approach, although few theorists confine themselves to only one level of explanation. Structural theories tend to be sociological and to emphasise the place of science within patriarchal society (E. Kelly, 1981) or to stress the sexual division of labour and how science relates to the means of production (Saraga & Griffiths, 1981). Social psychological theories tend to examine the nature of groups and to look at how the individual's identity is located in groups. Although there are few social psychological theories which are concerned specifically with the issue of women and science, intergroup theories such as Tajfel (1981) and Kanter (1977a; 1977b) suggest factors which operate to define science as a male preserve and to make changing the proportion of women and men in science problematic.

In contrast to the previous two levels of explanation, theories operating at the level of the individual suggest a wide variety of factors which may explain women's failure either to enter or to achieve in scientific or technological fields. Theoretical accounts tend to concentrate either on inherent differences between the sexes, particularly differences in cognitive functioning (Gray, 1981) or on factors in socialisation which produce differences in interests, values, attitudes and personalities of females and males (A. Kelly, 1981a).

The present research draws most heavily on research by psychologists working within the 'individual socialisation' framework of explanation. This form of explanation stresses individual differences in background factors, self conceptions, attitudes and values which may explain later differences in career interests and choices. In looking at the issue of women and science, it suggests that there are important differences in individual experience which encourage some women and discourage others from considering or pursuing a career in science or technology.

Some Problems and Issues Raised in Previous Research on Women in Science and Technology

Previous research on women in science and technology has varied in its choice of subjects, methodology and models of explanation, thus making comparisons between studies extremely difficult. Many reports are based on extremely small numbers of subjects, who tend either to be students or women noted for their outstanding achievement in science. Typically the woman scientist has been seen in a negative light, and questions have been raised about her social adjustment and psychological health. The literature is further complicated by problems of interpreting the findings during a time of rapidly changing sex roles. These issues and some of the shortcomings in the literature are summarised below in terms of two sub-headings: models of women's achievement and problems of interpretation.

Models of Women's Achievement. Two general models have been employed: the deficiency or deviance model and the enrichment model. These two models were first proposed by Angrist and Almquist (1975) and have later been elaborated by Lemkau (1979) and Yogev (1982). In the deficiency model, achievement in a non traditional field is seen as compensating for problems social relationships and in feminine identity; the woman scientist is portrayed as being particularly close to her father and as having a strong involvement with his masculine interests and values. She is typically seen as more distant from her mother and as being unable or unwilling to pursue 'normal' feminine interests. Studies employing the 'deviance' model have stressed factors, such as close relationship with father, birth order and family position, and early childhood interests and hobbies.

Although studies of male scientists have suggested that an interest in science be linked with relatively greater interest in things rather than people and involve compensatory features (Roe, 1953; McClelland, et al. 1953), the consequences for women are often seen as more serious. Her identification as a female is suspect, and she is seen as being under greater psychological stress than either her male counterpart or women in more traditionally feminine roles. It is notable that a large number of studies of female science students and scientists have included measures of social or psychological adjustment (e.g., Angrist & Almquist, 1975; Helson, 1972; Smithers & Collings, 1981). [2]

In contrast to the deficiency model, studies in the 'enrichment' vein have looked at relationships with both parents, and have been particularly concerned with the mother providing a role model for her daughter, both through her working pattern and her lifestyle. They have suggested that rather than rejecting feminine interests and a feminine identity, women in non traditional fields have tended to see gender boundaries as less important and have engaged in both stereotypically feminine and masculine activities. These studies suggest that their childhood socialisation has stressed competency traits and that such women do not see their own occupational achievement as either unusual or unfeminine.

Although there are notable exceptions, the 'deficiency' model tended to be used in earlier research (before 1970) and the 'enrichment' model is characteristic of more recent research. It is notable that both models see the achieving woman as being under stress. The deficiency model sees her as being forced to reconcile the role of a feminine woman with her professional achievement. In writing about some of the early research, Yogev (1982) depicts the professional woman as beset by ambivalence:

> The core of attributes found in most professional occupational roles was considered masculine; persistence and drive, aggressiveness and emotional detachment were equated with intellectual performance. Career women were thus viewed as the antithesis of feminine women and were thought of as failures as women or as having personality disturbances. (p. 220)

The enrichment model postulates a different sort of stress: that of 'role overload' or 'role strain'. The achieving woman is seen as having to cope with two sets of role demands: those from her job and those from her family life. She is seen as overburdened by her responsibilities (Myrdal & Klein, 1956), although authors vary in the extent to which they see the two roles as actually incompatible.

The notion of 'role overload' has been seen most clearly in studies of two career or dual career families. This line of research has stressed the problems of multiple roles and has suggested that although the professional mother experiences considerable job satisfaction, she faces frequent difficulties in managing her career and family roles (e.g., Rapoport & Rapoport, 1976). Several studies have suggested that success in managing both roles depends crucially on the support she receives (or believes that she receives) from her husband (Rapoport & Rapoport, 1976; Poloma & Garland, 1971) or from significant men in her life (Hawley, 1971; 1972).

The deficiency and enrichment models of women's achievement tend to draw on different theoretical underpinnings. The deficiency model has been influenced by psychoanalytic formulations, emphasising individual differences in early solutions to the Oedipal complex (Auster & Auster, 1981) and failure to identify with the mother (Hennig & Jardim, 1976). The enrichment model is more clearly identified with a social learning and cognitive developmental explanations of personality and sex differences. It emphasises the importance of reinforcement, observational learning and role performance. It suggests that girls and young women plan their careers and lifesyles based on encouragement and discouragement they have received from 'significant' people in their lives and that the models provided by these 'significant others' also constitute an important basis for learning about gender and for making decisions about one's future plans. Laws (1978) has posited that women may have two types of role model: role models for careers and role models for lifestyles. Although career role models may be either women or men, lifestyle role models are most likely to be other women.

Problems of Interpretation. Much of the research on non traditional women and women in science has been conducted on American or British university students and may not be applicable to women who are in paid employment (Harmon, 1970). It has tended to be concerned with women who enter prestigious scientific fields at graduate or postgraduate level, and relatively little is known about women who work in science or technology at craft or technician level.

Owing to the scarcity of potential subjects, researchers have frequently relied on anecdotal evidence and case studies. When they have used comparison or control groups, they have compared women scientists either with their male counterparts or with women in more traditional fields of work. Because few studies have sought comparisons with both groups, the 'deviance' of women scientists has tended to be exaggerated and to be coloured by negative attitudes towards women. If the female scientist is found to be different from male scientists, she is often seen as being deficient in qualities necessary to be a scientist. If she is relatively similar to her male colleagues, she is condemned for lacking appropriate feminine characteristics. She is equally likely to fail in comparisons with women in more feminine occupations or with women who are not employed outside the home, since her involvement in a masculine field of work is by definition, unfeminine. Furthermore, there is little or no allowance for individual differences, so that it is assumed that all female scientists fit a similar mould.

Recent changes in sex role definitions have raised serious questions about the biases of both the researchers and the instruments they have used and suggest that research on sex roles must be understood within a specific social and historical context. In a trenchant analysis, Helson (1972) argues that many of the negative images of career committed women reflected popular values about the 'appropriate' roles for women. She notes that much of the research offering positive descriptions of women in masculine fields was ignored until the notion of a 'healthy career woman' became more socially acceptable.

The resurgence of the women's movement and change in women's patterns of work thus raise questions about the applicability of results reported in research in the 1960's and early 1970's to people making career choices and life plans in the late 1970's and in the present day. Much of the currently accepted theory about women's socialisation and work patterns is based on research describing women who were born in the 1930's and 1940's, and considerable data comes from much earlier. For example, Hennig and Jardim's (1976) sample of outstanding women managers were born between 1910 and 1915. There is obviously a need for caution in generalising the insights from such research to working class British women in the present research who were born between 1959 and 1962.

Given the diversity of research on women in science and technology and women in non traditional or male-dominated careers, I have chosen to summarise it under three general headings: eminent women, non traditional women, and female engineers. The research on eminent and non traditional women is considered in this chapter, whilst studies of female engineers are reviewed in Chapter Two. Some of studies reviewed can be seen as belonging under more than one heading, and a number of studies concerned specifically with sex role self concept and sex role attitudes will be considered in greater detail in Chapters Five, Nine and Ten. My emphasis throughout has been on selecting studies which deal with issues of femininity in values, attitudes and personality characteristics. [3]

Research on Eminent Women

Most of the research discussed in this section was carried out in the United States in the late 1950's and early 1960's and has pictured the eminent woman as a deviant in American culture (Epstein, 1970; Anderson, 1973). She is typically described a rare or unusual creature, and her family background and personality characteristics are most often compared with those of eminent men.

Many of the early reports of eminent women come from symposia about the 'problem' of women and science. For example, Rossi's (1965) heavily cited work on women in science, medicine and engineering is based on a presentation to a conference held at M.I.T. in 1963 (Matfield & van Aken, 1965), whereas the papers edited by Kundsin derive from a 1970 conference on 'Successful Women in the Sciences', sponsored and published by the New York Academy of Sciences (Kundsin, 1973). A particularly important part of the latter conference was the personal autobiographies presented by outstanding women scientists. Paradoxically one of the factors identified as facilitating women's success was a 'foreign' background (Anderson, 1973; Lemkau, 1979), suggesting that some of the conflicts faced by women in science may reflect particular aspects of American culture.

Most studies in this tradition are based on extremely small samples of subjects and have employed a deficiency model to account for women's unusual achievement. They have been especially concerned with documenting women's experiences and relationships in early childhood. Drawing on psychoanalytic formulations, they have suggested that the outstanding woman has a masculine outlook and personality characteristics. To develop these masculine characteristics, she has been forced to repress or deny feminine aspects of her personality (Deutsch, 1945). Writing in 1963, Eleanor Maccoby suggested that a woman's intellectual productivity bears a direct relationship to her development of the masculine traits of independence and assertiveness. Both Maccoby (1963) and Helson (1966) have suggested that outstanding or especially creative women are likely to have been tomboys at some time during their childhood.

Taking up the theme of masculinity, many authors have stressed the importance of the eminent woman's warm and close relationships with her father (Plank & Plank, 1954, Hennig & Jardim, 1976; Stanley & Soule, 1974; Helson, 1966; Lozoff, 1973). She is frequently the first or only child and most often comes from an affluent or upwardly mobile family which has emphasised achievement values (Anderson, 1973; Auster & Auster, 1981). In some families she been raised as a 'substitute son' and may have been a focus for her father's ambitions (Hennig & Jardim, 1976). Her father has also served as a powerful role model for successful achievement.

According to Rossi (1965), the dynamic between father and daughter is a potent one, which enables both to derive important psychological benefits. Rossi suggests that in their roles as fathers, men are able to encourage their daughters and feel a fatherly pride in their accomplishments. The daughter's achievement enhances his feelings of masculinity, whereas comparable achievement by a wife or son might pose a threat to personal identity.

Extrapolating from Roe's (1951) research on eminent men in science, Rossi (1965) cites four factors which she suggests are present in eminent scientists:

1. High intellectual ability, with emphasis on spatial and mathematical ability
2. Intense channeling of energy in one direction
3. Extreme independence
4. Apartness from others

She maintains that potential women scientists are unlikely to be lacking in intellectual ability although there may be sex differences in cognitive style and patterns of mental ability. However, she suggests that relatively few women will be socialised in ways which encourage extreme independence, apartness from others and intense channeling of energy. These three factors provide direct contradictions to cultural ideals for women's behaviour, which place a great emphasis on social values and concern for others' interests and feelings. Rossi observes that women who become eminent scientists will need to come from very special family situations, which have provided support and encouragement for their developing scientific interests. Many of Rossi's speculations have received empirical support in studies of the personality characteristics of eminent scientists.

Personality Characteristics of Eminent Women Scientists

Bachtold and Werner (1972) have carried out a series of studies comparing women and men scientists using Cattell's 16 PF. They found that both women and men who were considered eminent scientists were characterised by high intelligence, social aloofness, assertiveness, seriousness, confidence and self sufficiency. However, the sexes diverged on Cattell's trait of tough-minded:tender-minded with men describing themselves as sensitive and women describing themselves as 'tough-minded'. Each sex scored in the opposite direction from traditional sex role norms.

Bachtold's finding that eminent male scientists were tender-minded fits with autobiographical and anecdotal data on the scientific process (Watson, 1969; Mitroff, 1974; Easlea, 1983), suggesting that the much of scientific activity is not cool and detached, but that it involves intuitive insights and passionate involvements. This data belies the stereotype of extreme masculinity usually attributed to scientists. [4]

When Bachtold (1976) compared eminent women scientists with four other groups of eminent women: writers, artists, psychologists and politicians, she found that women scientists were the most detached and reserved, the most serious and restrained, the most conventional and the most realistically 'tough-minded'. It is worth noting that the finding on conventionality corresponds to Cattell's factor M, which Bachtold has labelled 'conventional:imaginative.' This factor is sometimes labelled as 'practical:imaginative' (Smithers & Collings, 1981), which implies a cognitive rather than social interpretation of the term, 'unconventional.'

Bachtold's pattern of personality differences, suggesting a 'scientific personality', has been largely confirmed in data on British sixth formers collected by Smithers and Collings (1981) and Bradley (1981). However, unlike Bachtold (1976), Smither and Collings (1981) found that both girls and boys studying science in the sixth form were 'tough minded'. Without further research an explanation for this difference in results must remain speculative. However, it can be argued that the contradictory findings may be explained either by cultural factors or personality differences between eminent scientists and sixth form pupils who intend to study science.

Head (1980) has offered a provocative theory which supports this latter interpretation and which suggests important personality differences between female and male science students. Basing his observations on studies of adult scientists and on British science pupils, Head notes that by age 14 male scientists "...tend to be emotionally reticent, disliking overt emotional expression in others and themselves... authoritarian, conservative and controlled in their thinking." (p. 296) In contrast to male science pupils, girls studying science are not emotionally reticent or rigid in their thinking, although he notes that they do not see themselves as sexually and socially attractive, an observation also made by Smithers and Collings (1981).

Drawing on Marcia's (1966; 1976) extension of Erikson's notions of ego identity and ego diffusion, Head (1980) postulates that girls and boys choosing science are likely to be in different phases in the development of ego identity. Head suggests that the girl science pupil is most likely to have achieved ego identity, which will enable her to make subject choices which defy usual sex role expectations. In contrast many boys choosing science in school will be in a phase of identity foreclosure, which will explain their unusually rigid and authoritarian attitudes.

If Head's (1980) formulation is correct, some of the boys who studied science in school will subsequently give up science and achieve ego identity through work in other fields. Others who stay in science may already have achieved ego identity or may do so through subsequent life experiences. These experiences, usually conceptualised as crises, may enable them to free their styles of thinking and to allow them to be more intuitive and creative in their work. They may thus make the transition from being tough minded science pupils to more tender minded adult scientists. However, the process of occupational socialisation would appear to operate quite differently for the two sexes.

Personality Characteristics and Occupational Socialisation

It has frequently been suggested that personality factors become accentuated by the process of occupational socialisation (Lemkau, 1983), and the experience of being one of a very few women in a male dominated field may amplify this process. Bachtold (1976) maintains that the personality characteristics of the eminent woman scientist are in keeping with the scientist's work which is primarily involved with ideas and things rather than people. She suggests that the lack of sensitivity shown by women scientists is both adaptive and necessary if a woman is to survive in a field in which she is likely to meet with prejudice from male scientists.

Writing from a sociological perspective, Hochschild (1973) reinforces Bachtold's main argument and extends it. She holds that the professional woman occupies a marginal role, so that she is unlikely to win acceptance either from other women or from her male colleagues. She is partially rejected by both groups and is subject to what Hochschild terms, 'defeminisation'. The process of defeminisation is carried out both by her male colleagues and by herself. Her male colleagues may compliment her abilities, seeing them as similar to those of men, whilst she, herself, may strive to distance herself from the negative image of 'ordinary' women. [5]

Hochschild (1973) observed that the twelve eminent women scientists she studied were "... at best ambivalent about the women's movement." (p. 184) This she traces to their marginal position as 'exceptional women.' She suggests that such women may have considerable difficulty in identifying with other women, since they have been motivated by the negative goal of 'not being like other women' as well as a more positive goal of achievement in a career.

Anderson (1973) lends further support to Rossi's (1965) suggestions of the qualities necessary for a woman to achieve recognition in science. She particularly emphasises the ability of the woman scientist to function autonomously and to ignore negative feedback from those unsympathetic to their goals. She suggests that as children such women have been encouraged to behave independently and to see themselves as separate from their parents. Their early childhood experience encouraged them to be individuated, a characteristic more frequently associated with male children (Chodorow, 1978). Anderson also noted that successful women were often able to recall important other women in their lives, thus foreshadowing some of the more recent research on female role models.

Feminine Characteristics of Eminent Women

Although most researchers describing eminent women have detailed their instrumental characteristics and their ability to function autonomously, they have been less clear in specifying these women's feminine characteristics. Some have clearly made use of the compensatory notion contained in the deficiency model, whereas others have suggested that possession of these masculine characteristics does not imply rejection of feminine characteristics. Based on her data on creative women, Helson (1966) has argued that it is possible to adopt some masculine characteristics which do not conflict with other parts of a feminine personality. She suggests that her creative subjects did not have an overall masculine identification, but rather used a feminine style to carry out their intellectual goals.

A similar concept has been proposed by Hennig and Jardim (1976) in their description of outstanding women managers. They draw on Douvan and Adelson's (1966) notion of 'ambivalent feminine identification,' suggesting a form of identification which combines feminine goals with a desire for certain aspects of the roles which are traditionally considered masculine. Douvan and Adelson (1966) noted that as girls such women often have more male than female role models and that they are concerned about individual development and achievement in addition to more traditionally feminine goals such as marriage. Stein and Bailey (1973) have offered a closely related interpretation. They suggest that one way of coping with potential conflict between achievement and traditional femininity is to identify with some aspects of the masculine role. However, they note that identification with the masculine role does not imply a low level of femininity.

Research on eminent women has offered contradictory pictures of the mother's role in socialisation. Although she is usually seen in a traditionally feminine role, her influence is unclear. Sometimes she is seen as a rather remote or distant figure, who is less exciting or interesting than the father (Hennig & Jardim, 1976). In other instances, she is seen as offering support for her daughter to explore roles that are usually considered as male. Both Lozoff (1973) and

Hennig (1973) have suggested that eminent women are unusual in the encouragement and support that they have received from both parents. They suggest that their family environments have been distinctive in not emphasising gender and in encouraging women to feel comfortable in both their femininity and their outstanding achievement. These qualities are also features of the enrichment model and are discussed in some of the studies of non traditional women described below.

Although eminent women scientists and non traditional women share many of the same characteristics, the emphasis and focus in these latter studies is quite different. They are concerned with more ordinary and less elite groups of professional women and the range of occupations studied is much broader. Unlike studies of eminent women, which have relied on comparisons with male counterparts, these studies draw comparisons with other women. Some studies have compared career committed women with housewives; others have contrasted women entering male and female-dominated occupations. Although these studies also draw attention to the importance of male family influences, they tend to stress the relationship between mother and daughter and the role that the mother provides for her daughter. It is to this second stream of literature that we now turn.

Research on Non Traditional Women

As suggested above, the literature summarised in this section includes a variety of studies and is complicated by the fact that the term 'non traditional' has been interpreted differently by various authors. In some studies the term has been used to distinguish career committed women from housewives; in other studies the term has been used to refer to women entering fields which are male-dominated. In addition, there has been a tendency to confound the notion of career commitment with involvement in a male-dominated field of work.

Because of the large number of studies involved, I have included only a few studies of particular theoretical importance which compare career women and housewives. The majority of studies reviewed offer comparisons between women either preparing for or working in male-dominated and female-dominated fields of work. Unless otherwise stated, the term 'non traditional' has been used to refer to women in male-dominated jobs and the term 'traditional' to refer to women in female-dominated jobs.

Although methodologically and theoretically diverse, most of the studies reviewed have been concerned with describing family background and/or personality characteristics of non traditional women and how these factors influence career choice. As suggested previously, most of these studies have been conducted since 1970 and tend to reflect the influence of the feminist movement in both their research design and their interpretation.

To simplify the review, the studies of non traditional women are discussed in terms of three issues: Family Background and Personality Differences; Mothers as Role Models and Support for Career Choice. The chapter concludes with a summary contrasting the research on eminent and non traditional women.

Family Background and Personality Differences

Comparisons between women working (or intending to work) in male-dominated and female-dominated fields reveal differences between the two groups both in family background and personality characteristics. Some of the findings on women in male dominated fields fit well with studies of 'eminent women'; however, others suggest that the ordinary professional woman may be somewhat different from her 'eminent' counterpart.

Like 'eminent women', the more ordinary woman who works in a male-dominated field is likely to come from a middle class professional family with well educated parents (Birnbaum, 1975; Lemkau, 1983; Carney & Morgan, 1981; Levine, 1975; Tangri, 1972; Nagely, 1971; Greenfeld, Gerner & Wood, 1980). These characteristics of her family of origin are often seen as offering an explanation for other differences that have been observed. In comparison with women in female dominated fields, she has more profeminist attitudes towards sex roles (Rossi, 1965; Nagely, 1971; Tangri, 1972; Carney & Morgan, 1981), is less sex typed in her self description and is more likely to share household tasks with her partner (Lemkau, 1983). She places a greater value on work (Nagely, 1971) and is more interested in success and earning a high salary (Angrist & Almquist, 1975; Greenfeld et al., 1980).

Coupled with her greater commitment to work, the woman working in a male dominated field sees family needs and helping people as less important than the woman working in a traditionally feminine job (Rossi, 1965; Angrist & Almquist, 1975; Peng & Jaffe, 1979). She is likely to plan or have fewer children (Levine, 1975; Trigg & Perlman, 1976; Greenfeld et al., 1980) and to feel less need to be personally involved in the care of her children (Angrist & Almquist, 1975). Some research suggests that she sees working life and family needs as relatively compatible (Levine, 1975; Trigg & Perlman, 1976); however, Tangri (1972) found that her 'role innovative' subjects saw a greater conflict between marriage and career than her 'traditional' subjects.

These differences in attitudes and values are clearly reflected on personality measures. In comparison with the woman in a traditional female job, the non traditional woman scores relatively high on need for achievement and low on need for affiliation (Trigg & Perlman, 1976). Not surprisingly she places greater value on receiving personal recognition and is less concerned with being well liked (Greenfeld et al., 1980). Although the non traditional and traditional working woman do not appear to differ on 'competency' traits as measured by the 16PF, the non traditional woman tends to be more tough-minded and assertive (Lemkau, 1983). These characterisics are often linked with the independent relationships they have enjoyed with their families, especially their relationships with their mothers.

Mothers as Role Models

Hoffman (1972) has suggested that in comparison with boys, girls are less likely to receive encouragement for independence. She argues that "... girls need a little maternal rejection if they are to become independently competent and self-confident." (p. 146) Hoffman believes that in comparison with boys, girls are often over protected and that they are thus ill-equiped to cope with stressful situations and behave autonomously. Girls experience less pressure to develop identities separate from their mothers and may fail to develop confidence in their own resources.

This line of reasoning suggests that daughters whose mothers are employed outside the home are more likely to become independent and to see themselves as separate individuals. They are likely to spend less time with their mothers and have the opportunity to see a wider range of feminine roles. This general argument is well confirmed by empirical evidence suggesting a close link between mothers' and daughters' attitudes towards sex roles (Steinmann, 1963; Smith & Self, 1980). It has frequently been demonstrated that daughters whose mothers are in paid employment have less traditional notions about sex roles (Hartley, 1960, Steinmann, 1963; Angrist & Almquist, 1975; Altman & Grossman, 1977). They are more likely to be career committed (Angrist & Almquist, 1975; Zuckerman, 1980) and to aspire to work in male-dominated jobs (Tangri, 1972). Women who are in male-dominated fields are also more likely to be the daughters of working mothers than women in female-dominated fields or women women not employed outside the home (Ginzberg et al., 1966, Lemkau, 1983).

Some research has suggested that not only the mother's working pattern may be important but also the daughter's perception of the success of her mother's lifestyle (Angrist & Almquist, 1975; Laws, 1976; Altman & Grossman, 1977). The mother may be seen as either a positive or negative role model, with the daughter evaluating the desirability of her mother's work pattern and her success in coping with family responsbibilites.

In a study which supports this notion of a role model, Altman and Grossman (1977) found that female college students whose mothers did not work outside the home appeared to base their future life plans on their evaluation of their mother's lifestyle and her satisfaction with it. For example, students who perceived their mothers as satisfied with their lifestyles planned to emulate her, whereas those who judged their mothers to be dissatisfied planned a career. However, contrary to expectation, subjects whose mothers were employed outside the home and who perceived their mothers as dissatisfied were also highly committed to a career, suggesting that dissatisfaction, itself, may be a factor in career commitment. In commenting on their results, Altman and Grossman (1977) speculate that daughters may have attributed their mothers' dissatisfaction to her failure to achieve more at work, rather than to her dissatisfaction with combining work and family responsibilities.

Based on a partial replication of Goldberg's study (1968) of how women evaluate work attributed to men and work attributed to women, Baruch (1972) suggested that daughters of working mothers learn to value female competence, whereas daughters of housewives tend to devalue the achievement of other women. Like Altman and Grossman (1977) she found that daughters' attitudes towards their future plans were related to their judgments of the success of their mother's work pattern. Baruch also found that daughters consider their fathers' satisfactions with their mother's working pattern in judging the success of their mother's lifestyle.

Both Altman and Grossman's (1977) and Baruch's (1972) studies call into question the rather simplistic model of a working mother as role model. Their research and that of Rapoport and Rapoport (1976) suggests that there is a need to know more about the type of work done, how the mother values work, and how household and childcare responsibilites are carried out, if we are to understand how various family members perceive the mother's pattern of work. Some of the complexity of family relationships is reflected in studies of family influences on career choice.

Influences on Career Choice

Although the non traditional woman sees her mother as an important model, her relationship with both parents emphasise independence. Her pattern of relationships with her family, friends and teachers contrasts sharply with that of her traditional sister, and she appears to derive special support from male family and friends.

Unlike the 'eminent' woman, the non traditional woman enjoys a balanced relationship with both parents. However, the relationship is characterised by autonomy and has usually involved some conflict with both parents (Nagely, 1971; Tangri, 1972; Plas & Wallaston, 1983). Tangri (1972) has described her sample of 'role innovative' women as having cognitive distance from both parents and as seeing neither as a role model:

> A picture emerges of the Role Innovator as one who has substantial cognitive distance from both parents, warm feelings toward mother, but some perceived similarity to father. Neither parent seems to be serving as a role model, and perhaps the only basis for perceived similarity to father is the work orientation per se. (p. 184)

In the non traditional family, the two parents appear to offer different but complementary forms of support and encouragement. In Tangri's (1972) study, there was often evidence of ambivalence in mother-daughter relationships. Daughters felt that they were closer to their mothers than their fathers but found that their fathers were more sympathetic and supportive of their career choices. These findings fit closely with other researchers' observations that fathers are more influential in womens' non traditional career choices, whereas mothers are more influential in women's traditional career choices (Lemkau, 1983; Newton & Brocklesby, 1982). They also provide empirical support for Rossi's (1965) suggestion that fathers find it relatively comfortable to encourage their daughters to explore non traditional options.

Tangri (1972) invokes a line of reasoning similar to Rossi's (1965) to explain mothers' opposition to their daughters' career plans. Based on her data, Tangri suggests that the mothers of 'role innovative' daughters were quite ambitious themselves but that they usually worked in female-dominated occupations. Tangri believes that these mothers found their their daughters' ambitions and achievements personally threatening and perceived them as a challenge to their own lifestyle.

As a corollary of their more autonomous and independent relationships with their families, non traditional women are less likely than women in traditional fields to see their parents as influential in their career choice (Angrist & Almquist, 1975; Stake & Levitz, 1979; Wilson, Weikel & Rose, 1982; Newton, 1981; Newton & Brocklesby, 1982). However, they are more likely to receive strong social support from male friends, boy friends and husbands (Rossi, 1965; Angrist & Almquist, 1975; Tangri, 1972; Lemkau, 1983; Newton & Brocklesby, 1982; Wilson, Weikel & Rose, 1982; Hawley, 1971; 1972). They are also more likely to be influenced by teachers than traditional women (Angrist & Almquist, 1975; Tangri, 1972; Newton, 1981a).

Non traditional women often appear to place men in two categories: 'men in general' and 'sympathetic men'. They tend to see men in general as prejudiced towards women (Rossi, 1965; Hawley, 1971;1972); however, they often derive considerable emotional support from sympathetic male friends and family members, whom they see as viewing women's career achievements very positively.

Although most researchers have relied on women's reports of the attitudes of significant men in their lives, Tangri (1972) included male friends and boy friends of her subjects in her study. In this way she was able to validate women's perceptions of the attitudes of 'significant' men in their lives. She found that these men shared similar sex role attitudes with her 'role innovative' women and tended to see occupational achievement as personally benefitting women. This finding contrasts sharply with the general findings that men have more conservative attitudes towards sex roles than women and that women estimate men's attitudes as being much more conservative than they are in actuality (McKee & Sheriffs, 1959; Steinmann & Fox, 1974).

Tangri's findings have considerable theoretical importance, since it has often been suggested that women with strong achievement needs and profeminist views are likely to distort and misperceive the attitudes of men towards women (Steinmann & Fox, 1974). In showing that 'significant' men do have profeminist attitudes, Tangri (1972) provides evidence for the soundness of the non traditional woman's judgement. She suggests that 'supportive' men are real and not merely a projection of the non traditional woman's needs and wishes.

A recent study by Lemkau (1983) highlights the importance of supportive men for non traditional women and suggests that traditional women rely on other sources of support and influence. In a study comparing women employed in non traditional and traditional fields of work, Lemkau (1983) found that non traditional women were more likely to see their boyfriends, husbands, male teachers and male friends as being a positive influence on their career choice. Conversely women in traditional fields were more likely to regard their female relatives and female teachers as influential. Although both groups saw their mothers as influential, non traditionals saw their fathers as more influential than their mothers whereas traditionals saw their fathers as much less influential than their mothers (Lemkau, 1983).

Whilst several researchers have suggested that the importance of fathers and male influences on non traditional career choice has been over-rated (Angrist & Almquist, 1975; Greenfeld et al., 1980), the theme of male influence is also highly prominent in the studies of female engineers described in Chapter Two, where it will be noted that female engineers share characteristics both of eminent women scientists and of more ordinary professional women in male dominated fields. The characteristics of women from these two comparison groups are summarised briefly below.

The research on eminent women scientists offers a clear picture of a cool highly intelligent women who has been dedicated to her field of work from an early age. She has many masculine personality characteristics and has enjoyed a warm and close relationship with her father. She is strong, assertive and 'tough-minded' and usually has little sympathy with the women's movement. Her own achievement provides strong personal evidence that women can succeed in a male world.

Like the eminent woman scientist, the non traditional woman is strong, assertive and 'tough-minded.' She is ambitious and relatively unconcerned about affiliative needs.

However, she is less likely to be the first or only child in the family and she is usually closer to her mother than to her father. Although she sees her mother as a role model, her relationships with both parents appear to be characterised by ambivalence and independence. She is unlikely to see her career choice as being influenced by her family, but she sees the opinions of male family members and sympathetic men as important. She holds relatively liberal views towards women's roles and believes that significant men in her life value women's achievements positively.

Footnotes

[1] The majority of research has dealt with the characteristics of women scientists. Very little is known about women technologists. This relative neglect reflects both the low status of research on women and the the relatively low status of technology. Some interesting insights into these issues are provided by Rothschild (1983) and her contributors in her collection of readings, Machina ex Dea.

[2] The question of whether the woman scientist or non traditional woman is more or less psychologically healthy than women in traditional roles is unresolved. The issue is complicated by biases in clinical judgment and in commonly accepted standards of mental health for women (see Broverman et al., 1970). Furthermore, it is virtually impossible to separate psychological difficulties which may arise from individual problems from difficulties which arise because the woman is occupying a role which is seen as strange or odd within the culture.

For example, Smithers and Collings (1981) compared sixth form girls and boys in science with their like-sex peers. They found that whilst girls in science were more person oriented than boys, they were significantly less person oriented than girls choosing other subjects. They also found that girls in science reported more difficulty in everyday social situations and in meeting people than their peers or than boys in science. From this data we do not know whether girls studying science became interested in science because of difficulties in making social relationships or if their interest in science created problems in their social relationships. More plausibly both factors are implicated and are involved in a series of complex interactions, but social science data rarely allows the inference of causality.

There have been several studies suggesting that non tradtional women are more likely to seek psychological counselling than other women (Constantini & Craik, 1972; Angrist & Almquist, 1975) or that they experience more emotional problems than the average woman (Stanley & Soule, 1974). Helson (1967) found that creative women mathematicians were high on clinical scales of the MMPI although their scores were within normal limits. She interprets this finding as suggesting that their personalities were more complex and that they were less defensive than creative women.

Against these findings suggesting pathology, other researchers have argued that women in non traditional fields, particularly those who have been highly successful, have unusual coping capacities (O'Leary & Braun, 1972; Morrison & Sebald, 1974.) In her comprehensive review of literature on women in non traditional occupations, Lemkau (1979) maintains that there is no general trend for non traditional women to be less emoitonally healthy than comparison women. See Lemkau (1979) for further information.

[3] In selecting literature to include I have only included a few references from the growing literature on women in medicine. Whilst this literature undoubtedly has useful parallels, my concern is primarily with the issues faced by women in fields that are perceived as highly and stereotyically masculine. Although medicine is still heavily dominated by men, there have been recent changes in the proportion of women entering medical school and working in general practice (Leeson & Gray, 1975). These changes, coupled with the more 'caring' and humanitarian image of medicine provides it with a popular image which makes female entry more socially acceptable. Medicine is consistently seen as less masculine than mathematics, physics or engineering (Weinreich-Haste, 1979).

[4] For a more thorough discussion of the differences between the image of science and the actual characteristics of scientists, see Kelly & Weinreich-Haste (1979) and Weinreich-Haste (1981).

[5] Many of the same dynamics have been described by Kanter (1977a; 1977b) in her theory of tokens. She suggests that the token woman must distance herself from other women to have her personal achievements recognised.

CHAPTER TWO

WOMEN ENGINEERS: DEVIANT BY ANY STANDARD? A REVIEW OF THE LITERATURE ON FEMALE ENGINEERS

Introduction

The literature on women engineers is severely limited by the lack of appropriate control or comparison groups. As in the literature on 'eminent' women described in Chapter One, much of the evidence on women engineers is autobiographical and consists of personal comments in conference proceedings on the 'problems' for women in engineering (Brown, 1975; Ott & Reese, 1975). The majority of research on female engineers has used as women studying (or intending to study) engineering at graduate level as subjects (Wolpe, 1971; Davis, 1975; Ott & Reese, 1975; Ott, 1978; Yanico et al., 1978; 1981; Weinreich-Haste & Newton, 1983; Bryant, 1984). Relatively little is known about women who are training or working at craft or technician level or about practising women engineers at any level.

Although there has been a tendency to assume that female engineers are very similar to women scientists, it will be argued here that they are a distinctive group and must be considered separately. The present chapter examines the process of choosing engineering as a career and its social and psychological implications. It draws primarily on comparisons between female and male engineers, but also considers how women choosing engineering differ from women choosing other 'non traditional' careers and women choosing more traditionally feminine options. It suggests that women engineers are seen as 'deviant' in relation to each of these comparison groups, but that to understand this judgment of deviance, it is vital to know the characteristics of the reference group being used. As in the previous chapter, the basic focus of the chapter is on career choice and concepts of gender and feminine roles.

The chapter begins with a consideration of family and peer Influences on the choice of engineering. It then contrasts the male and female choice of engineering with conventional gender role expectations. The next section examines personality and value differences between female and male engineers. The final section of the chapter discusses how female and male engineers differ in their concepts of women's roles and femininity and summarises the differences between the two groups.

Family and Peer Influences on Career Choice

Although women who enter engineering often see their parents as supportive of their career choice, they do not usually see their parents as directly influential in their choice of engineering. As in Tangri's (1972) and Lemkau's (1983) studies of career influences on non traditional women, female engineers (including those in the present sample) are more likely to report that they had first considered engineering because of the influence of the media, teachers or careers officers (Davis, 1975; Newton, 1981a; Weinreich-Haste & Newton, 1983; Newton, 1983b). This forms a sharp contrast with male engineers and females entering traditionally feminine fields, who are more likely to see their parents as most influential in their career choice (Newton & Brocklesby, 1982a; Newton, 1983).

Like women scientists, female engineers come from strongly middle class backgrounds and are more likely than average to have attended single sex schools (Wolpe, 1971, Weinreich-Haste & Newton, 1983). Most researchers have found that they come from more elite backgrounds than male engineers (Robin, 1969; Ott, 1978; Newton, 1984); however, Davis (1975) found no differences in the family background of female and male engineering students. Female engineers also frequently come from engineering families (Breakwell, n.d.; Wolpe, 1971; Weinreich-Haste & Newton, 1983b), although this finding was not confirmed in the present sample (Newton, 1984). [1] [2]

There appears to be a paradox in sources of career influence on women's choice of engineering. Teachers and careers advisors are likely to suggest engineering as a career and to provide information about it (Weinreich-Haste & Newton, 1983; Newton, 1983b). However, they are also very likely to discourage women from engineering and to suggest that it is a job which is unsuitable for a woman (Weinreich-Haste & Newton, 1983; Bryant, 1984). In contrast, parents are unlikely to suggest engineering as a career for their daughters but once the choice has been made, they are usually quite supportive (Newton, 1981a).

As in the literature on 'eminent' women and non traditional women there appear to be differences in the responses of male and female family and friends to the choice of engineering. Women in the present sample saw their fathers, brothers and male friends as supportive of their career choice; however, they often received ambivalent or negative reactions from their mothers, sisters and female friends (Newton, 1980a; Newton & Brocklesby, 1982a; Bryant, 1984). These findings parallel Rossi's theoretical speculations (1965) and Tangri's (1972) empirical findings, suggesting that women are often threatened by other women's achievement in male-dominated fields.

Whilst evidence on the role of male peers is contradictory, it tends to support the distinction noted by Hawley (1971; 1972) between 'men in general' and 'supportive men'. In samples of women studying or intending to study engineering at graduate level, Weinreich-Haste and Newton (1983) and Bryant (1984) found that male peers were perceived as discouraging. However, when female engineers participating in the present study and related research were asked about the attitudes of 'close male friends', they reported that they were strongly encouraging and supportive (Newton, 1980a; Newton & Brocklesby, 1982a).

These latter findings fit closely with studies of female engineering students and other women in non traditional fields, who have described the perceived support of younger male staff members as an extremely important factor in their career persistence (Tangri, 1972; Davis, 1975; Johnson, 1975). However, it is important to consider how these findings have been interpreted and how they relate to similar research on male engineers and non traditional women.

There has been a tendency to see female engineers' concern for male support as reflecting females' greater need for social approval and dependance and to view this characteristic as a weakness. This interpretation is in line with the general perception of women's need for achievement in social spheres, which has been viewed as a different form of the achievement motivation often found in males (McClelland, et al., 1953; Douvan & Adelson, 1966). Although female engineering students are more dependant on social support than male engineering students, it should be remembered that male engineering students are characterised by their intense interest in things and their general difficulty in social relationships (Robin, 1969; Eichhorn, 1969; Hacker, 1981). Female engineers and scientists are usually found to have less need for social approval than women in more traditionally feminine fields of study (Rossi, 1965).

It should also be noted that female engineering students occupy a marginal and highly isolated position, particularly in American universities where technological subjects are often taught on a separate site. They are much more likely to be regarded as odd or unusual than the female science student. As will be discussed below, the choice of engineering tends to set a woman apart from other women and from her future colleagues. To understand some of the dynamics of this process it is useful to look at differences between girls and boys who select engineering and how their choices accord with usual gender role expectations.

Choosing Engineering: Males and Females

One of the more consistent findings in the literature on male engineers is that they choose engineering unusually early, even in comparison with other male peers (Gross, 1969; Eichhorn, 1969; Johnson, 1975; Ott, 1978). Gross (1969) noted that more than one-third of the engineering graduates in his sample had decided on engineering before the second year in high school (age 14), whereas the comparable figure for Merton's (1957) sample of doctors was 18%. In contrast, females choose engineering relatively late in their school or university careers and may become engineers after initial training in mathematics or physics, rather than in engineering (Newton, 1984; Wolpe, 1971; Bryant, 1984; Johnson, 1975; Ott, 1978).

The only evidence conflicting with this pattern has been reported by Davis (1975) who found female engineering students chose engineering earlier than their male counterparts. One possible interpretation of Davis's contradictory results is that the distribution of the timing of female engineers' career choice may be bi-modal, with some girls choosing engineering at an early age, like their male counterparts and others making a relatively late choice. Both Breakwell (n.d.) and Newton (1981a) have noted a bi-modal pattern in their samples of technicians with approximately one-third of each sample, making an early choice.

The motivations for choosing engineering for girls and boys also appear to differ with each sex making the choice on the basis of somewhat different perceived interests and abilities. Boys typically choose engineering because of an interest in science and a fascination with how things work, whereas girls choose engineering because of their interest in and talent for mathematics (Davis, 1975; Burks, 1975; Ott, 1978; Newton, 1984). Girls who choose engineering score relatively high on social maturity (Robin, 1969; Ott, 1978; Hacker, 1981) although they are not as interested in people as women in female dominated fields (Rossi, 1965). However, boys who choose engineering seem to be especially disinterested in people and to describe themselves as having had few close relationships in childhood (Hacker, 1981).

After their initial choice of engineering as a career, women and men subsequently select different fields of engineering, with women being more inclined to choose chemical or civil engineering (Robin, 1969). They also tend to be employed in different types of jobs (Davidson, 1984). Men are more likely to be employed in industry, whereas women are most frequently employed in education (C. Perrucci, 1970; Weinreich-Haste, 1984). However, these differences in interests and patterns of choices must be understood in the context of their social and psychological implications. As suggested below, these factors have far-reaching consequences, both in the initial choice of engineering and in long term commitment to it as a career.

Implications of Choosing Engineering

The social and psychological implications of considering or choosing engineering as a career are quite different for girls and boys and must be viewed in relation to conventional gender role expectations. The boy who chooses engineering at a relatively early age is seen as following natural interests and talents. He is often encouraged in a single minded pursuit of engineering-related hobbies, and his narrow interests are seen as both natural and appropriate. The choice is seen as congruent with his developing masculinity.

In contrast, the girl choosing engineering is seen as defying conventional gender role expectations. Both Rossi (1965) and Roberts (1964) have suggested that girls view engineering much more negatively than other scientific careers and that they see this field as extremely unfeminine. Rossi suggests that girls expect little parental support for the choice of engineering as a career, especially from their mothers and assume that they will meet resentment from future male colleagues. Unlike other scientific careers, many women see engineering as a job requiring skills and characteristics that women do not possess.

Rossi (1965) speculates that the barriers to a woman's career choice in engineering operate much earlier than in her choice of medicine or other scientific fields. She sees the image of engineering as directly conflicting with 'appropriate' gender role behaviour and as representing a complete antithesis to feminine skills and interests. She suggests that not only does engineering represent a highly masculine image, it also suggests less prestigious blue collar work.

Most of Rossi's speculations have received strong empirical support, especially her suggestions on the strong negative image of engineering for women. In her study of female engineering students, Wolpe (1971) found that 50% of her sample felt some stigma associated with their choice of career and that they had "... sometimes felt odd rather than happy about their decision." (p. 130)
This feeling of stigma was most often associated with social life, including the family.

This powerful negative image of engineering for women serves to prevent most girls from ever considering it as a career and may make entrants to the field question their choice. In a large sample of sixth form girls studying science, Roberts (1964) reported that only 16% would consider engineering as a career. High amongst the reasons for rejecting engineering was the feeling that it was a 'man's field' and unsuitable for women. There was also a strong feeling amongst respondents that they were not well enough qualified or academically good enough to do engineering.

Even amongst women studying engineering, concern about its being a 'man's world' is strong. As Wolpe (1971) noted, many women feel stigmatised by their career choice; they also are concerned by the discrimination they will experience and how this may limit their career prospects. In surveys of women studying or intending to study engineering in higher education, one of the most frequent problems anticipated by women is discrimination by future employers (Wolpe, 1971; Weinreich-Haste & Newton, 1983; Bryant, 1984). Similar reports of discrimination (either actual or anticipated) have been reported by university students in the United States (Davis, 1975), by technician trainees (Breakwell, n.d.; Newton & Brocklesby, 1982a) and by practising graduate engineers in Britain (Davidson, 1984).

This continual social labelling of engineering as unsuitable for women appears to lead to differences in the type of commitment that women and men have to engineering and in their perspectives on it as a career.

Commitment to a Career in Engineering

The difference in timing of choice of engineering as a career has several important consequences, particularly in Britain where students are required to make early choices of subject options. [3] It leads to women being much less likely to choose engineering or to consider themselves qualified to consider a career in engineering. When women do choose engineering, they are likely to face continuous questioning from all quarters which may lead to considerable stress and self-doubt. The origins of these differences in the process of choice and commitment to engineering as a career can be seen both in the differential socialisation experienced by female and male children and by the way parental and societal forces are reinforced by the school system. These factors lead boys to feel confident in their choice of engineering , whilst they lead girls to feel less well qualified and labelled as 'odd' by friends, families and teachers. Although differences in how parents treat girls and boys are well documented (e.g., Block, 1973; Newson & Newson, 1978), the discussion here will be confined primarily to school factors which discourage girls from considering engineering as a career.

The traditional organisation of British schools and the strong cultural notions of appropriate 'girls' and 'boys' subjects often make it difficult for a girl to select the subjects necessary to study engineering, and in some schools appropriate facilities studying these subjects may not be available to girls (Newton, 1981a; DES, 1975). In addition, the girl who chooses physical sciences and/or technical subjects (e.g, metal work, technical drawing, craft and design technology), is likely to labelled as 'odd' and to face implicit or explicit questions about her femininity. This combination of structural and social factors leads to a relatively small proportion of female pupils ever being in a position to consider engineering as a career, and many girls inadvertently reject engineering or the sciences at age 13 without being aware of the implications of their subject choices (HMI, 1980).

Even when girls study the physical sciences and mathematics necessary for engineering, they often lack the practical skills which boys usually gain through hobbies. This lack of mechanical background operates as a major source of concern both for women considering engineering and women actually training as engineers (Rossi, 1965; Roberts, 1964; Weinreich-Haste & Newton, 1983; Bryant, 1984). Breakwell (n.d.) found that after two years of training female technicians rated themselves lower on practical abilities and technical abilities than male technicians. Similar findings have been reported by Newton & Brocklesby (1982a) who found that even in their third and fourth year of training a significant proportion of technician trainees felt that they would never rectify their initial deficits in practical skills. [4]

These feelings of doubt and uncertainty about their abilities may undermine a woman's confidence and lead her to question her choice of engineering, particularly when she meets with reactions of disbelief about her career choice or when she faces perceived or actual discrimination in her studies or in employment. These differential processes lead to men and women forming a different type of commitment to engineering as a career.

As suggested above, boys who show an early interest in engineering are seen as following their natural inclinations. His early choice of engineering often appears to be a final one, so that he no longer considers other career options. Eichhorn (1969) found that not only did graduate engineers choose engineering early, they were unlikely to admit that they had ever had any doubts about their career choice.

Unlike the boy who choose engineering and is seen as making an obvious and positive choice, the girl who considers engineering usually meets with mixed reactions from family, friends and teachers. She is often encouraged to 'keep her options open' and asked whether she is certain about her career choice. She is seen as 'odd' and there is often implicit or explicit concern about her femininity. This feeling of oddity appears to be a source of stress to many women in engineering (Davidson, 1984), although it has been observed that some women in engineering find their 'oddity' or 'difference' a positive feature of their career choice (Wolpe, 1971; Newton & Brocklesby, 1982a).

It can be argued that whilst such questioning of her career choice by others may serve to strengthen commitment and determination, it may also create doubt and uncertainty, leading to a continuing need to question her commitment to her career. Epstein (1974) has suggested that female lawyers do not make a 'once and for all' commitment to law but continually re-evaluate their commitment to the field in light of their present personal circumstances. Following a similar line of argument, Angrist and Almquist (1975) have suggested that given women's roles in society, their career choices necessarily involve contingencies and may fluctuate more than those of males. [5]

Several studies of women in engineering, including the present study, have shown that they are more satisfied with their jobs than their male colleagues (Schreiber, 1979; O'Farrell & Harlan, 1982; Davidson, 1984). However, they also see themselves as more likely to leave engineering than their male counterparts and appear to become less ambitious and less satisfied over time. (Breakewell, n.d.; O'Farrell &

Harlan, 1982; Schreiber, 1979). [6] These finding are supported by studies of female and male engineering students in the United States which suggest that they leave engineering for different reasons, with females being particularly inclined to leave because of the narrowness of the engineering curriculum. Contrary to popular stereotypes, females do not leave engineering to marry or have families, but because of the feelings of stress associated with working with male engineers and their feeling of poor future prospects in the field (Davis, 1975; Davidson, 1984).

Because of differences in the timing and process of choice for female and male engineers, there appear to be important personality and value differences, which serve to amplify the mere fact of gender and lead to misunderstandings and misperceptions of each other. As will be suggested below, these differences appear to go far beyond the 'tough-minded'-'tender-minded' distinction in Bachtold and Werner's (1973) comparisons of eminent female and male scientists and lend support to Head's (1980) notion that females and males choosing science (and engineering) may represent different stages in the achievement of ego identity.

Although discussion of the dynamics of discrimination against female engineers is beyond the scope of this review, there is strong evidence to suggest that some of the problems encountered stem from important differences in the breadth of their world view and the extent of their interest in subjects outside of technical matters.

World Views and Perspectives

Robin (1969) suggested that the 'problem' for women in engineering was one of incompatibility between female and male engineers. He described male engineers as introverted, unsophisticated, narrow in interests and relatively uninterested in cultural activities. He saw the female engineer as having much broader interests. A similar distinction was drawn by Ott (1978) who found female engineering students interested in a much broader range of subjects than their male colleagues. Davis (1975) noted that one of the major reasons that women in her sample left engineering was because of the narrowness of the technical curriculum and the lack of opportunity to explore wider interests. She found that female engineering students showed few personality differences from other women in scientific and technical fields and that their personality profiles and interests were most similar to women employed in technical, medical, military or scientific occupations. However, their interests were much broader than male engineering students' interests.

When Davis (1975) asked female engineers to describe their male classmates, she found that the men were characterised as being dull and immature, as well as unfriendly. The gulf between female and male engineers is described eloquently by Brown (1975), a female engineer in writing about her own career:

> Engineering is probably the toughest profession for a woman to make her mark in. The reason for this is that engineering has generally attracted to its ranks men who are extremely conservative...they are proving even slower than

> lawyers or doctors to accept women as their peers or superiors. (p. 5)

These differences between female and male engineers are reflected in how they value their careers and what they expect to achieve. Drawing on data collected by Cotgrove and Weinreich-Haste (1982), Weinreich-Haste and Newton (1983) reported that male engineers were more likely to see themselves as more profit-oriented, radical, and technical than female engineers. In contrast, female engineers saw themselves as more sociable, more conservative, more service oriented and more thing oriented. [7] Similar differences in values have been reported by Ott (1978) who found that male engineering students were more interested in money and more interested in politics, whilst female engineering students were more interested in being useful to society and generally had political attitudes that reflected more humanitarian concerns. In a British sample, Bryant (1984) found that female polytechnic students rated status as very low in their concerns, although this is a value typically rated quite high by male engineers.

As shown below, one of the greatest sources of divergence between female and male engineers is in their self-perceived femininity and masculinity (Cotgrove & Weinreich-Haste, 1982) and in their attitudes towards women's work and family roles (Brown, 1975; Ott, 1975; Bryant, 1984). These differences have important implications for how women and men in engineering regard each other and how they integrate (or fail to integrate) their work and personal lives.

Concepts of Femininity

Most research suggests that female engineers regard themselves as highly feminine and have strong feminine interests (Wolpe, 1971; Cotgrove & Weinreich-Haste, 1982; Newton & Brocklesby, 1982b). Using American samples, both Robin (1969) and more recently Yanico et al. (1978) have found that female engineering students are no less feminine than other female students. In the Cotgrove and Weinreich-Haste study (1982) of British university students, the largest difference separating the female engineers and male engineers was on the masculine-feminine dimension, with each group scoring at the extreme. Unlike the American studies, Cotgrove and Weinreich-Haste (1982) found that their female engineering students were more feminine than comparable groups of female sociologists and physicists.

The high degree of self-perceived femininity of female engineers accords with other literature on non traditional women, particularly literature on female scientists and doctors (Mandelbaum, 1981). It suggests that either the decision to enter and/or the decision to remain in a male dominated field involves an element of compensation for the masculinity of the career choice. However, Robin (1969) found that female engineers scoring relatively high on masculinity and low on femininity were more likely to do well on their course than their more feminine classmates, suggesting that a high level of femininity may not be adaptive for success in engineering. In line with this notion, Breakwell (n.d.) found that women in her sample of technicians declined in self-perceived femininity during their second year of training.

Robin's (1969) research and other research using bi-polar measures of femininity-masculinity call into the question the limitations of these measures (Constantinople, 1973; Bem, 1974; Block, 1973; Spence & Helmreich, 1978) and suggest the need to consider both self perceived femininity and masculinity in female's choice of and achievement in engineering. Outside of the present study, the only known study of female engineers to assess femininity and masculinity as separate dimensions is a longitudinal study of female engineering students and home economics students in the United States. Yanico and her colleagues (1978; 1981) found that at the beginning of their course women studying engineering scored significantly higher on masculinity on the Bem Sex Role Inventory (BSRI) than women studying home economics. There were no differences between the two groups on femininity. (Unfortunately Yanico et al. have not yet reported on how their sample changed over their four year university course. See Chapter Five for a more detailed discussion of androgyny measures and the literature on non traditional women.)

Although female engineers generally have traditional attitudes towards women's responsibilities in the home (Bryant, 1984; Newton & Brocklesby, 1982a; Weinreich-Haste & Newton, 1983; Weinreich-Haste, 1984), they have relatively egalitarian views of women's work roles (Newton & Brocklesby, 1982a). They also appear to have flexible views of their home and work roles, and are more positive than male engineers about the possibility of combining work and family roles (Ott, 1978). Weinreich-Haste (1984) found that in comparison with other groups of female university students, female engineers were most willing to entertain the notion of commuting if they and their husbands were offered equally desirable jobs in different places.

In contrast to female engineers, the attitudes of male engineers are dramatically more conservative. They expect women to occupy traditional roles at home and at work and tend to marry women who do not work outside the home (Bryant, 1984; Brown, 1975; Ott, 1975, 1978). Interview data suggests that many male engineers, particularly older men, are genuinely puzzled by women who have serious career ambitions (Newton & Brocklesby, 1982a). Although Weinreich-Haste (1984) does not report comparable data on the 'commuting question' for a group of male engineering students, it seems unlikely that they would be in favour of such an arrangement. Bryant (1984) found that male engineering students strongly believed that child care was a woman's responsibility, that they were strongly committed to this idea, and that they were unwilling to compromise.

An interesting speculative twist to the notion of compatibility of female and male engineers is added by data reported by Breakwell (n.d.). She found that female engineers (N = 33) varied in their attitudes towards women's roles, according to the age at which they had made their career choice, with 'early choosers' having more traditional notions of women's roles than 'late choosers'. 'Late choosers' saw family and career as compatible. This finding suggests that her 'early choosers' may be more similar to their male colleagues than the 'late-choosing' group. Speculating from David's (1971) data on the values of female and male scientists, Aldrich (1978) suggests that female engineers may be penalised to the degree that they deviate from male engineers' values.

Although female engineers are more flexible than male engineers in their notions of how to combine work and family roles, most studies suggest that they see engineering as highly incompatible with family life (e.g., Newton & Brocklesby, 1982a; Weinreich-Haste & Newton, 1983; Davidson, 1984). Several researchers have suggested that female engineers, like other women in non traditional careers, link their intention to have fewer children with their feelings about problems of combining child-rearing with an engineering career (C. Perrucci, 1970; Newton & Brocklesby, 1982a). It appears that female engineers are strongly involved in their careers and that they face difficulties in reconciling some of their own traditional notions about women's responsibilities in the home with the demands of their work and the attitudes of their employers and male colleagues.

The major research findings on female engineers are summarised below and contrasts are drawn between female and male engineers.

Summary of Characteristics of Female Engineers

Unlike male engineers, most women make the choice of engineering relatively late in their school careers. They choose engineering out of an interest in mathematics and see engineering as having greater social value than male engineers. However, they face constant questioning about their career choice and frequently feel socially stigmatised.

In contrast, male engineers make an early career choice out of an interest in science and how things work. Their early career choice appears to restrict their personality development, and the two sexes differ both in values and on specific personality characteristics. The major difference between the two sexes is that female engineers tend to have a broad and flexible view on many issues, whilst male engineers see issues more narrowly and hierarchically. These differences in personality characterstics and values between female and male engineers may account for some aspects of the discrimination that women experience in engineering.

Although they see themselves as very different from their male colleagues in outlook, female engineers derive emotional support from a few men whom they see as similar to themselves. They are not identified with women's issues and are unwilling to label themselves as femininists. However, they do appear to find support from other women and see other women as a reference group.

Against the backdrop of literature on 'eminent' and non traditional women, female engineers appear to share many of their characteristics. Although they hold many of the political values of male technologists, they appear to regard the notion of gender more flexibly and to embrace both feminine and masculine characteristics. They do not resemble the popular stereotype of the highly masculine 'butch' woman, who has no interest in family or more ordinary feminine concerns. They appear to see work and home life as two separate spheres which may require different characteristics and role behaviours.

Footnotes

[1] The proportions of subjects coming from engineering families varies widely in the different studies undertaken. Breakwell (n.d.) reported that 80% of her technician subjects came from engineering families and that in these families, 50% of the fathers were engineers. However, she noted that women from non engineering families were somewhat more likely to succeed than those from engineering families, suggesting that the latter group must be unusually highly motivated. Wolpe (1971) found that 59% of her university students had a male relative in engineering; however, these women were no more likely than women from non engineering famiies to see their families as influencing their career choice.

[2] In the present sample of female technicians, over one third of the subjects had fathers who were engineers; however, the proportion was equally high in the control groups of females in traditional jobs. It should be noted that neither Wolpe (1971) nor Breakwell n.d. had comparison groups in their studies. [See Newton (1984) for further information on the families of subjects in the present research sample.]

[3] Although there are similar problems in the United States, particularly in encouraging female students to study advanced mathematics, option choices are made much later and not nearly so irrevocable. In addition, university curricula tend to be more flexible, allowing students to switch fields of specialisation with relative ease. However, there is still interest in attracting American girls to engineering relatively early in their school careers. Burks (1975) describes a programme to interest 12 and 13 year old girls in engineering.

[4] Although experience in practical activities is not required for trainees for engineering at technician or graduate level, the woman without such experience is likely to be disadvantaged. There appear to be three separate but related aspects of this disadvantage: a lack of experience and confidence when facing practical tasks, a lack of knowledge frequently gained in 'boys' hobbies and potential difficulty in visuo spatial tasks

Many young women entering engineering training lack experience with tools and tend to find it difficult to understand the terminology used on the shop floor. Even if they have studied physics at school, they are also less likely to have a working knowledge of principles of electricity, mechanics and the operation of an internal combustion engine (Newton & Brocklesby, 1982a). Although they can learn the requisite skills, terminology and physical principles, they typically begin training knowing much less than their male counterparts. This lack of knowledge and experience is likely to create an additional source of doubt and worry about their suitability for engineering.

Furthermore, practice in 'tinkering activities' which are usually associated with boys hobbies may actually produce an increase in visuo spatial ability. As noted by Maccoby and Jacklin (1974) in their exhaustive survey of sex differences, boys score consistently higher than girls on tasks of visuo spatial ability. Although many authors attribute this sex difference to biological factors (e.g., Gray, 1981), others attribute it to experience with toys and hobbies which involve tinkering and construction (Fennema & Sherman, 1977). Some evidence supporting this position comes from the GIST project, mentioned in Chapter One. As part of this project experience in 'tinkering activities' on a craft and design technology option was associated with increases in scores (for both sexes) on a test of visuo spatial ability (Kelly, Smail & Whyte, 1984).

It should be noted that many activities in engineering require visuo spatial ability and that selection tests in engineering typically include several measures of this ability.

[5] I am unaware of any study which has conducted a longitudinal comparison of males' and females' career choices. Angrist and Almquist (1975) show considerable fluctuation in career interests and commitments during a four year period at an American university in the 1960's. However, they did not have a male control group. The cultural stereotype is that males will show strong and early commitment to careers and that females will show less commitment and be more likely to change their minds. Even if exaggerated, these cultural stereotypes appear to have a strong influence on how females and males view potential careers and career commitment.

[6] Similar patterns of findings have been reported in samples of American Army cadets at West Point. (See Yoder & Adams, 1984.) It has been suggested that the reason for females' initial greater ambitions reflects their less realistic appraisals of their jobs. The relatively high level of initial ambitions may also suggest comparisons with a female rather than a male reference group (Schreiber, 1979), whilst the decline in ambition and feelings of disillusionment are often attributed to discrimination and a more realistic assessment of their future job prospects.

[7] The finding that male engineers reported themselves radical and female engineers conservative is somewhat surprising and was not present in similar data collected on school children by Cotgrove & Weinreich-Haste (1982).

Differences between their two samples and the lack of correspondence with the previous literature may reflect differences in subjects' interpretation of the dimension 'conservative-radical' on a semantic differential scale. It may argued that a female choosing engineering may see the choice as radical in comparison with her schoolmates, but may regard herself as politically conservative.

The finding that female engineers saw themselves as more thing oriented than male engineers also appears to require some explanation. Although this fits with Bachtold and Werner's (1973) findings on the differences between tender-minded male scientists and tough-minded female scientists, it contradicts other findings suggesting that female engineers are more sociable than male engineers and that male engineers are intially motivated by their interest in things rather than people (Ott, 1978; Robin, 1969). One possible explanation of these anomalies lies in the reference group used by female engineers. In both the Bachtold and Werner (1973) and Cotgrove and Weinreich-Haste research (1982), female engineers may have rated themselves in comparison with other females. The self perception of the male engineers appears more difficult to explain and may represent some form of compensation for earlier perceived deficiencies or a lack of awareness of others' values.

CHAPTER THREE

THE DESIGN OF THE EXPERIMENTAL STUDIES AND THE SELECTION OF MEASURES

Introduction: General Aims of the Research

The strongly masculine image of engineering appears to be an important factor in girls' deciding against engineering as a career. As noted by both Roberts (1964) and Rossi (1965) most girls see engineering as a job unsuitable for a woman. Yet most studies of female engineers suggest that they regard themselves as highly feminine, that they have feminine hobbies and interests and that they hold relatively traditional notions of women's roles in the home. These apparently contradictory findings suggest that female engineers may have different definitions of femininity than their more traditional sisters and their male counterparts in engineering. The research described in the thesis was designed to explore how female engineers perceived their own femininity and masculinity and how they viewed their roles as women. The following specific questions were considered in the research:

How do female engineers view their own femininity and masculinity?
What are their attitudes towards women's roles?

How do they perceive men's attitudes towards women's roles?

> To what extent do they resemble their female schoolmates and other women entering traditionally feminine occupations in how they view gender and women's roles?
>
> To what extent do they resemble their male counterparts in engineering in their perceptions of gender and women's roles?
>
> Do their self perceptions and attitudes change in response to their experience of working in engineering?

The EITB initiative described in the Preface offered an opportunity to investigate some aspects of these questions. The author was given access to the young women participating in the programme during the two year period of EITB sponsorship. She was also assisted by EITB staff in recruiting appropriate comparison groups for the research, thus enabling a series of comparisons and partial comparisons between female engineers and two important groups: women entering traditionally feminine occupations and males entering engineering. As described below, the research design enabled some regional comparisons although these comparisons were unfortunately confounded with the effects of technology.

Three aspects of gender were selected for investigation: sex role self concept, sex role attitudes and sex role ideals. [1] The research described in the thesis aims to explore how these gender concepts may be involved in career choice and how they may be modified as a result of early occupational socialisation.

The remainder of the chapter outlines briefly the rationale for the research undertaken. It begins with a consideration of the gender concepts being measured: sex role self concept, sex role attitudes and sex role ideals. It describes the instruments used to measure these concepts and reviews their psychometric characteristics. The concluding portion of the chapter sets out the basic design for the experimental studies and describes the comparison groups used.

The conditions of administration, the procedures used and scoring of the measures are detailed in Chapter Four, whilst reviews of previous research using the measures selected in relation to occupational choice and socialisation are presented in Chapter Five (sex role self concept) and Chapter Nine (sex role attitudes and sex role ideals).

The Aspects of Gender Measured in the Present Research

Three sets of individual characteristics relating to gender were selected for the present research: sex role self concept (femininity and masculinity), sex role attitudes and sex role ideals. On the basis of previous literature, each of these variables was seen as being related to women's career choice of engineering. The rationale for selecting each of the variables and the instruments used to measure them are outlined below.

Sex Role Self Concept

As shown in Chapters One and Two, women choosing non traditional occupations appear to have both feminine and masculine characteristics. They have the instrumental qualities necessary to enter and persist in male-dominated fields and yet they also retain feminine qualities and many traditional feminine values.

Given these findings, it seemed important to assess both femininity and masculinity in the present research. At the time the research began, androgyny measures were beginning to be used widely in psychological research and were showing relationships with a variety of factors including occupational choice. As discussed in Chapter Five, these measures appeared to offer clear theoretical advantages over conventional bi-polar scales of femininity and masculinity. They are relatively easy to administer and to score and seemed well suited for the research planned.

The Bem Sex Role Inventory (BSRI) was the measure of sex role self concept selected for the present research. Although a similar measure has also been constructed by Spence and Helmreich (1978) and existing personality measures have been adapted by Heilbrun (1976) and Berzins et al. (1978), the BSRI is the most widely used measure of sex role self concept. Unlike the other measures, its validation studies emphasised the notion of flexibility in relation to traditional definitions of gender appropriate concepts (e.g., Bem, 1975, Bem & Lenney, 1976). [2] The BSRI also offered the advantage of having been used by other British researchers at the time the present research was begun (e.g., Williams, 1978).

The BSRI consists of 60 adjectives describing personality characteristics, which Bem suggests are positive and socially desirable in American society. Twenty adjectives represent a sex typed notion of femininity; twenty adjectives represent a sex typed notion of masculinity, and the remaining twenty are seen as neutral in relation to gender. Each adjective is rated on a seven-point scale ranging from 1 ("never or almost never true") to 7 ("always or almost always true"), and each point is labelled. (A copy of the scale with the instructions used in the present resarch is included in Appendix 3.1.)

Originally the BSRI was scored to produce three scores: a femininity score, a masculinity score and an androgyny score. The femininity and masculinity score for a subject were computed by taking the arithmetic average of self-ratings for items on each scale. The androgyny score was computed by calculating the t ratio for the difference in total points endorsed on the two scales (Bem, 1974; Kelly & Worell, 1977).

Bem's original method for calculating the androgyny score has attracted a great deal of controversy (e.g., Spence et al., 1975; Strahan, 1975; Blackman, 1982), and she has subsequently revised her scoring procedure (see Bem & Watson, 1976; Bem, 1977). She has adopted Spence et al.'s (1975), suggestion of distinguishing between two types of subjects who show little difference in their scores on the femininity and masculinity scales: individuals who score relatively high an both scales, whom she calls androgynous and individuals who score relatively low on both scales, whom she calls undifferentiated. However, the question of how to score the BSRI remains a controversial issue in the literature on the measure (e.g., Lenney, 1979b; Blackman, 1982). (The procedures used for scoring the BSRI in the present study are described in Chapter Four.)

The test-retest reliabilities for the BSRI over a four week interval have been reported by Bem as .89 for social desirability (measured by the neutral items), .90 for both femininity and masculinity and .93 for androgyny (Bem, 1974). Internal consistency estimates, computed by coefficient alpha have also been relatively high. Using two samples of college students, Bem (1974) reported figures of .80 and .82 for femininity, identical correlations of .86 for masculinity, .85 and .86 for androgyny and somewhat lower figures of .70 and .75 for social desirability. As predicted, Bem (1974) found that the femininity and masculinity scores were unrelated in men, producing correlations of .11 and .02 in separate samples of college students and showing small, but not significant, negative correlations in women.

The BSRI has been shown to have construct validity in a wide number of areas (see Beere, 1979; Kelly & Worell, 1977; Lenney, 1979a; 1979b for reviews of the large numbers of studies using the BSRI), as well as in the original research reported by Bem and her colleagues (Bem, 1974; Bem, 1975; Bem, 1976; Bem and Lenney, 1976; Bem, Martyna & Watson, 1976). It shows moderate correlations with the California Psychological Inventory (Bem, 1974) and with other measures of androgyny (Kelly & Worell, 1977; Spence & Helmreich, 1978).

Sex Role Attitudes and Sex Role Ideals

Previous research on women in non traditional occupations has generally found that they hold more profeminist attitudes than women in traditionally feminine occupations or women who are not employed outside the home (e.g., Lemkau, 1979, Yogev, 1982). [3] However, research by Steinmann and her colleagues (e.g., Steinmann & Fox, 1974) suggests that to understand sex role behaviour we need to know not only their own attitudes towards women's roles, but also their ideals and their perceptions of men's ideals of feminine behaviour. In a series of investigations, Steinmann (1974) reported a discrepancy between the ideal of feminine behaviour women hold for themselves and the ideal they attibute to men. Although both women and men described an ideal woman as having having moderate attitudes towards women's roles, most women perceive men as having highly traditional views of women's roles. Based on research using similar concepts, Hawley (1971, 1972) found that women preparing for non traditional occupations perceived men as having more liberal ideals of femininity than women preparing for traditional occupations. Her evidence fits closely with the studies of 'eminent' and non traditional women discussed in Chapter One, suggesting the importance of support or perceived support of significant men for women's achievement in male dominated fields. (See Chapters Nine and Ten for a focussed review of literature on sex role attitudes and ideals.)

These lines of research suggested the importance of assessing women's ideals and their perceptions of how men viewed women's sex role behaviour, in addition to their own attitudes towards women's roles. The MAFERR Inventory of Feminine Values (Steinmann & Fox, 1968; Steinmann, 1974), hereafter referred to as the 'MAFERR', was used for this purpose in the research.

The MAFERR was selected because it offered several clear advantages over other measures of sex role attitudes also in use when the research began. Its primary advantage lay in its scales for assessing and comparing three sets of attitudes towards women's roles: 'self', 'ideal self' and 'man's ideal woman'. The concept of ideal self has frequently been used in attitude and personality research (e.g., Rogers, 1951; Wylie, 1979) and as noted by Garnets and Pleck (1979) has a "... long and venerable history in personality psychology". (p. 276) Although Burns (1979) has suggested that the ideal self may represent a cultural ideal, it offers an important potential comparison between individual subjects and between groups of subjects.

The MAFERR also offered the advantage of having been used extensively in previous research on sex role attitudes and ideals and of providing standardisation data on subjects in a variety of occupational roles and on subjects in a large number of cultures including the United Kingdom.

The measure was originally developed by Fand (1955) and modified by Steinmann (1963, 1974). It has been widely used in research on attitudes towards women's roles in the United States (e.g., Steinmann, 1963, Steinmann & Fox, 1966; Steinmann, 1974; Voss, 1980; Nielsen & Edwards, 1982;

Putnam & Hansen, 1972; Altman & Grossman, 1977; Crovitz & Steinmann, 1980). The MAFERR has also been used in England, France, Germany, Finland and Greece as well as in a variety of countries in Latin America and in relatively under-developed parts of the world (Steinmann, 1974). A modified form of the MAFERR has also been employed by Gump (1972). In 1974 Steinmann reported that data was available for over 20,000 subjects of whom approximately 14,000 were women and 7,000 were men.

The MAFERR has made use of large numbers of both female and male subjects in a variety of occupational roles in its standardisation. Although it has made use of student groups in its development, the MAFERR is relatively unusual amongst instruments of its kind in having data on relatively large numbers of female subjects who were either employed or who defined themselves as housewives. The majority of the subjects who have completed the MAFERR are white from middle class backgrounds; however, Steinmann (1974) has also reported data on working class subjects and on subjects from different ethnic groups.

Each form of the MAFERR contains 34 statements each of which indicates a value or value judgment of women's roles or activities. Using a five point Likert scale, the respondent specifies the strength of her/his agreement or disagreement with each of the statements. The points on the scale range from 'strongly agree' to 'strongly disagree' with the midpoint being represented as 'I have no opinion'. Seventeen statements indicate attitudes which describe a 'family orientation' to women's roles and seventeen statements characterise a 'self-achieving orientation'. Steinmann (1974) suggests that a 'family orientation' refers to a woman who sees her family responsibilities as more important than any "...potential personal occupational activity", whereas a 'self achieving woman' considers "...her own satisfactions of equal importance to those of her family and desires to realise her own talents and abilities." (p.55)

Steinmann (1974) reports a Spearman-Brown split-half reliability of .81 and in a more recent study Nielsen and Edwards (1982) report a Spearman-Brown split-half reliability of .86. She notes that the items have face validity, but that they have also been considered by a group of seven judges who agreed on their categorisation as family or self-oriented. Writing in 1974, Steinmann suggested that the items fall into five categories which she descibes as "five independent clusters that have been developed as a direct result of statistically evaluating each item in the Inventory" (p. 414) She describes these general categories as 'the personal and social characteristics of women', 'self realisation', 'male-female relationships', 'marriage and career' and 'attitudes towards parenthood'. (Copies of the various forms of Inventory are included in Appendix 3.2.)

Evidence of the criterion validity of the MAFERR is provided by a study by Altman and Grossman (1977) who found that the MAFERR Self scale showed a correlation of .77 with an index of life plans, so that women who scored high in the self-achieving values on the MAFERR were showed a high score on a measure of future career plans. In the same study Altman and Grossman also reported high correlations with 'housewife' and 'non housewife' scales of the Strong Vocational Interest Blank for Women, with self-achieving women as measured by the MAFERR seeing their interests as highly dissimilar to women who were housewives.

Although the measure is labelled as an 'Inventory of Feminine Values', Steinmann (1963) states that the inventory is designed to measure "...overt attitudes towards the feminine role" (p. 301). It would appear to tap at least some of the attitudes elicited by Spence and Helmreich's Attitudes towards Women Scale (1972), although the MAFERR has a greater proportion of items which refer explicitly to home and family responsibities.

In addition to the Self Form (Form A in the present research), which consists of 34 statements relating to female subjects' attitudes towards women's roles, the MAFERR includes two additional forms of this scale: the Ideal Woman Form (Form B) and the Man's Ideal Woman Form (Form C). These forms of the Inventory make use of the same items as the Self Form but present them in a different order. The subject is asked to complete the attitude items as she imagines her 'ideal woman' or 'man's ideal woman' would complete them.

There is a parallel form of the MAFERR for male subjects, known as the MAFERR Inventory of Masculine Values, which assesses men's attitudes towards their roles in the family and in the outside world. Male subjects in the present research completed forms describing their own attitudes (Self Form, labelled Form H) and those of an Ideal Man (labelled Form I). They also completed the form for their Ideal Woman (labelled Form IW). However, because the Self and Ideal forms of the MAFERR are not strictly comparable for females and males, direct comparisons between female and male subjects are only possible between the 'Ideal Woman' scale (Form B) and 'Man's Ideal Woman' scale (Form C) completed by female subjects and the 'Man's Ideal Woman' scale (Form IW) completed by male subjects.

In preparation for the research described in the thesis, the original versions of the Self, Ideal and Ideal Woman Forms of the MAFERR as supplied by Steinmann and Fox (1968) were administered to a pilot sample of 38 female and 45 male subjects in the fifth form of a local school. (Female subjects completed Forms A, B and C; whilst male subjects completed Forms H, I and IW.) The intake of the school was predominantly working class and the subjects were of average academic ability.

Subjects in this group were unable to understand the instructions on the forms as they were supplied by Steinmann and Fox (1968). Therefore, the instructions were adapted slightly to make the forms comprehensible to fifth form students. Most of the changes were made to reflect differences in American and British usage of language. However, it was necessary to make a substantial change in the usual instructions for 'Man's Ideal Woman,' since many of the subjects in the pilot group did not understand this concept. The version of the form used in the research instructed subjects to complete the form for 'Man's Ideal Woman' by defining an 'Ideal Woman' as "a woman that men would like and wish to marry." Whilst this instruction made the task more personal and concrete than in the original version of the MAFERR, it was felt more important to use a form of wording that subjects understood rather than to maintain the original form of wording. [4]

The Design of the Research

The research described in the thesis consists of two groups of experimental studies, utilising separate research samples. The same design was used for the two series of studies and is presented in Figure 3.1. One group of studies explored sex role attitudes and ideals, whilst the other group of studies investigated sex role self concepts. Both studies were longitudinal, assessing subjects as they began training and towards the end of their second year of training. (Studies of sex role attitudes and ideals involved subjects who began training, education or employment in 1977, and studies of sex role self concept involved subjects who began training, education or employment in 1978.)

In each series of studies female engineers participating in the EITB Scheme described in the Preface were compared with a group of their female friends from school and with a group of male engineers being trained on the same sites. In London two additional comparison groups were included: women studying for an Ordinary National Diploma in Business Studies with an option in Secretarial Studies and women following a course in Nursery Nursing.

Regional comparisons were possible between London and the Midlands for three groups: female engineers, female friends and male engineers. Figure 3.2 provides a summary of the number of subjects participating in the two series of experimental studies. As shown in this Figure, the experimental studies of sex role self concept are described in Chapters Six-Eight, whilst the experimental studies of sex role attitudes and sex role ideals are described in Chapters Eleven-Thirteen.

Each of the comparison groups provided an important focus or contrast with the female engineers. The group of female school friends offered a control for family and school factors. Subjects in this group had attended school with the female engineers and had either entered employment in traditionally feminine jobs or had stayed at school to study for advanced level examinations.

The group of male engineering trainees provided a contrast between female and male trainees. The male engineers in the study began training at the same time as the female engineers and were trained on the same sites as the female engineers. The groups of female and male engineers were trained separately during their first year, and the two groups had relatively little contact with each other. During their second year of training both female and male engineers worked in a variety of engineering companies.

Trainees of both sexes underwent a series of 'industrial rotations' in which they spent eight weeks to three months working in several departments within the company. Although female trainees were sometimes placed in pairs or occasionally in groups of three or four, they were often the only women working at technician level in their companies. [See Newton & Brocklesby (1982a) for further information on differences in the training of female and male engineers in the present research.]

Figure 3.1

Groups of Subjects in the Experimental Studies

of Sex Role Self Concept and

Sex Role Attitudes and Ideals*

Groups in London	Groups in Birmingham
Female Engineers+	Female Engineers++
Female Friends	Female Friends
Male Engineers+	Male Engineers++
Women in Business Studies**	
Women in Nursery Nursing**	

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* All subjects completed measures of sex role self concept or measures of sex role attitudes and ideals at the beginning of training and towards the end of the second year of training, employment or education. (See Chapter Four for further information.)

** These two groups were based at Kingston College of Further Education, whereas the 'London' samples of both female and male engineers were from both Kingston and Croydon.

\+ Engineers in London were employed in electronics and electrical engineering.

++ Engineers in Birmingham were employed in light mechanical engineering.

Figure 3.2

Numbers of Subjects Participating in the Experimental Studies

EXPERIMENTAL STUDIES OF SEX ROLE SELF CONCEPT (Chapters 6-8)

London	N		N
Female Engineers	17	Women in Business Studies	13
Female Friends	14		
Male Engineers	8	Women in Nursery Nursing	12

Birmingham	N
Female Engineers	20
Female Friends	43
Male Engineers	23

EXPERIMENTAL STUDIES OF SEX ROLE ATTITUDES AND IDEALS (Chapters 11-13)

London	N		N
Female Engineers	16	Women in Business Studies	14
Female Friends	20		
Male Engineers	19	Women in Nursery Nursing	15
Male Engineers	19		

Birmingham	N
Female Engineers	17
Female Friends	33
Male Engineers	20

The comparisons between female engineers, female friends and male engineers in London and Birmingham offered a partial control for the effect of region. Unfortunately the effects of region and type of engineering were confounded, since engineers in London were being trained in electronics and electrical engineering and those in Birmingham were being trained in light mechanical engineering. The situation was further complicated by the fact that female and male engineers in London were trained on two sites and followed a somewhat different pattern of training during their first year. Approximately half the subjects spent their first year at the EITB training centre at Croydon, whereas the other half underwent their first year at Kingston College of Further Education. [5]

The comparison between the female engineers, their female friends, women training in Nursery Nursing and Business Studies emphasised the influence of occupational choice and socialisation by providing a contrast between a non traditional occupation and varying degrees of traditionally feminine occupations. All comparisons were made within one region (London). However, it was not possible to control completely for regional effects. As noted above, the female engineers were trained on two sites: Croydon and Kingston. The comparison groups of women in Business Studies and Nursery Nursing were based at Kingston College of Further Education, and it proved impossible to secure comparable groups at a further education college in Croydon to balance the sample. Therefore, the comparisons within London, described in Chapters Seven and Twelve are necessarily partial comparisons.

All subjects completed the appropriate measures during their first month of training and towards the end of their second year of training. They were also interviewed individually at both times. The procedures used for collecting the data are presented in the next chapter. (Some of the data from these interviews has been reported by Newton and Brocklesby, 1982a and Newton, 1984 which are included in Supplementary Material accompanying the thesis.)

Footnotes

[1] Various terms have been used to refer to psychological femininity and masculinity. I have used the term 'sex role self concept'. Another frequently used term is 'sex role orientation'.

[2] Helmreich, Spence & Holahan (1979) attempted a conceptual replication of Bem and Lenney's basic study and failed to reproduce the original results. One possible explanation of the failure to replicate the previous study lies in the differences in the two measures and the differing procedures used in the two experiemnts. [See Bem (1985) for a discussion of differences between the two studies and her spirited defense of her original study.]

[3] Relatively few studies have compared women in different non traditional occupations or have employed adequate controls for status or level of occupation. On the basis of Bachtold's (1976) and Weinreich-Haste's (1984) data, one would expect that women engineers would have more traditional attitudes towards women's roles than women in the social sciences. However, they may have more profeminist attitudes than women in highly traditional women's fields, such as nursing and teaching.

[4] The following standardised version of the instructions for the 'Man's Ideal Woman' form are supplied by Steinmann and Fox (1968), "THINK OF MAN'S IDEAL WOMAN AND RESPOND TO EACH STATEMENT IN THIS FORM AS YOU THINK MAN'S IDEAL WOMAN WOULD. Unfortunately this change in instructions made it difficult to compare how women regarded their Ideal Woman (Form B) and how men viewed an Ideal Woman (Form IW), and the results of these comparisons described in Chapter Thirteen must be regarded as tentative.

[5] Because of the relatively small number of subjects it was not practical to include the comparison between subjects being trained in Croydon and Kingston as part of the analysis.

CHAPTER FOUR

GENERAL PROCEDURE FOR THE SIX EXPERIMENTAL STUDIES

Introduction

This chapter is concerned with the procedure used in the experimental studies. The first portion of the chapter describes how the subjects in the various experimental groups were selected and the conditions under which they completed the experimental measures. It also provides basic information about the organisation of the fieldwork and members of the research team. The second part of the chapter deals with the measures used in the research and their analyis. Although the data collected in the interviews is not included in the thesis, a brief description of the content of the interview schedules is included in this section, and copy of a sample interview for female engineers is in Appendix 4.1. The final portion of the chapter describes the procedure for coding and analysing the data for the two experimental measures: the BSRI and the MAFERR.

Organisation of the Six Experimental Studies

Since the groups used and procedures for collecting the data in the two experimental studies were virtually identical, the general procedure has been described for both studies. For purposes of convenience, the two experimental measures have been called the 'group measures'. This section begins with a description of general procedures common to all groups and then considers the selection of subjects in each group, detailing how group members were selected and any variations in procedure specific to that group.

Timing of the Fieldwork

Subjects in all experimental groups were involved in a longitudinal study, designed to assess changes in how they perceived their careers and gender related issues during the first two years of their training or work experience. They were interviewed individually and then completed one of the group measures, either the BSRI or the MAFERR, during the September or October of their first year of training. The first set of group measures were always completed in a group setting with other subjects from the same experimental group. The follow-up sessions were held approximately twenty to twenty two months after the original data had been collected. (See Figures 4.1 and 4.2, which show when data was collected for each of the experimental groups.) In the follow-up sessions, subjects were re-interviewed and completed the same group measures as administered at the beginning of the research.

Figure 4.1: Timing of Interview Sessions in Experimental Studies of Sex Role Self Concept

	First Session		Second Session	
BIRMINGHAM				
Female Engineers (N = 20)	Sept.	1978	July	1980
Female Friends (N = 43)	Oct.	1978	Aug.-Sept.	1980
Male Engineers (N = 23)	Sept.	1978	July-Sept.	1980
LONDON				
Female Engineers (N = 21)	Sept.	1978	July	1980
Female Friends (N = 14)	Oct.	1978	Aug.-Sept.	1980
Male Engineers (N = 8)	Sept.	1978	July-Sept.	1980
Business Studies (N = 13)	Oct.	1978	June	1980
Nursery Nurses (N = 12)	Oct.	1978	June	1980

Figure 4.2: Timing of Interview Sessions in Experimental Studies of Sex Role Attitudes and Ideals

	First Session	Second Session
BIRMINGHAM		
Female Engineers	Sept. 1977	July 1979
Female Friends	Oct. 1977	Aug.-Sept. 1979
Male Engineers	Sept. 1977	July-Sept. 1979
LONDON		
Female Engineers	Sept. 1977	July 1979
Female Friends	Oct. 1977	Aug.-Sept. 1979
Male Engineers	Sept. 1977	July-Sept. 1979
Business Studies	Oct. 1977	June 1979
Nursery Nurses	Oct. 1977	June 1979

Because of differences in the training undergone by subjects in the various groups, complete standardisation of procedures was not possible. The largest variation occurred in procedures for collecting the follow-up data. Data was collected from three groups: female engineers, women in business studies and women in nursery nurses when the subjects were still available as a group. Unfortunately subjects in the female friends and male engineers groups could not be assembled for similar group sessions. Therefore, these subjects were interviewed and completed the 'group' measures individually. This difference in procedure was seen as highly undesirable; however, the researcher and her fieldwork organiser were unable to find any strategy to overcome this problem.

All subjects were volunteers who were informed of the general purpose of the research. They were promised a copy of the major research findings as soon as they were available. As described below, subjects in two groups, the female engineers and female friends, also received record tokens for participating in the research.

Interviewing conditions varied widely according to the training site. It was usually possible to interview subjects in a relatively quiet room with few distractions; however, occasionally it was necessary to interview a subject near the shop floor or in a room in which there were frequent interruptions from other people. Group sessions were conducted in classrooms reserved for training.

Selection of Subjects

Female Engineers. As mentioned previously, female engineers in the research were participants in the Girl Technician Scholarship Scheme run by the Engineering Industry Training Board (EITB). All subjects in this group were interviewed individually by one of the research team during their first two weeks of training (September, 1977 or 1978). After completing the individual interviews, subjects met as a group to complete either the Bem Sex Role Inventory or the MAFERR, which are subsequently described as the 'group measures'.

The second or follow-up interviews and group measures were usually administered in July of subjects' second year of training. The interval between the two interview and group testing sessions was approximately 22 months. When the second interviews were conducted, subjects were in the final weeks of their EITB sponsorship and were preparing to enter a variety of engineering companies which would allow them to complete their training. It was the last time when the trainees were available as a group.

As in the initial session, subjects were interviewed individually and then completed the group measures, either the BSRI or the MAFERR in a group setting. Because several subjects in the original sample had left the Scholarship Scheme, these subjects were dropped from the final research sample. (Figure 4.3 shows the numbers of subjects in the original and final samples for each of the groups in the experimental studies of sex role self concept, whilst Figure

4.4 provides the same information about samples of subjects in the experimental studies of sex role attitudes and ideals.)

Male Engineers. Male trainees who were trained on the same sites as the female engineers were selected to participate in the research. The EITB regional staff arranged for the research team to meet the appropriate company training officers, and the training officers were responsible for selecting a representative sample of male technician trainees.

Male trainees in the research sample were interviewed individually and completed the initial group measures in September of 1977 and 1978. The procedures used were identical to those used with the female engineers. However, because of the differences in the pattern of their training, it was not possible to carry out the follow-up interviews and group measures in a group setting.

Figure 4.3: Original and Final Sample Sizes in Experimental Studies of Sex Role Self Concept

	Original Sample N	Final Sample N
BIRMINGHAM		
Female Engineers	25	20
Female Friends	49	43
Male Engineers	26	23
LONDON		
Female Engineers	21	17
Female Friends	19	14
Male Engineers	23	8
Business Studies	13	13
Nursery Nurses	14	12

Figure 4.4: Original and Final Sample Sizes in Experimental Studies of Sex Role Attitudes and Ideals

	Original Sample N	Final Sample N
BIRMINGHAM		
Female Engineers	26	17
Female Friends	42	35
Male Engineers	24	20
LONDON		
Female Engineers	21	16
Female Friends	24	21
Male Engineers	24	19
Business Studies	15	15
Nursery Nurses	15	15

After their first year of 'off the site' training, male trainees returned to their companies to complete their training. They worked on a variety of sites and some trainees were placed in different parts of the country. They no longer met as a group, and it was not possible to arrange a group interview session, although this possibility was explored with several companies who had a relatively large number of trainees in the sample.

Therefore, the follow-up interviews were usually conducted in the subjects' homes. Either the senior research assistant or one of the interviewers interviewed the subject and then asked him to complete the group measures. As with female trainees, several subjects in these groups left engineering during the period of the research. However, there tended to be a larger loss of male subjects in the study because they appeared less interested and willing to cooperate in the research. The loss of subjects was particularly high in the group of male trainees who began training in London in 1978 and who participated in the studies of sex role self concept. There were 23 subjects in the original sample and only 8 in the final sample. The reasons for the high wastage for subjects from this group are unknown.

Differences between Female and Male Trainees

There were several important differences in the way female and male trainees were selected for their first year of training and in the pattern of their subsequent training which have implications for the results obtained on the experimental measures.

Female engineers in this research were participants in a special Scholarship Scheme sponsored by the EITB. Candidates were chosen by the EITB on the basis of their school records, their performance on aptitude tests and on impressions gained at interview. Because of the novelty of the programme and the general social unacceptability of female engineers, the EITB had considerable difficulty in attracting suitably qualified candidates to the programme (Newton, 1981; Keil & Newton, 1980; EITB, 1983a). The selectors found it difficult to choose candidates and frequently relied on their intuitive judgments of 'good motivation' in selecting or rejecting young women for the programme. It is notable that the full quota of young women (50 in each year) was not achieved in any of the three intakes (EITB, 1983a).

The Scholarship Scheme sponsored the first two years of participants' technician training, and women in the programme were given the 'firm promise' that the EITB would assist them in finding engineering companies which would employ them for the subsequent two years necessary to complete their training. However, because the programme was a new one, neither the EITB nor the trainees could be certain that companies would wish to employ the female trainees. Their position was a very different one to that enjoyed by male trainees.

In contrast to the female trainees, male engineers were employed by engineering companies when they began their training. They were selected by usual company criterea, typically a large battery of selection tests and a personal interview. Training officers involved in selecting male trainees noted that they had little difficulty in deciding on suitable candidates and that their decisions were often strongly influenced by a boy's hobbies and previous interest in engineering. Male trainees usually had a strong likelihood of being offered employment upon the successful completion of four years' training.

Although both female and male trainees were faced with a difficult transition between the first and second year of their training, female trainees were in a more precarious position. They often entered second year industrial placements in companies which never had employed women as technicians and who were uncertain about taking on female trainees. In addition, upon the completion of EITB sponsorship at the end of their second year of training, approximately half of the female trainees subsequently moved to a second company which employed them for the remaining two years of their training. The discontinuity in the pattern of their training is likely to have been an additional source of stress to female trainees.

<u>Female Friends</u>

This group was recruited by the female engineering trainees. The researcher or one of her team met with the female trainees approximately one week after their individual interviews and asked them to select two or three of their school friends who would be willing to participate in the research. (It was decided to recruit a larger number of friends than trainees because a larger loss from this group was anticipated. However, it is notable that the predicted loss of subjects in this group did not occur, and the friends group was dramatically larger than the group of female engineers in Birmingham in both studies.)

In selecting friends to participate in the research, female trainees were asked to choose friends who had been in the same year at school and who had either entered employment in a traditionally feminine job or had stayed on at school to complete Advanced level examinations. Both female trainees and their friends were given record tokens for their participation in the research. Trainees received a £2 token for each friend they recruited who appeared for interview, whilst friends participating in the research received a £3 token for their participation. The travelling expenses for members of the friends group were also covered by the researchers. This form of incentive was seen as necessary to arrange for the recruitment and participation of the friends group.

Subjects in the friends group came to a group session for initial individual interviews and group measures on a Sunday morning and afternoon in October. All subjects in London attended the same session; however, it was necessary to schedule a second Sunday session in Birmingham because of the very large numbers of friends recruited. The group sessions in London were held at the EITB Training Centre in Croydon; those in Birmingham were held at a hired hall near the city centre. (The latter location was much more convenient and accessible than the EITB offices in Birmingham.)

Upon arrival subjects in the friends group were told about the purposes of the research and the general procedure for the day was explained to them. The session was designed to be relaxed and informal, and subjects were provided with refreshments and Sunday papers to read during the time when they were waiting. In several instances subjects in the friends group were accompanied by one of the female engineers who had recruited them.

As with male engineering trainees, practical difficulties made scheduling a second group interview day impossible. Therefore, interviews and group measures were carried out individually with these subjects during the months of August and September in 1979 or 1980. The majority of interviews were conducted in the subjects' homes. All subjects were interviewed individually and asked to complete the appropriate group measures.

Business Studies and Nursery Nursing Groups. Subjects in these groups were undertaking courses of study at Kingston College of Further Education. This location was chosen because approximately half of both female and male engineering subjects received their first year training at the same college. Although the engineering trainees were on a separate site from the main college, the groups offered a useful control for regional effects.

One of the members of the EITB regional training staff arranged the initial contact between the researcher and the principal of the college, who then enlisted the aid of the relevant course tutors. The college principal wrote individually to each person who might participate in the research and invited their cooperation. He asked them to indicate whether they were willing to particpate in the research by returning a form to the researchers. All subjects who were invited to participate agreed to be subjects in the study. As shown in Figures 4.3 and 4.4, almost no subjects were lost from these groups.

Subjects in these groups were interviewed on the college premises during their free time during the day. A session to complete group measures was arranged by the college tutors. Both the initial and follow up interviews were completed at the college. Because of the timing of the course and the logistics of organising the groups and interviewers, the interval between first and second interview sessions was slightly shorter in these groups (20-21 months vs. 22 months for the other groups).

<u>The Research Team</u>

When the research began in 1977 the researcher was based in the Social Psychology Research Unit at the University of Nottingham. She worked closely with a senior research assistant who was given the responsibility for organising the fieldwork for the project. The initial interviews for all groups (with the exception of the group of female friends) were carried out by the researcher, the senior research assistant and two additional research assistants.

Because of the need to carry out the interviews with the 'friends' group on a single day, several additional interviewers were employed for these sessions. The additional interviewers for these occasions were female postgraduate research students or research assistants in the Social Psychology Research Unit.

All interviewers were female, and all received a specific briefing from either the researcher or the senior research assistant which covered the general purposes of the research, the interview schedule and the group measures.

The Social Psychology Research Unit moved from the University of Nottingham to the University of Kent in autumn of 1978, and the researcher moved to Huddersfield Polytechnic in November, 1978. Fortunately the researcher was still able to oversee the project, and it was possible to retain the services of the senior research assistant. The senior research assistant organised the follow up interviews and group measures and conducted the majority of these interviews herself. To aid her in carrying out interviews in the home, she made use of two additional interviewers, both of whom had previous experience in market research. One of the interviewers lived in London and the other was based in Birmingham. Both were given extensive briefings on the interview schedule and research measures.

The Measures Used in the Research

Individual Interviews

Two basic interview schedules were used in the research, one for engineering trainees (both female and male) and one for members of the female comparison groups (female friends, women in business studies and women in nursery nursing). The initial interview consisted mainly of descriptive items, which dealt with the process of career choice and various background variables. Data collected included items such as school-leaving qualifications, careers advice, type of school attended, preferred job characteristics, parental jobs and postion in the family. Subjects were also asked which parent they believed they resembled most. The interview required approximately 45 minutes to complete. There were minor modifications to some of the questions used in the 1977 interview, and a few additional questions were included in the 1978 interview. The interviews for male engineering trainees and female comparison groups followed the same general pattern.)

The follow-up interview dealt mainly with the process of training, asking the women to reflect on their experience in the EITB programme. It also covered the topic of job and career satisfaction, requiring subjects to review their career choice and comment on it. Further questions explored subjects' attitudes towards household responsibilities and child care.

The Group Measures

The MAFERR. All female subjects in the group beginning training in 1977 completed three forms of the MAFERR: Self, Ideal Woman and Man's Ideal Woman (Forms A, B & C) in September or October, 1977 (Time 1). These three forms were administered in one session and were always presented in the above order. [1] Although it would have been desirable to have balanced the order of presentation, it was felt that this would have been confusing for subjects and would not have seemed 'logical' to them. The three forms were always administered by a female experimenter/interviewer in a group setting in the subjects' first year training site. (The groups ranged in size from 8 to 12.) A second female experimenter/interviewer was also present to assist in the organisation of the materials.

Subjects were told that there were several forms to be filled in, but were not told the nature of the subsequent tasks. After a subject had completed the 'self' form, it was collected by the experimenter and replaced with the 'ideal woman' form. The same procedure was followed with the 'man's ideal woman' form.

Male subjects completed a comparable 'self' and 'ideal' form, describing attitudes towards male roles (Forms H and I). They also completed a third form for their 'ideal woman' (Form IW).

Most subjects took approximately 10 minutes to complete each form, and the entire group procedure lasted approximately 40 minutes. Subjects completed the MAFERR for a second time between June and September, 1979 (Time 2). The forms were presented in the same order and with the same instructions as in the first administration.

The MAFERR was originally designed to be scored with a range of scores from -68 to +68 with 0 representing the neutral point (Steinmann, 1974). This method of scoring proved computationally inconvenient for the present research. Therefore, in this study each statement had a potential score ranging from 1-5 and the appropriate statements were reversed so that a high score always represented traditional (family oriented) attitudes towards women's roles. Since there were 34 statements on each form, the minimum score on each form was 34 and the maximum score was 170. Each form (Self, Ideal and Man's Ideal Woman) was scored separately for each subject. The forms were scored in accordance with the instructions provided by Steinmann and Fox (1968). [2]

The BSRI. All subjects beginning training in 1978 completed the BSRI. As noted in Chapter Three, this scale consists of 60 adjectives, which comprise three scales of 20 items each: the femininity scale, the masculinity scale and the social desirability scale. The social desirability scale contains items which are neutral in relation to gender. Although it was administered in the present research, the social desirability scores were not analysed.

The scoring of the BSRI presented both conceptual and practical difficulties with none of the commonly used techniques seeming appropriate for the present research. To understand the issues it is necessary to outline the most commonly used approaches and their strengths and shortcomings.

There are three general techniques which have been recommended for scoring androgyny measures: the absolute t ratio method, the median split technique and scoring androgyny as a continuous variable. There is no consensus on which technique is most appropriate, although the median split technique tends to be most widely used.

Originally Bem (1974) recommended computing t-ratios for individual subjects to test whether there were significant differences in the subject's femininity and masculinity scores. She classified subjects in five categories: feminine, near feminine, androgynous, near masculine, and masculine.

In response to criticism on this procedure (Strahan, 1975; Spence, Helreich & Stapp, 1975), Bem (1977) recommended adopting the median split technique utilised by Spence and Helmreich with the Personal Attributes Questionnaire (PAQ). In this technique medians for masculinity and femininity are derived from the group under study. When there are unequal numbers of females and males in the population, the numbers are weighted so that the two sexes are equally represented. This procedure is particularly suitable for relatively large and representative populations.

Unfortunately the median split technique presents several problems. It is particularly likely to misclassify subjects who are on are near the median (Heilbrun, 1981b). The technique is also unsuitable when the population under study is small or unrepresentative or containing members of only one sex (Lenney, 1979b; Sedney, 1981).

There have been at least three attempts to develop an index for scoring androgyny as a continuous variable (Heilbrun, 1981; Strahan, 1981 and Bryan, Coleman and Ganong, 1981). However, these approaches have been criticised as losing much of the information available in not preserving the distinction between femininity and masculinity (Blackman, 1982).

In the present research a combined method of scoring the BSRI was used. Bem's t ratio method was used to classify individuals as traditionally sex typed, cross sex typed and 'balanced', and group medians were used to decide whether subjects designated as 'balanced' were either androgynous or undifferentiated. This combined method of scoring has been suggested and used by several other researchers (Orlofsky, Aslin and Ginsburg, 1977; Sedney, 1981; Orlofsky and Stake, 1982). It has the advantage of preserving the strengths of both methods. This procedure has also been followed by Bem (1977) in her reanalysis of data previously classified only by the t ratio technique. It accords with the recommendation by Lenney (1979b) to suit the scoring method to the hypotheses under investigation.

Although the combined method seemed most appropriate for the current research, there remained a question of which group medians were most appropriate to use in assigning subjects to the androgynous and undifferentiated categories. Bem and Watson (1976) suggest that when the ratio of the sexes is unbalanced, the group medians should be weighted so that both sexes are represented in equal proportions. In the current research there were 214 women and 70 men in the sample, so that the scores of males would have been heavily weighted. In addition, males in the current research were all engineering trainees and unlikely to be representative of male subjects in the population.

Therefore, two sets of medians were used in the experimental studies using the BSRI. In comparisons between groups of females (Chapters Six and Seven) the medians used have been those for all females participating in the research at time 1. For comparisons between females and males in engineering (Chapter Eight), weighted medians of the entire research sample have been used, following the technique suggested by Bem and Watson (1976). [3] Subjects were classified as undifferentiated only if their scores were designated as 'balanced' by the absolute t ratio method (Bem, 1974; Bem & Watson, 1976) and if both their femininity and masculinity scores fell below the relevant group medians. [4]

Coding and Data Analysis

All data from the group measures was coded and entered on an Apple IIe computer via a statistical program, 'Supastat' which has been developed at Huddersfield Polytechnic. The researcher independently coded and entered a sample set of data for subjects from one group for each measure, and the inter-rater reliability between the two sets of data was .98.

With the exception of the analyses of variance, all data analyses were carried out by the researcher using the Supastat statistical package. The analyses of variance were performed by Colin Hargreaves using a BMD package at the University of Kent. However, the researcher remains responsible for the interpretation of this data.

A further presentation of relevant literature relating to the experimental measures and the results of the experimental studies are presented in Section Two.

Footnotes

[1] The procedure was identical for male subjects, who completed the MAFERR Inventory of Masculine Values forms for Self, an Ideal Man and their Ideal Woman. (Forms H, I & IW.)

[2] Although the Ideal forms (Forms B and I) ask subjects to indicate whether they had a specific person in mind when answering the questions and how that person was related to the subject, very few subjects answered 'Yes' to this question. Therefore, this information was not included in the data analysis.

[3] This procedure actually changed the classification of only one subject in the two sets of ratings (time 1 and time 2). A female engineer who was classified as androgynous for comparison with females was re-classified as undifferentiated for comparison with males. If the two types of classification had been used with all female subjects, an additional two subjects would have been classified differently under the two sets of criteria.

[4] Group medians for comparisons between female groups were 88 for Masculinity and 93 for Femininity. Group medians for comparisons between female and male engineers were 94 for Masculinity and 89 for Femininity.

SECTION TWO

THE EXPERIMENTAL STUDIES

INTRODUCTION TO SECTION TWO:

SIX EXPERIMENTAL STUDIES:
THEIR RATIONALE AND RESULTS

This section of the thesis is concerned with the rationale for the hypotheses in the six experimental studies, the results of these studies and their interpretation in light of the experimental hypotheses. The section is organised in terms of the variables being studied so that the first part of the section (Chapters Five-Eight) is concerned with the experimental studies of sex role self concept, whilst the second part of the section (Chapters Nine-Thirteen) is concerned with the experimental studies of sex role attitudes and ideals. The remainder of this introduction provides an overview of some of the issues covered in the section

The section begins with Chapter Five, which provides a focussed review of the literature relating psychological femininity and masculinity to occupational choice and socialisation. It specifically considers studies using the BSRI, noting how profiles on the BSRI are related both to occupational choice and to behavioural flexibility and adaptability. It also reviews some of the evidence suggesting that sex role self concept may be a function of social role and explores the notion of developmental changes on the BSRI. Finally the chapter concludes with a section summarising the rationale for the hypotheses for the experimental studies and offers a formal statement of these hypotheses. The hypotheses are grouped in terms of three different types of predictions: Predictions of Differences between Groups in Levels of Femininity and Masculinity, Predictions of Differences between Groups in Androgyny Classification and Predictions of Differences between Groups in Changes in Levels of Femininity and Masculinity. These general hypotheses are translated into more specific predictions in each of the following three chapters.

Chapter Six examines differences between female engineers and their female friends in both London and Birmingham. It compares the initial levels of psychological femininity and masculinity and the androgyny classification of subjects in these two groups; it also looks for the effect of region, both in initial differences and in the changes observed between time one and time two. Chapter Seven investigates similar issues in a partial comparison between women in different occupational groups: women in business studies, women in nursery nursing, female engineers in London and their female friends in London. (As noted in Chapter Three, this study is only a partial comparison because it was not possible to control completely for the effect of region.) In the remaining experimental study of sex role self concept, Chapter Eight explores differences between female and male engineers, both at time one and time two.

This study offers a contrast between the two regions although the regional effects are confounded with the effects of technology. Its results are compared with the predictions offered by the experimental hypotheses and are also considered in terms of the differences in the patterns of training received by female and male engineers.

The experimental studies of sex role attitudes and ideals follow the same pattern as the experimental studies of sex role self concept. Chapter Nine begins with a focussed review of previous studies of sex role attitudes in occupational choice and discusses some of the methodological problems associated with studying sex role attitudes. It also explores various theoretical explanations for attitude change. Chapter Ten considers previous research on sex role ideals, giving particular attention to other studies which have employed the MAFERR. It discusses the apparent discrepancies between women's and men's perceptions of the ideals of the opposite sex and also looks at how women different occupational groups view sex role ideals. The chapter concludes with the presentation of the hypotheses for Experimental Studies Four, Five and Six. The hypotheses are considered in two categories: Initial Differences between Groups in Sex Role Attitudes and Ideals and Predicted Changes in Sex Role Attitudes and Ideals.

Chapter Eleven examines the inital sex role attitudes and ideals of female engineers and their friends in London and Birmingham. It looks for evidence of change in these attitudes and ideals during the time period being studied and explores possible explanations for the findings obtained. Chapter Twelve investigates sex role attitudes and ideals in a partial comparison between women in business studies and nursery nursing with female engineers in London and female friends in London. As in the comparable study of sex role self concept, this study provides a limited comparison of women entering different occupations. The concluding chapter for this section, Chapter Thirteen is an experimental study of sex role attitudes and ideals in female and male engineers in London and Birmingham. It examines these factors in both female and male engineers and notes how attitudes and ideals are modified during the first two years of training.

In the chapters on the experimental studies, the results of the studies are discussed in relation to the original hypotheses. Whenever possible, the findings are related to theoretical issues and to practical factors, including aspects of the experimental design, which may have affected the results. The findings of the six experimental studies are summarised in Section Three of the thesis and the evidence for some of the theoretical notions introduced in Chapters Five and Nine is reviewed.

CHAPTER FIVE

PERCEIVED FEMININITY AND MASCULINITY IN OCCUPATIONAL CHOICE: A FOCUSSED REVIEW OF THE LITERATURE AND HYPOTHESES FOR THE EXPERIMENTAL STUDIES ONE, TWO AND THREE

Introduction

This chapter provides an introduction to the experimental studies of sex role self concept. It begins with a focussed review of literature on perceived femininity and masculinity and occupational choice. The review then considers studies of sex role self concept and behavioural adaptabilty. Finally it explores developmental issues and changes in sex role self concept. These aspects of the literature form the basis for the hypotheses for the three experimental studies of sex role self concept. These hypotheses are formally stated at the conclusion of the chapter and are further developed and elaborated in Chapters Six, Seven and Eight.

In reviewing literature relevant to the present research, I have focussed on studies of occupational choice using the BSRI. However, since there are relatively few such studies, I have also included some studies employing other measures of psychological androgyny and selected studies using bi-polar measures of femininity and masculinity. Although direct comparisons between studies using androgyny and bi-polar measures are not possible, several studies using bi-polar measures have been included because they offered important insights for the current series of studies. [1]

A Focussed Review of the Literature

The review is concerned with four general topics: Studies of Occupational Choice, Studies of Behaviour and Behavioural Adaptability, Developmental Studies of Sex Role Self Concept and Modification and Change in Sex Role Self Concept. Each of these topics is related to the present research and underpins the experimental hypotheses generated.

Studies of Occupational Choice

Relatively few studies have explored the issue of occupational choice using androgyny measures; however, there have been a number of differences in observed levels of masculinity and femininity related to occupation using traditional bi-polar measures. Both types of studies tend to suggest that perceived masculinity and femininity are important factors in selecting and persisting in different occupations. To simplify the organisation of a large number of studies, the studies are considered in two groups: (1) comparisons of men and women and (2) comparisons of women in traditional and non traditional roles.

Comparisons of Men and Women. In one of the few studies employing a measure of androgyny (the PAQ), Spence and Helmreich (1978) looked at the classification of male and female scientists on the PAQ. They found that male scientists (N = 143) were most likely to be masculine sex typed (43%), whereas female scientists (N = 18) were most likely to be androgynous (46%). They noted that male scientists were similar to college males although somewhat higher in masculinity. Female scientists were similar to female varsity athletes in that women in both groups were most often classified as androgynous.

Gaudreau (1977) carried out a factor analytic study to establish construct validity of the BSRI. Amongst his criterion groups were male police officers and full-time housewives. As predicted, these groups differed significantly with the police officers scoring higher on masculinity and housewives higher on femininity. Police officers also scored higher on androgyny than housewives. An interesting aspect of Gaudreau's study was the finding that the items 'masculine' and 'feminine' formed a separate factor, which appeared to represent the sex of the individual. This substantiates the notion that when asked directly about the characteristics of femininity and masculinity, most people see them as representing a single dimension.

In a study of occupational plans, Harren, Kass, Tinsley and Moreland (1979) examined the relationship between scores on the BSRI and the extent to which subjects' intended occupations were male or female-dominated. They found that men and women who scored high on the BSRI femininity scale chose college subjects and future occupations which were female dominated. However, contrary to prediction, the BSRI masculinity scale did not relate to either the college course followed or anticipated occupation.

<u>Comparisons of Women in Traditional and Non Traditional Fields.</u> Yanico and her colleagues (1978; 1981) compared women studying engineering and women studying home economics in a longitudinal study. At the beginning of their course, they found that women studying engineering scored signficantly higher on masculinity on the BSRI than women studying home economics; however, there were no differences between the groups on femininity. When the subjects were classified in three sex role groups: androgynous (androgynous + undifferentiated), masculine sex typed or feminine sex typed, there were no differences in the number of women falling into the androgynous category; however, there were more masculine sex typed women in engineering and more feminine sex typed women in home economics. They also found that feminine sex typed women in engineering were less satisfied with their studies and less certain about continuing in engineering than women who were classified as androgynous. However, contrary to prediction, sex typing did not relate to persistence in the field of study for women in either the engineering or home economics group. The authors speculate that women whose self concept is incongruent with their field of study may modify their self concepts as a result of their studying a strongly sex typed field. Unfortunately follow-up data on the BSRI for their subjects is not yet published, so that this interpretation remains speculative.

Hamby and Shapiro (1982) compared female students of dentistry with females on courses preparing them to be dental hygienists and dental assistants on the BSRI. They found that dental students were somewhat more likely to be classified as androgynous and were much less likely to be feminine sex-typed than the other two groups. Female dental students were also more likely to fall into the undifferentiated category than were dental hygienists or assistants.

In an important study using the BSRI, Welch (1979) found that scores on masculinity were related to the degree of career salience in groups of married women. She compared women who were not working with those in non professional and professional occupations and found that masculinity was related to the degree of career commitment, with women in professional occupations scoring highest on masculinity. She found no differences between the three groups in levels of femininity.

Welch's findings suggesting that the important dimension of difference between career committed women (until recently, by definition, this choice was non traditional) and women with less or no overt work commitment suggests that differences lie in masculinity but not in femininity. This finding is supported by Lemkau's (1979) extensive review of the literature on women's occupational choice. Lemkau observed, "...women in male dominated professions do not appear to differ from other women on positive traits related to traditional femininity." (p. 227) She reported that the only consistent personality difference in the studies she surveyed was that women in non traditional fields perceived themselves as more 'socially aloof' than other women. The importance of feminine values and relationships for women in non traditional fields has also been stressed by Plas and Wallston (1983). They found that women interested in scientific careers tended to value women and receive support primarily from other women more than they did from men.

The notion of 'aloofness' or detachment is echoed by Rossi (1965), who undertook a longitudinal study of women in 'pioneer' (non traditional) occupations, women in traditionally feminine occupations and women who were full-time homemakers. Rossi (1965) suggested that pioneers had looser ties with their families, were less able to sustain intense interpersonal relationships and were less likely to be dependent on others or nurturant of others. (p. 84)
She found that in comparison with homemakers, pioneers were more likely to describe themselves in terms of the masculine characteristics 'dominant' and 'occupationally competitive.' Homemakers were more likely to describe themselves as 'socially competitive' and dependent. In a partial replication of Rossi's work, Birnbaum (1975) compared successful high-achieving married and single professional women with women who were full-time homemakers. She found that both groups of professional women were similar to Rossi's pioneers in being 'occupationally competitive'; only single professional women saw themselves as not being dependent and homemakers were the only group to describe themselves as 'socially competitive.'

Several studies using bi-polar scales of masculinity-femininity have suggested the importance of masculinity (or lack of femininity) in women's choice of non traditional fields of study or work. Cotgrove and Weinreich-Haste (1982) found that girls who had expressed an interest in becoming an engineer described their ideal selves as less feminine and more masculine than girls who were not interested in engineering. Tangri (1972) found that female university students who hoped to enter 'role innovative' occupations described themselves as less feminine than women who were interested in occupations where the sexes were equally represented or women in female dominated occupations. Cowan and Moore (1971) also reported that women in non traditional or pioneer occupations saw themselves as less feminine and wanted to be less feminine than women who aspired to work in traditionally feminine fields.

Mandelbaum (1981) compared women working as doctors and as members of the clergy. She hypothesised that clergywomen were following a more non traditional occupation and would be more masculine in personality. Her results, based on data gathered from the Adjective Check List supported this prediction, with clergywomen being characterised as more driving and surgent, more self-confident and more likely to present themselves favourably before others. Clergywomen were also lower in needs for self-abasement and deference and higher in needs for achievement, dominance, aggression and autonomy.

Several researchers (Kreps, 1971; Cartwright, 1977; Mandelbaum, 1977) have suggested that women who persist in non traditional fields of work have more masculine personality characteristics than women who are trained in these fields but who have interrupted work patterns. As with so many other studies in this field, these findings emphasise the presence of masculine personality characteristics but provide little explanation. We do not know if 'persisters' and 'non persisters' differed in their initial characteristics and/or the extent to which they changed in response either to their work roles or other social roles.

A further area of evidence which provides some insight into how people may choose traditional or non traditional fields of work comes from laboratory studies which attempt to relate sex role self concept to behavioural measures. Several of these studies look at the willingness of subjects to engage in cross-sex behaviour, which would appear to be an important characteristic in either selecting or rejecting a non traditional occupation.

Studies of Behaviour and Behavioural Adaptability

The studies in this area have looked at a variety of tasks, including traditional social psychological paradigms, such as conformity and independence and tasks which measure behavioural adaptability. In an early study of conformity Bem (1976) found that sex role self concept related to performance on a task designed to measure conformity and independence. Utilising cartoons as stimuli, Bem (1976) found that masculine and androgynous subjects were relatively independent, whereas feminine subjects tended to be relatively conforming. There were no differences between females and males. This finding may be quite important when related to non traditional career choice. It fits well with the notion that women entering non traditional careers are less likely to be influenced by others opinions (See the discussion of Hawley's research in Chapter Ten.)

There have been several studies which have considered some notion of behavioural adaptability or flexibility, following Bem's (1974; 1976) original suggestion that androgynous people may have a wider repertoire of behaviours than people who are traditionally sex typed. In one of the first studies on this topic, Bem and Lenney (1976) reported that sex-typed subjects ('feminine' women and 'masculine' men) were more stereotyped than androgynous or reverse-sex subjects in their choice of activities. The sex typed subjects tended to avoid 'cross sex' activities and felt uncomfortable and unhappy with themselves after they had performed these activities.

In a study exploring similar issues, Kelly, Wildman and Urey (1982) reported that in both males and females androgynous and masculine sex typed individuals performed most effectively in a decision making task. The differences between sex role orientations were strongest when the decision making task was stereotypically masculine. [2] However, Kelly et al. (1982) found that masculinity scores were much more likely to be associated for decision making behaviours for females than for males. Kelly et al. suggest that because males are expected to be decision makers and have been rewarded for decisive behaviour in the past, masculinity scores may be less predictive of males' behaviour than females' behaviour.

Orlofsky and Windle (1978) found that sex role orientation as measured by the BSRI related to behavioural adaptability in both males and females. Masculine sex typed and androgynous males and females scored higher on a scale of assertiveness than their same sex counterparts who were feminine sex typed or undifferentiated. On a feminine task, 'affect cognition', males differed according to sex role orientation with androgynous and feminine males scoring higher than masculine or undifferentiated men. There were no differences amongst females on this task, fitting with Bem's (1976) suggestion that masculine sex typed and undifferentiated females may possess a measure of feminine characteristics and styles of behaving by virtue of their growing up as females in a society which emphasises femininity for women.

The findings of studies on behavioural adaptability (Bem & Lenney, 1976; Kelly, Wildman & Urey, 1982; Orlofsky & Windle, 1978) suggest the difficulty of measuring behavioural differences for either sex when the task is strongly stereotyped as being the province of that sex. They also reinforce the observation made by several authors that the meaning and implications of sex role self concept are different for the two sexes (Bem, 1975; Heilbrun, 1976; Allegeier, 1975).

Since the measurement of sex role self concept is relatively new, it is not surprising that little is known about how sex role concepts may be modified. The next two sections of the review address some of the issues related to changes in sex role self concept. The first sub-section considers developmental studies of sex role self concept, whilst the second sub-section explores possible mechanisms for change.

Developmental Studies of Sex Role Self Concept

In her standardization of the BSRI Bem (1974) reported significant differences between the mean levels of masculinity and femininity achieved by males and females in two populations of college students. She found that in both groups males scored higher on the masculinity scale and females scored higher on the femininity scale. Similar differences have also been reported by Silvern and Ryan (1979) and accord with the general finding on bipolar scales of masculinity and femininity that males score towards the masculine pole and females score towards the feminine pole.

Most studies utilizing the BSRI with male college students have found that the majority of subjects are masculine sex typed. In their standardisation data for the BSRI, Bem and Watson (1976) reported that in a sample of male Stanford University students, the largest proportion of the sample (37%) fell into the masculine sex typed category. In the same population the largest proportion of women were classified as feminine sex typed (34%). Similar results have been reported by Silvern and Ryan (1979), who found that 41% of both their male subjects and female subjects were traditionally sex typed. In a more recent investigation Lee and Scheurer (1983) also found a preponderance of traditionally sex typed subjects. They noted that 38% of males and 41% of females were allocated to the conventional categories. [3]

The general pattern of results reported in research using Spence and Helmreich's Personal Attributes Questionnaire (PAQ) resembles findings with the BSRI. In a sample of high school students Spence and Helmreich (1978) found that 44% of males and 32% of females were traditionally sex typed and that in a sample of college students the corresponding percentages were 34% and 32%. However, Spence and Helmreich generally report a higher proportion of androgynous subjects, particularly amongst males. In their high school sample they found 25% of males were androgynous, whereas in the college sample the percentage was 32%. With females they found that 35% of the high school sample was classified as androgynous (a somewhat higher percentage than those who were feminine sex typed), whereas 27% of the college women were classified as androgynous.

In a large cross sectional study Hyde and Phillis (1979) examined androgyny using the BSRI with male and female subjects of different age groups. They found that men were most likely to be masculine sex typed in all age groups except those over 60, who were more likely to be androgynous. In a similar fashion, women were most likely to be feminine sex typed in all age groups; however, the proportion of subjects who were feminine sex typed was particularly high in subjects over 60. Females were much more likely to be categorized as androgynous than males in both the 13-20 and

21-40 age groups. In these two age groups 26% and 31% of females were classified as androgynous whereas only 9% and 4% of males fell into this category. When they examined their data through regression analyses they found that age did not predict either masculinity or femininity.

When Hyde and Phillis's (1979) results are related to theories of personality in relation to the life cycle, their findings for men provide some support for Neugarten's observation (1968) and Pleck's (1975) theoretical suggestion that men emphasise their feminine characteristics as they grow older. However, the results for women are somewhat more puzzling, since they contradict Neugarten's (1968) and Sheehy's (1976) notions that women become more instrumental and perceive themselves as more masculine with age.

Hyde and Phillis interpret their results in terms of the content of items used on the masculine and feminine scales of the BSRI, suggesting that masculine items tend to be have a youthful bias, so that it is unlikely for either sex to become more masculine over time. They suggest that the feminine items do not share this bias and suggest qualities which may be developed or emphasised by both sexes as they grow older.

However, the Hyde and Phillis study suffers from a number of methodological problems. Because of its cross sectional design it was impossible to control for the changes in sex role norms which have occurred during subjects' life times. In addition, the authors did not consider the effect of social role, which may be an important factor, especially when comparing women in different age groups. Their sample was primarily of middle class American subjects; this group is likely to have a relatively high proportion of women who are not employed outside the home and is unlikely to be similar to working class women in the United States or women in Britain.

When social role is considered, as shown in the studies discussed below, it appears to have important explanatory power in accounting for developmental differences in sex role self concept.

Social Roles and Sex Role Self Concept

The majority of studies which have examined sex role self concept have compared groups of women occupying different roles. Relatively few have considered men's social roles, and by omission, there appears to be two unwarranted assumptions: (1) that men's sex role self concepts are relatively stable and (2) that their social roles are unchanging. As shown below, the evidence on men's sex role self concepts is scanty and does not form a consistent picture.

In one of the few comparisons of men and women in different social roles, Abrahams et al. (1978) suggested that gender concepts change in response to life situations and to the perceived masculinity or femininity required in various social roles. In a cross sectional design using the BSRI, Abrahams and her colleagues compared women and men in four situations: cohabiting, married without children, anticipating the birth of a first child and parenthood. By utilising the method of planned comparisons they showed differences in the groups in the four situations, suggesting the importance of situational determinants of femininity and masculinity. When examining their results in terms of mean androgyny scores, they found that men were most masculine sex typed when occupying parental roles and most androgynous when married but childless. They were somewhat masculine sex typed in both the cohabiting and expectant roles. In contrast, women were most androgynous when cohabiting and became increasingly feminine sex typed when married and even more feminine sex typed when they became parents. The effects found for both sexes were unrelated to age, although it should be noted that the age range of subjects participating in the study was a relatively narrow one.

Similar evidence for the congruity between perceived femininity and masculinity and social role for women comes from a large scale study using the BSRI by Hoffman and Fidell (1979). They found that masculine sex typed and androgynous women were most likely to be employed outside the home and were most satisfied with their employment, whereas feminine sex typed women were likely to take full responsibility for child care and household tasks and to find these activities satisfying. This study highlights the importance of the link between sex role self concept and social role and also considers the dimension of satisfaction, a factor which is frequently overlooked in studies of this type.

In a study comparing androgynous and conventionally sex typed men and women on the BSRI, Allegeier (1975) found that sex role self concept appeared to operate differently for males and females and that its links with background factors and anticipated social roles appeared to be stronger for females. She found that androgynous females differed from their sex typed counterparts in having moved frequently during childhood, having been raised in larger communities, having parents of higher occupational status, having higher educational aspirations, desiring fewer children and placing more importance on competence at work. However, sex typing did not appear to relate to these background variables for males. The only difference reported amongst males was that androgynous males saw being an influential member of the community as more important than sex typed males.

Allegeier suggests that the failure of sex typing variables to relate to background variables or future plans may reflect the differing constraints on men and women. Women's future aspirations are likely to be related to the number of children she bears, a factor which is also likely to be linked with the importance she places on achieving competence at work. In males, however, these factors are less likely to be associated, because men do not perceive themselves as personally involved or their work aspirations limited by the number of children they father. Her formulation echoes Angrist and Almquist's (1975) notion of 'careers and contingencies' for women.

Similar findings have been reported by Moreland, Harren, Krimsky-Montague and Tinsley (1979) who found that sex role self concept as measured by the BSRI related to several aspects of making decisions about future careers for females but related only to a measure of rational style for men.

These studies also suggest that sex role self concept must be considered in relation to stereotypical notions of appropriate behaviour for men and women, a theme which was raised earlier in discussion of studies of behavioural adaptability.

Further evidence on the links between sex role self concept and social role comes from studies of people selecting or occupying different occupations. These studies have tended to assume that sex role self concept is an important determinant in occupational choice, but there has been little consideration of the extent to which the experience of working in a particular occupation may modify sex role self concept. The failure to consider this issue seems to be related to several factors, which reflect both theoretical and practical issues. On a theoretical level there has been a tendency for psychologists to assume that personality traits are stable and unlikely to be modified after childhood; linked with this belief has been psychologists' relative neglect of the topic of occupational socialisation. Added to these theoretical issues have been practical matters, such as the difficulty of doing longitudinal research and the very recent development of androgyny measures.

Modification and Change in Sex Role Self Concept

The few studies examining changes in sex role self concept have employed a cross sectional design. I have been able to find only one longitudinal study of sex role self concept. This study, undertaken by Gulanick, Howard and Moreland (1979), suggests that sex role self concept may be modified over a period of several months and that the changes observed may persist for at least a year. In their study Gulanick and her colleagues carried out a programme of assertiveness training with female student volunteers who were feminine sex typed. They found that subjects who had participated in a variety of exercises to increase assertiveness were more likely to be classified as androgynous on the BSRI than students who were in 'discussion only' or 'wait list' control groups.

Other evidence suggesting that personality (and by implication sex role self concept) may be modified in early adulthood comes from a four year longitudinal study of extremely intelligent American women who married whilst they were university students (Ross, 1963). Women who married during their time at university showed significant changes in their personality profiles, becoming less independent and more conservative and showing greater submissiveness and reduced impulse expression. This study is a particularly important one, since its longitudinal design permits some inference about causality. It suggests that the personality change demonstrated was in response to marriage, rather than the women who married being fundamentally different in personality from those who did not marry at this time.

Although further evidence would be desirable, the two longitudinal studies cited above in conjunction with the cross-sectional studies of sex role self concept and social role previously discussed, suggest that occupational socialisation may produce a change in sex role self concept. In the following section, a series of general hypotheses is set out for the three experimental studies of sex role self concept.

Hypotheses to be Tested

Based on the literature discussed above, a series of general hypotheses has been generated. These hypotheses predict how the experimental groups will differ on initial levels of masculinity and femininity and how they will change during the time observed. The rationale for the hypotheses and specific differences predicted will be further elaborated in each of the following chapters.

On the basis of the literature discussed above it is predicted that groups entering different occupations will differ in their initial levels of perceived masculinity and femininity and the magnitude of change shown over the time observed. There will also be differences in the proportion of subjects who are classified as androgynous, sex typed or undifferentiated on the BSRI.

Initial Differences between Groups

The predictions for initial differences between the groups can be broken down into three categories: differences in levels of masculinity and femininity, differences in androgyny classification, and regional differences.

Levels of Masculinity and Femininity. It is expected that subjects entering traditionally masculine occupations will score relatively high on masculinity as measured by the BSRI, whereas subjects entering traditionally feminine occupations will score high on femininity as measured by the BSRI. Therefore, both female engineers and male engineers are expected to score relatively high on masculinity in comparison with other groups, and nursery nurses are expected to score relatively high on femininity. These predictions are based primarily on the strongly sex stereotyped images of the occupations, but also on the specific findings of Yanico et al. (1978; 1981); Spence & Helmreich (1978), Hamby and Shapiro (1982) and Harren et al. (1979). However, it should be noted that the evidence supporting the prediction that engineers will score high on masculinity has considerably more empirical support than the prediction that nursery nurses will score high on femininity. Several studies have suggested that women in non traditional occupations differ in masculinity but not in femininity from other women (Lemkau, 1979).

It also is expected that female engineers will score higher on femininity than male engineers. This difference reflects cultural norms and is consistent with standardization data reported for male and female students by Bem (1974) and Bem and Watson (1976). This prediction is also in line with Lemkau's finding (1979) that women in non traditonal fields had relatively high levels of femininity. Predictions of differences between male and female engineers on levels of masculinity are not made, although it could be argued that male engineers are likely to have a higher level of masculinity than female engineers.

The women in business studies and the friends of female engineers are seen as intermediate groups who will score lower on masculinity than female engineers and lower on femininity than nursery nurses.

Androgyny Classification. It is predicted that female engineers will be most likely to be androgynous or masculine sex typed and least likely to be feminine sex typed in comparison with other groups. In a similar fashion, it is predicted that male engineers will be likely to be masculine sex typed and unlikely to be feminine sex typed. These predictions are based on the masculine nature of engineering as an occupation (Cotgrove & Weinreich-Haste, 1982) and on the empirical studies of engineers and scientists. It is considered more likely that female engineers will be androgynous than male engineers. This prediction is also supported by normative data on the BSRI, which has shown that adolescent males are less likely to be categorised as androgynous than adolescent females (Bem & Watson, 1976; Hyde & Phillis, 1979).

It is further predicted that nursery nurses are the most likely of all groups to be feminine sex typed. This prediction is based on the stereotypically feminine image of the field and on empirical studies on women in female dominated fields (Yanico et al., 1978; 1981; Hamby & Shapiro, 1982).

It is also predicted that female friends and women studying business studies will be intermediate groups in comparison with other females being studied in terms of their androgyny classification. Therefore, there will be lower proportions of female friends and women in business studies who are androgynous or masculine sex typed than female engineers. However, the proportion of subjects from these two groups who are classified as androgynous or masculine sex typed will exceed the proportion of nursery nurses who fall into these two categories. Conversely when compared with nursery nurses there will be lower proportions of female friends and women in business studies who will be feminine sex typed. These predictions are based on the assumption that women in both groups will be entering roles that are less extreme than either of the other two female groups. The majority of these subjects will be working or training with both males and females and will be preparing for traditionally feminine occupations.

Regional Effects. Regional differences are predicted. As documented by Davidson (1985), sex role attitudes are more traditional in the North than in the South. It is, therefore, predicted that sex roles and hence, sex role self concepts, will be relatively rigid in the Midlands, so that subjects will be more likely to see themselves as either masculine or feminine sex typed. Conversely subjects in London will be expected to have a more androgynous view of sex roles and be more likely to see themselves as 'balanced' (androgynous or undifferentiated) than subjects in Birmingham. It is expected that cultural differences in the two regions will be accentuated by differences in technology in the engineering group, since subjects in the Midlands were being trained in mechanical engineering the subjects in London were being trained in electrical engineering or electronics.

Changes in Sex Role Self Concept. Female engineers are seen as the group most likely to change over the period of time observed. One might facetiously attribute the predicted change to what I shall call the 'agitation hypothesis.' Because of their unusual and non traditional choice female engineers are expected to face the most questioning of their conceptions of their own masculinity and femininity and are expected to be frequently in a position of having to defend their career choices.

Owing to the socialising pressures and values of the engineering industry, they are expected to show an increase in masculinity. However, they are also expected to show a change in femininity because of the challenges to their femininity evoked by working in the industry. The direction of the change in femininity is unspecified, because two responses seem possible. Some women may respond by accentuating their femininity, whereas others may respond by 'playing down' their femininity and seeing themselves more in terms of their masculine characteristics. This latter response is well documented in the literature (e.g., Hennig & Jardim, 1976; Podmore & Spencer, 1982).

Male engineers and female nursery nurses are both seen likely to change in response to the socialising influence of their occupations, so that male engineers are expected to increase in masculinity and nursery nurses are expected to increase in femininity.

In line with the previous predictions about initial differences between the groups being studied, it is assumed that female friends and women in business studies will show relatively small changes in their perceived masculinity and femininity and that they will show less change than any of the other groups.

If the predictions made above are formalised, the following hypotheses are made for the three experimental studies:

<u>Initial Differences Between Groups: Levels of Masculinity and Femininity</u>

1. Female engineers will have a higher level of masculinity than women preparing for or employed in traditionally feminine fields of work, e.g., friends, women in business studies, women in nursery nursing.

2. Nursery nurses will have a higher level of femininity than women in all other groups.

3. Female engineers will have a higher level of femininity male engineers.

<u>Initial Differences Between Groups: Androgyny Classification</u>

1. Female engineers will be more likely to be androgynous or masculine sex typed than women in all other groups. They will be less likely to be feminine sex typed than women in all other groups.

2. There will be a higher proportion of male engineers who are masculine sex typed than subjects in any other group. There will be a higher proportion of female nursery nurses who are feminine sex typed than subjects in any other group.

3. Subjects in Birmingham will be more likely to be masculine or feminine sex typed than subjects in London.

<u>Changes in Sex Role Self Concept</u>

1. Female engineers will be more likely than all other groups being studied to show change in their sex role self concepts.

2. Female engineers and male engineers will show an increase in masculinity. Nursery nurses will show an increase in femininity. Female engineers will show a change in femininity (direction unspecified).

These hypotheses are tested in the following chapters three chapters. In Chapter Six differences between female engineers and their friends are considered; in Chapter Seven differences between female engineers in London, their friends, women studying business studies and women studying nursery nursing are explored, and in Chapter Eight differences between male and female engineers are investigated. The results are summarised and explored in relation to findings on the MAFERR in Chapter Fourteen.

Footnotes

[1] Comparisons between studies using different androgyny measures should be viewed with caution. As noted by Worell, 1978 and Lenney, 1979a, each of the four instruments in common use employs a somewhat different definition of androgyny. In a review of scales of androgyny, Kelly et al. (1978) reported high correlations amongst the masculinity and femininity scores on the extant measures; however, when subjects were classified by the widely used median split technique, a high proportion of subjects was classified differently. Therefore, findings reported with one instrument may not be upheld when using another instrument.

[2] The authors compared only masculine and sex neutral tasks, so that the response of subjects to a decision making task involving feminine content is unknown. These results generally support Bem and Lenney's (1976) findings.

[3] Because of the differing approaches used in scoring 'androgyny' measures in the various studies cited, comparisons between the studies are difficult and should be seen as providing only a rough guide to differences between subjects of different ages.

CHAPTER SIX

STUDY ONE: A CONTROLLED COMPARISON OF PERCEIVED FEMININITY AND MASCULINITY IN FEMALE ENGINEERS AND THEIR FEMALE FRIENDS IN LONDON AND BIRMINGHAM

Introduction and Overview

In this study female engineers in London and Birmingham were compared with their female school friends. Subjects in this study were 37 female engineers (17 trained in London and 20 in Birmingham) and 57 female friends (14 in London and 43 in Birmingham). Female engineers began the EITB programme in September, 1978 and were interviewed and completed the BSRI during their first two weeks of training. They were interviewed again in July, 1980 and completed the BSRI for a second time in the same session. Their female friends were recruited by the female engineers and completed the interview and the BSRI in October, 1978. They were interviewed again and completed the BSRI for a second time in July or August, 1980. (Further information on the procedure for this study is available in Chapter Four.)

As outlined in Chapter Five, female engineers were expected to differ from their friends in their perceived masculinity, with female engineers seeing themselves as more masculine than their friends. There were no differences predicted between the two groups in levels of femininity; however, because of their anticipated higher levels of masculinity it was hypothesised that in comparison with their friends, female engineers are more likely to be androgynous or masculine sex typed and less likely to be feminine sex typed. They were expected to show an increase in masculinity and to show a greater change in sex role self concept than their female friends because of the strongly masculine nature of engineering and because of their having to defend their choice of engineering.

The remainder of this chapter lists the hypotheses to be tested in this study, describes the results of the study in terms of these hypotheses and discusses the interpretation of the findings.

Hypotheses to be Tested

The general hypotheses set out in Chapter Five and summarised in the introduction are presented as the following specific predictions regarding female engineers and their female friends:

Initial Differences between Groups

6.1 Female engineers will have a higher level of masculinity than their female friends.

6.2 Female engineers will be more likely to be androgynous or masculine sex typed and less likely to be feminine sex typed than their female friends.

6.3 There will be regional effects with subjects in Birmingham being more likely to be sex typed, whereas subjects in London will be more likely to be androgynous or undifferentiated.

Changes in Sex Role Self Concept

6.4 Female engineers will be more likely to show change in their sex role self concepts than their female friends.

6.5 Female engineers will show an increase in their level of masculinity and will show a change in their level of femininity (direction unspecified).

Results of Study One

The results of this study are discussed below in relation to each of the hypotheses. Hypotheses 6.1 - 6.3 deal with the initial differences between group, whereas Hypotheses 6.4 - 6.5 concern changes over time. The main findings from the analyses are summarised, and further information about the statistical tests carried out is presented in Appendices 6.1 - 6.7.

Initial Differences

6.1 Female engineers will have a higher level of masculinity than their female friends.

The prediction that female engineers would perceive themselves as more masculine than their friends received some support in both London and Birmingham and was statistically significant when the regions were combined ($t = -1.93$, 92 df, $p = .03$, one-tailed test). As shown in Table 6.1, the difference between groups approached statistical significance in both London ($p < .06$) and Birmingham ($p < .07$).

The differences between groups on femininity were not significant in either region, nor when the regions were combined.

6.2 Female engineers will be more likely to be androgynous or masculine sex typed and less likely to be feminine sex typed than their female friends.

The prediction that female engineers were more likely to be androgynous or masculine sex typed than their female friends was not significant within either region; however, it was confirmed when the two regions were combined (Chi squared = 3.90, 1 df, $p < .05$). As hypothesised, female engineers were significantly less likely to be feminine sex typed than their female friends with the difference being significant at the .0002 level when the regions were combined (Chi squared = 9.15, 1 df). The effect was stronger in Birmingham where the difference between female engineers and their friends was significant at the .02 level. In London the comparable difference just missed the conventional .05 level of significance, being significant at the .052 level. (See Appendix 6.2 for further information on the statistical tests used.)

Table 6.1

INITIAL LEVELS OF MASCULINITY AND FEMININITY: Comparisons between Female Engineers and their Female Friends in London and Birmingham on the BSRI at Time 1

	Lon Eng (N=17)	Lon Frnd (N=14)	Birm Eng (N=20)	Birm Frnd (N=43)
Masculinity Score+	91.41	83.36	94.40	87.95
Standard Deviation	12.55	15.48	13.00	16.99
Femininity Score*	92.94	96.29	87.45	92.79
Standard Deviation	15.08	10.03	11.50	14.71

+ Differences between the London Engineers and London Friends were significant at the .06 level, using a one-tailed test ($t = -1.60$, 29 df). Differences between Birmingham Engineers and Birmingham Friends were significant at the .07 level with a one-tailed test ($t = 1.50$, 61 df). When the regions are combined, the difference is significant at the .03 level with a one-tailed test ($t = -1.93$, 92 df).

* Differences between Female Engineers and Female Friends were not significant within either region; they were also not significant when the regions were combined.

Table 6.2

ANDROGYNY AND SEX TYPING IN FEMALE ENGINEERS AND THEIR FEMALE FRIENDS: Four Fold Classification According to Femininity and Masculinity Scores on the Bem Sex Role Inventory (BSRI)+

	Total	Andro.		Masculine		Feminine		Undiff.	
	N	N	%	N	%	N	%	N	%
Lon Eng	17	9	(53)	3	(18)	3	(18)	2	(12)
Birm Eng	20	7	(35)	7	(35)	3	(15)	3	(15)
All Eng++	37	16	(43)	10	(27)	6	(16)	5	(14)
Lon Frnd	14	6	(43)	1	(7)	7	(50)	-	
Birm Frnd	43	7	(16)	13	(30)	21	(49)	2	(5)
All Frnd	57	13	(23)	14	(25)	28	(49)	2	(4)

\+ Owing to rounding errors, percentages do not always add up to 100%.

++ As predicted, Female Engineers were significantly more likely than Female Friends to be classified as androgynous or masculine sex typed; they were significantly less likely to be classified as feminine sex typed. (See Appendix 6.2 for further information on the statistical tests used.)

6.3 There will be regional effects with subjects in Birmingham being more likely to be sex typed, whereas subjects in London will be more likely to be androgynous or undifferentiated.

As predicted, subjects in Birmingham were more likely to be sex typed, whereas subjects in London were more likely to be 'balanced'. The comparison, which combined the Female Engineers and Female Friends group was significant at the .04 level, for a chi squared value of 4.36 with 1 degree of freedom. However, the effect was stronger in the comparison between the Female Friends groups than with the Female Engineers. When the Female Friends in London and Birmingham were compared, the difference between the groups approached statistical significance ($p = .08$, using Fisher's exact test); the difference for the parallel comparison between Female Engineers in London and Birmingham was not statistically significant. (See Table 6.3 and Appendix 6.3 for further information.)

Table 6.3

ANDROGYNY AND SEX TYPING WITHIN REGION: London Engineers, London Friends, All London Subjects, Birmingham Engineers, Birmingham Friends and All Birmingham Subjects: Four Fold Classification According to Femininity and Masculinity on the Bem Sex Role Inventory (BSRI) at Time 1+

	Total	Andro.		Masculine		Feminine		Undiff.	
	N	N	%	N	%	N	%	N	%
Lon Eng	17	9	(53)	3	(18)	3	(18)	2	(12)
Lon Frnd	14	6	(43)	1	(7)	7	(50)	-	
Lon Ss*	31	15	(48)	4	(13)	10	(32)	2	(6)
Birm Eng	20	7	(35)	7	(35)	3	(15)	3	(15)
Birm Frnd	43	7	(16)	13	(30)	21	(49)	2	(5)
Birm Ss	63	14	(22)	20	(32)	24	(38)	5	(8)

+ Owing to rounding errors, percentages do not always add up to 100%.

* When groups are combined, subjects in London are significantly more likely than subjects in Birmingham to be classified as balanced (androgynous or undifferentiated) than as sex typed (feminine or masculine sex typed).

Changes over Time

6.4 Female engineers will be more likely to change in their sex role self concepts than their friends.

6.5 Female engineers will show an increase in their level of masculinity and will show a change in their level of femininity (direction unspecified).

The changes in masculinity and femininity shown by female engineers and their female friends are shown in Figures 6.1 and 6.2. The hypotheses about change were explored using several statistical techniques. The major analyses were analyses of variance on the masculinity and femininity change scores. However, additional analyses considering absolute change scores and the changes within group were also carried out. Each of the analyses is disucssed separately.

Analyses of Variance. To assess changes shown by the female engineers and their female friends, a two-way analysis of variance on the change in masculinity scores and a two-way analysis of variance on the change in femininity scores were performed. The results of these analyses are presented in Tables 6.4 and 6.5. The two factors in the analysis have been labelled 'group' (Engineers-Friends) and 'place' (London-Birmingham).

Neither analysis of variance produced any significant main effects or interaction effects. Inspection of the means at Time 1 and Time 2 (See Tables 6.6 and 6.7) suggests that engineers in London were becoming somewhat more masculine; but those in Birmingham were becoming slightly less masculine. However, these changes do not approach

Figure 6.1 Changes in Masculinity Shown by London Female Engineers, Birmingham Female Engineers, London Female Friends and Birmingham Female Friends

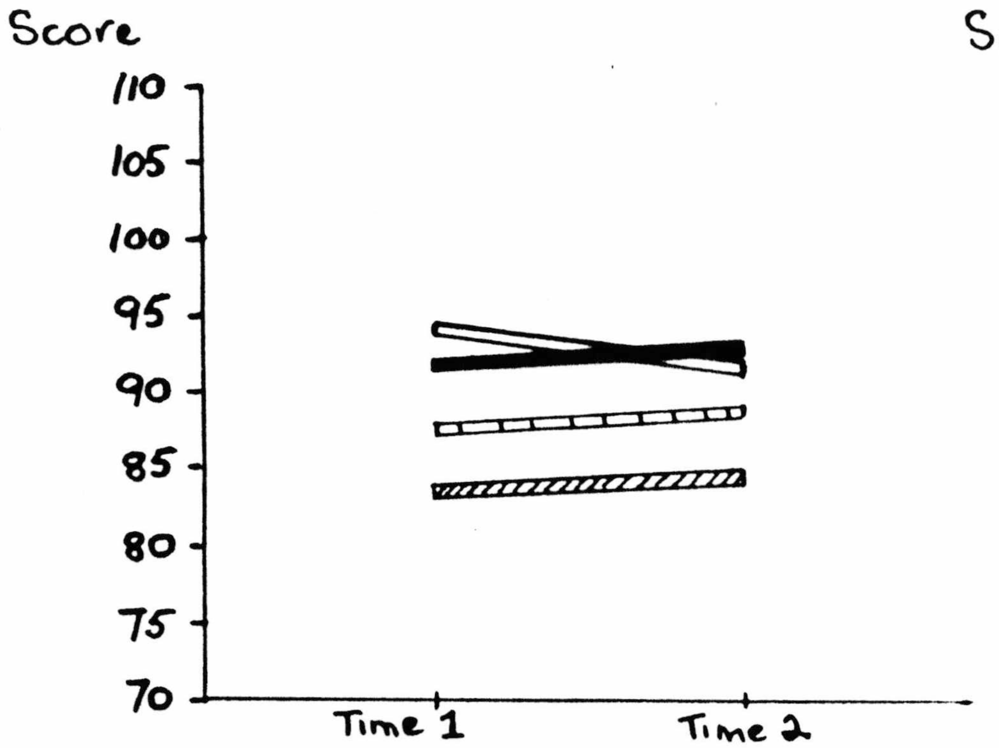
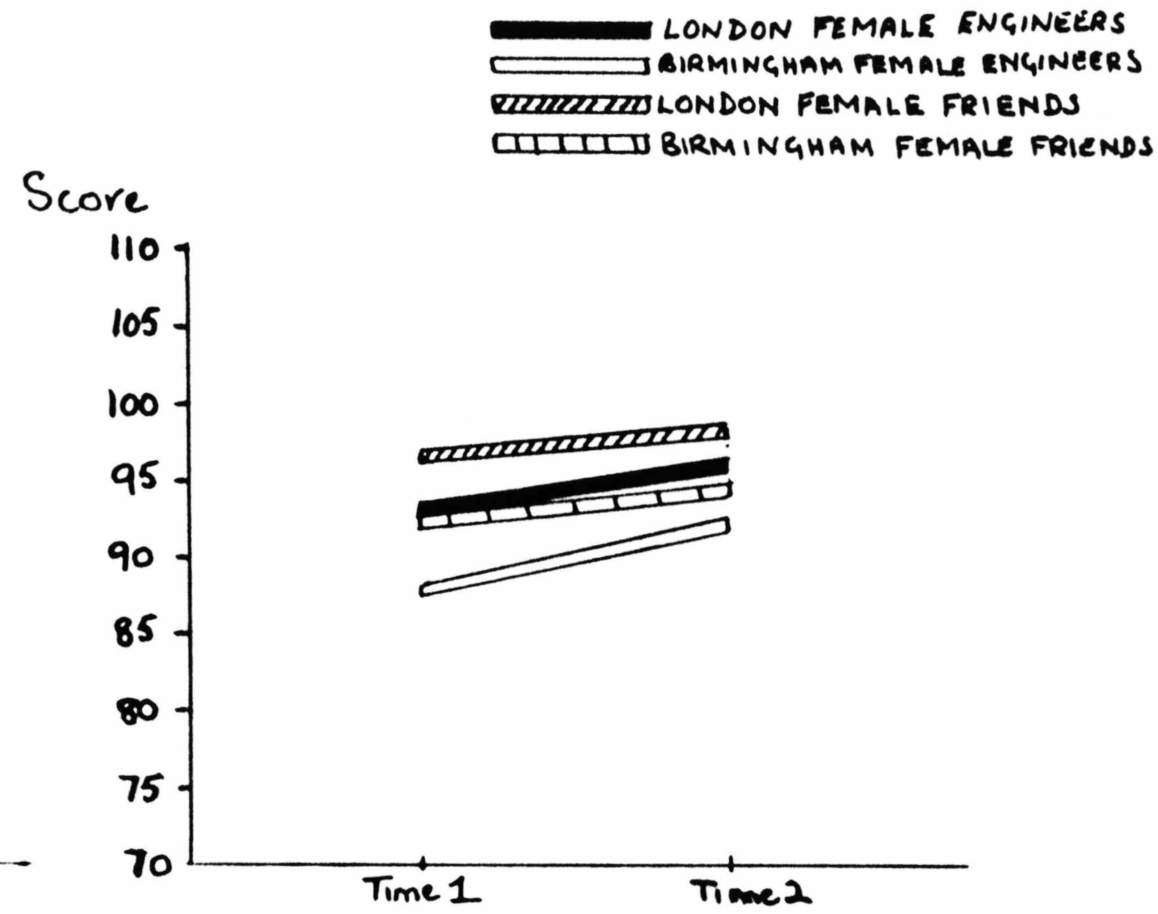


Figure 6.2. Changes in Femininity Shown by London Female Engineers, Birmingham Female Engineers, London Female Friends and Birmingham Female Friends



statistical significance, so that there is no support for the hypothesis that female engineers would become more masculine.

T tests on Absolute Change Scores. The prediction that engineers would show more changes in their perceptions of masculinity and femininity was also evaluated by comparing the absolute change scores for the Engineers and Friends groups. The only significant group difference was between London Engineers and London Friends on masculinity, with the engineers showing a greater absolute change. This finding provides limited support for the prediction that female engineers would change more than their friends. (See Table 6.8 for means and standard deviations of the absolute change scores; also see Appendix 6.4.)

Paired t tests within Group. None of the within group comparisons between masculinity scores at Time 1 and Time 2 was significant. The findings for changes in femininity were more impressive; as shown in Figure 6.2 and in Table 6.7, all groups became more feminine. The largest change was shown by Birmingham Female Engineers, with a paired t test yielding a significance value of .03 ($t = -2.39$, 19 df, two-tailed test). There was a similar trend in London ($t = -1.35$, 16 df, $p = .19$, two-tailed test), and when the regions were combined the change was significant at the .01 level, using a two-tailed test ($t = -2.68$, 36 df). These changes in femininity provide some support for the notion that female engineers will show more change than their friends. However, this argument is weakened by the finding that the Female Friends group tended to show a similar, if less dramatic, increase. This change is described below. (Further information on the changes shown by all groups is presented in Appendix 6.5.)

Although the change shown by London Female Friends did not approach significance, Birmingham Female Friends showed a tendency to increase in femininity ($t = -1.42$, 42 df, $p = .16$, two-tailed test). When the regions were combined, this trend was somewhat stronger and achieved a significance level of .11 for a two-tailed test.

Table 6.4

ANALYSIS OF VARIANCE FOR MASCULINITY CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham on the BSRI

Source	df	SS	MS	F	signif.
GROUP (Eng-Friends)	1	93.70	93.70	0.82	NS
PLACE (Lon-Birm)	1	53.70	53.70	0.05	NS
GROUP X PLACE	1	76.50	76.50	0.67	NS
Residual	90	10246.30	113.80		
Total	93	10470.20			

Table 6.5

ANALYSIS OF VARIANCE FOR FEMININITY CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham on the BSRI

Source	df	SS	MS	F	signif.
GROUP (Eng-Friends)	1	40.34	40.34	0.42	NS
PLACE (Lon-Birm)	1	27.95	27.95	0.29	NS
GROUP X PLACE	1	1.41	1.41	0.01	NS
Residual	90	8622.75			
Total	93	8692.45			

Table 6.6

MEAN MASCULINITY AND NET CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham at Time 1 and Time 2 on the BSRI

Group	N	Time 1	Time 2	Change Score+
London Eng	17	91.41	92.47	1.06
Birm Eng	20	94.40	91.70	-2.70
All F. Eng	37	93.03	92.05	-0.98
London Friends	14	83.36	84.29	0.93
Birm Friends	43	87.95	89.07	1.12
All F. Friends	57	86.83	87.90	1.07

+ When Masculinity Scores at Time 1 and Time 2 were compared, using paired t tests, none of the changes was statistcally significant. (See Appendix 6.5 for further information.)

Table 6.7

MEAN FEMININITY AND NET CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham at Time 1 and Time 2 on the BSRI

Group	N	Time 1	Time 2	Change Score
London Eng	17	92.94	95.77	2.83
Birm Eng	20	87.45	91.75*	4.30
All F. Eng	37	89.97	93.60	3.63
London Friends	14	96.29	97.86	1.57
Birm Friends	43	92.79	95.30	2.51
All F. Friends	57	93.65	95.93	2.28

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* The difference between the Femininity scores at Time 1 and Time 2 is significant at the .03 level ($t = -2.39$, paired t-test, two-tailed test). Changes shown by London Female Engineers are suggestive, being significant at the .16 level and those shown by Birmingham Female Friends are significant at the .19 level. (Both significance levels are for two-tailed tests.)

Table 6.8

ABSOLUTE CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham for Absolute Change Scores on the Masculinity and Femininity Scales of the BSRI

Group	Chnge in Masc.	s.d.	Chnge in Fem.	s.d.
Lon Fem. Eng (N = 17)	9.29*	5.55	6.82	5.72
Lon Fem. Frnd (N = 14)	5.36	4.45	5.43	4.36
Birm Fem. Eng (N = 20)	9.50	6.05	7.60	4.84
Birm Fem. Frnd (N = 43)	8.42	7.41	9.40	7.01

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* When the absolute change scores for masculinity were compared for London Female Engineers and London Female Friends, the change shown by the Female Engineers was significantly greater ($t = -2.14$, 29 df, $p = .04$, two-tailed test). None of the other changes was statistically significant. (See Appendix 6.4 for further information.)

Discussion of Results

Summary of Findings

When initial levels of masculinity and femininity were compared, female engineers scored significantly higher on masculinity than their friends. However, there were no significant differences in their levels of femininity. As predicted, female engineers were more likely to be androgynous or masculine sex typed than their friends and less likely to be feminine sex-typed. Neither finding reached a conventional level of statistical significance within region; however, both differences were significant when the regions were combined.

Subjects in Birmingham were more likely to be sex typed, whilst subjects in London were more likely to be androgynous or undifferentiated. However, this effect was primarily a result of differences between the two Friends groups and was not a trend amongst the female engineers.

There was limited support for the prediction that female engineers would show larger changes in their sex role self concepts than their friends. The changes observed were a greater absolute change in masculinity (shown by London Engineers only) and a increase in femininity (significant for Female Engineers as a group and Female Engineers in Birmingham). Contrary to prediction, female engineers did not become significantly more masculine during their first two years of training.

Interpretation of Results

Initial Differences. The finding that female engineers saw themselves as resembling their friends in femininity but as exceeding them in masculinity is in line with previous research on women in non traditional fields of work (e.g., Lemkau, 1979). It replicates a comparison of female students of engineering with female students of home economics reported by Yanico and her colleagues (1981). In this study the groups differed in masculinity but not femininity on the BSRI. The importance of femininity amongst female engineers has also been reported by Cotgrove and Weinreich-Haste (1982) who found that female engineering students described themselves as more feminine than female students of sociology or physics.

The pattern of results in the current research is seen as having two sources: in the type of woman choosing engineering and in the selection procedure used to choose the women for the engineering course. Women choosing engineering are more likely than their friends to see themselves as similar to the men with whom they will work. In addition, the decision to enter engineering suggests instrumental qualities, since the young woman doing so is required to defend her choices and to cope in an essentially masculine world.

However, the cultural values placed on femininity make it unlikely that the prospective female engineer will see herself as 'unfeminine' and indeed, the decision to enter engineering may encourage her to emphasise her feminine as well as her masculine qualities. This interpretation is reinforced by the finding that both groups of engineers tended to become more feminine over time and that the change in Birmingham was statistically significant.

Informal conversations with male engineers and training officers who were involved in the selection process suggest that the selectors did not want girls who were considered 'too masculine' and that they preferred girls whom they saw as 'fairly tough' and 'able to cope', but as also retaining feminine qualities.

When levels of masculinity and femininity are translated into androgyny classifications, female engineers are significantly more likely than their friends to be classified as androgynous or masculine sex typed than their friends and significantly less likely to be classified as feminine sex typed. It appears that feminine sex typing is incompatible with the choice of engineering. To make such an extreme non traditional choice requires a high measure of agentic and instrumental qualities.

As shown in Table 6.9, female engineers were also significantly more likely than their friends to be classified as balanced (either androgynous or undifferentiated) than as sex typed. (See Appendix 6.7 for further information on this supplementary analsysis.) This unanticipated finding suggests that female engineers may find it relatively easy to blend qualities of femininity and masculinity and see the two as complementary. In contrast, their friends may see the qualities as opposites and are more likely to describe themselves as having feminine or occasionally masculine characteristics. This interpretation fits with Bem's (1978) and Heilbrun's (1981b) suggestions that androgynous women are adept at combining feminine and masculine behaviours, whereas androgynous men behave in masculine ways in some situations and in feminine ways in others. [1]

Although the regional effects were less strong than predicted, they tended to fit with the notion that subjects in Birmingham being more sex typed than subjects in London. As noted previously, the effects of region are confounded with the effects of technology for the engineers participating in the research.

Table 6.9

DIFFERENCES BETWEEN FEMALE ENGINEERS AND FEMALE FRIENDS IN SEX TYPING: A Comparison of the Proportions of Female Engineers and Female Friends in London and Birmingham who are Classified as 'Balanced' (Androgynous + Undifferentiated) and Sex Typed (Feminine or Masculine) on the BSRI at Time 1

	Lon Eng (N=17)		Lon Frnd (N=14)		Birm Eng (N=20)		Birm Frnd (N=43)	
		%		%		%		%
'Balanced'	11	65	6	43	10	50	9	21
Sex Typed+*	6	35	8	57	10	50	34	79

+ Female Friends are significantly more likely to be sex typed than Female Engineers. This finding is significant in Birmingham chi squared = 4.18, 1 df, p = .04) and is significant when the regions are combined, chi squared = 7.56, 1 df, p = .006. (See Appendix 6.6 for further information.)

* There are no significant differences between the two regions.

Table 6.10

ANDROGYNY CLASSIFICATION AT TIME 1 AND TIME 2: A Comparison of London Engineers, London Friends, Birmingham Engineers and Birmingham Friends on the BSRI

	Time	Andro. N	Andro. %	Masculine N	Masculine %	Feminine N	Feminine %	Undiff. N	Undiff. %
Lon Eng (N = 17)	1	9	(53)	3	(18)	3	(18)	2	(12)
	2	5	(29)	3	(18)	7	(41)	2	(12)
Birm Eng (N = 20)	1	7	(35)	7	(35)	3	(15)	3	(15)
	2	3	(15)	7	(35)	9	(45)	1	(5)
All Eng (N = 37)	1	16	(43)	10	(27)	6	(16)	5	(14)
	2	8	(22)	10	(27)	16	(43)	3	(8)
Lon Frnd (N = 14)	1	6	(43)	1	(7)	7	(50)	-	
	2	1	(7)	2	(14)	10	(71)	1	(7)
Birm Frnd (N = 43)	1	7	(16)	13	(30)	21	(49)	2	(5)
	2	11	(26)	9	(21)	23	(53)	-	
All Frnd (N = 57)	1	13	(23)	14	(25)	28	(49)	2	(4)
	2	12	(21)	11	(19)	33	(58)	1	(2)

+ Owing to rounding errors, percentages do not always add up to 100%.

<u>Changes over Time.</u> The relative stability of the BSRI scores over time was contrary to prediction. It suggests that within this relatively short period of time (22 months), there were few changes within either group in sex role self concept. However, it may be that the period of time sampled was too short to produce the expected changes. During this time the engineers were still in the midst of training and may have still been consolidating their identities within the profession. They had another two years of training before they completed their apprenticeships and had no guarantee that they would be employed when they finished their training. [This issue is discussed further in Chapter Eleven and is also explored by Newton and Brocklesby (1982a).]

Angrist and Almquist (1975) and Laws (1978) have suggested that career commitment and identification is often 'contingent' for females. Young women see their possibilities more flexibily than young men and may be inclined to delay their professional identification until they are certain of their prospects. Although this sex difference is often interpreted as lack of career commitment, it can also be seen as a realistic reflection of the less favourable employment possibilities for women.

The observed increase in perceived femininity over this period of training may be interpreted as representing a response to working in an industry heavily dominated by males and masculine values. It seems likely that working in such an environment reinforces feelings of femininity and encourages women to see themselves as more feminine than they did initially.

As previously noted there was no evidence to suggest that female engineers were being socialised to take on more masculine values. Although female engineers in London showed a significantly larger absolute change in masculinity than their friends, the increase shown in masculinity was quite modest and did not represent a statistically significant change. Paradoxically female engineers in Birmingham showed a slight decrease in masculinity, although this change was also not statistically significant.

Table 6.10 shows a comparison between initial and final androgyny classifications for subjects in London and Birmingham. Inspection of the pattern of classifications suggested that female engineers in both regions and female friends in London were less likely to be classified as androgynous and somewhat more likely to be classified as feminine sex typed at time 2 than at time 1. There appeared to be relatively few changes in the pattern of classification shown by female friends in Birmingham.

These changes were evaluated for each group using chi squared tests to compare the proportion of subjects classified in the same categories at time 1 and time 2. Two analyses were carried out for each group; the first compared the proporton of subjects who were classified as androgynous at the time 1 and time 2, whilst the second compared the proportion who were classified as feminine sex typed at the two times of measurement.

These analyses showed that the London Friends were significantly less likely to be classified as androgynous at time 2 than time 1 (Fishers exact test = .03). There was a similar although non significant trend amongst both groups of female engineers, who show a decrease in the proportion of subjects who are classified as androgynous and an increase in the proportion who are classified as feminine sex typed. (See Appendix 6.7 for further information on these analyses.)

Whilst the changes shown by female engineers may be interpreted as representing a reaction to working in a male dominated field, the parallel response in the group of female friends in London is puzzling. An alternative explanation suggests that there are one or more additional factors producing this change.

A recent report by Tesch (1984) suggested that sex role self concept may be related to intimacy status. In a cross sectional study using Spence and Helmreich's PAQ, Tesch found that when adults (mean age = 25) were classified according to intimacy status, women who were classified as 'pre-intimate' tended to be classified as androgynous whereas those who were classified as 'intimate' tended to be classified as 'feminine sex typed'. These results partially replicate Feldman et al.'s (1981) findings that sex role self concept was related to role status. Unfortunately the information in the present study does not include a measure of intimacy status. However, it is plausible that during the time period being studied the number of subjects who saw themselves as being involved in intimate relationships increased and that this change may account for the observed increase in feminine sex typing.

Postscript: Applications of Bem's Gender Schema Theory

In relating to the findings from the present study to gender schema theory, several speculative possibilites are raised. Bem (1981, 1983, 1985) suggests that people vary in the degree to which they process information in terms of gender. In her most recent work, Bem observes that sex typed people differ from those who are classified as androgynous or undifferentiated:

> They [sex typed individuals] should have a lower threshold for spontaneously organsing information -- including information about the self -- into gender based equivalence classes, and they should be more motivated to confrom to the culture's definitions of masculinity and femininity. (Bem, 1985 p. 197)

Based on evidence from the present research and in other data on this sample of female engineers (e.g., Newton & Brocklesby, 1982a), it may be suggested that female engineers are less likely than their friends to see their own personality characteristics as being gender related and are less likely to evaluate situations in terms of gender. This interpretation is supported by anecdotal evidence, suggesting that women in engineering are less likely than women in more traditionally feminine fields to report experiencing discrimination based on sex. [2]

Several researchers have found that androgynous females are more highly defended than women who are feminine sex-typed (e.g., Kelly & Worell, 1977; Heilbrun, 1981b). In

Heilbrun's research (1981b), androgynous males scored lowest on defensiveness whereas feminine sex typed males scored highest. With females the pattern was almost reversed with androgynous women being the most defensive and women who were low on femininity (masculine sex typed or undifferentiated) being the least defensive. Heilbrun suggests that being highly defended provides androgynous women with added confidence that enables them to function well in achievement situations.

Based on these lines of argument, it may be suggested that in comparison with her feminine sex typed friend, the androgynous female engineer has a wider repertoire of responses, she is less likely friend to process information in relation to gender and that she is more highly defended. She may be psychologically 'thick skinned' or 'tough', so that she is able to ignore or dismiss criticism from friends and male colleagues. She views situations in terms of people and their characteristics and is less likely than her friends to label behaviour as feminine or masculine or to interpret others' actions as relating to her role as a woman. This interpretation is supported by Spence and Helmreich's (1978) work of female scientists. In a small study Spence and Helmreich found that female scientists were less concerned with others' opinions and more involved in work and mastery than other females. [3]

Unfortunately the BSRI does not allow one to distinguish between individuals who view qualities which are stereotypically seen as related to gender from those who see themselves as possessing identical qualities but do not see these as reflective of gender. For example, if a subject describes herself as 'dominant' we do not know if she sees this as a masculine quality or if she sees it as irrelevant to gender. We also do not know the situations in which she sees herself as dominant. Although Bem (1985) does not elaborate her argument, her recent work on gender schematic processing suggests that if subjects endorse items which represent both stereotypically feminine and stereotypically masculine qualities, they are usually gender aschematic and conversely, if they show a differential rate of endorsement, they are likely to be engaged in gender schematic processing. [4]

Bem also does not deal directly with how the gender schema may be modified although she implies the importance of early childhood learning and offers suggestions on how to raise gender aschematic children (1981, 1983, 1985). If we accept her contention that androgynous and undifferentiated people are less likely to process information in terms of gender (1981, 1983, 1985), what happens when androgynous people are in situations which emphasise gender and which involve them in close interactions with people who see gender as an important dimension? Is the gender schema enlarged or modified? And what about the converse situation? Will repeated contacts with other people who are gender aschematic and experience in situations which do not emphasise gender cause a reorganisation of the gender schema?

As suggested in Chapter Eight, female engineers work closely with male engineers, who are strongly sex typed. Because the presence of women in engineering is a relatively new phenomenon and because women are in a serious minority, they are likely to be seen by their male counterparts and male supervisors in terms of feminine characteristics (See Kanter, 1977a; 1977b and Newton & Brocklesby, 1982a). Although gender may not be a salient category when they began training, after almost two years of training female engineers may now see gender as a more important category, both in terms their own characteristics and behaviour and the characteristics and behaviour of others. As shown in Table 6.9, 57% of Female Engineers were classified as androgynous or undifferentiated when they began training; however, after almost two yars of training only 30% of Female Engineers fell into these categories. Does this trend in the data suggest a change from gender aschematic to gender schematic processing? If so, what processes are involved?

Unfortunately these questions are beyond the scope of the present research and of the psycholgical instruments currently available. However, these questions do raise important theoretical issues. Some of these issues will be explored more fully in Chapter Fourteen in a discussion of some the limitations of Bem's theories of androgyny and gender schema.

Footnotes

[1] As in Bem's early research, Heilbrun (1981) uses the term 'androgynous' to refer to both androgynous and undifferentiated subjects.

[2] Many female engineers I have met claim that they have never experienced discrimination. Upon close questioning it appears that they do regard many situations which other women would interpret as offensive or mild harrassment as 'harmless teasing'.

[3] Orlofsky and Windle (1978) carried out a study of behavioural flexibility and sex role self concept. They argue that, "... behavioural flexibility derives from strong identifications with both masculine and feminine roles rather than from a simple lack of identification with either sex role." (p. 809) This interpretation contradicts Bem's recent theoretical position on gender schema theory (1985).

It is notable that Bem has changed her position on this issue. In her early articles (e.g., Bem, 1976), her position was similar to Orlofsky and Windle's. However, she did argue that "... androgyny carried with it the seeds of its own destruction." However, one would hardly expect this process of destruction to have occurred so rapidly, so that only five years later subjects had been freed from their stereotypical notions of gender.

[4] Bem's data (1985) supports her interpretation that androgynous and undifferentiated subjects are gender aschematic. However, there remains a conceptual problem of distinguishing between people who are gender aschematic and are classified as androgynous or undifferentiated on the BSRI and those who see themselves as having both stereotypically feminine and masculine characteristics and who are also classified as androgynous and undifferentiated on the BSRI. (See the discussion above.)

CHAPTER SEVEN

STUDY TWO: PERCEIVED FEMININITY AND MASCULINITY IN WOMEN IN BUSINESS STUDIES AND NURSERY NURSING: SOME PARTIAL COMPARISONS WITH FEMALE ENGINEERS AND FEMALE FRIENDS IN LONDON

Introduction

This chapter focuses on sex role self concept in the two comparison groups of female subjects preparing for highly traditional careers: the Kingston Business Studies and Kingston Nursery Nursing groups. To gain perspective on the differences observed, these groups are compared with the London Female Engineers and London Female Friends. However, as noted in Chapter Three, these comparisons only offer a partial control for the effect of region. Since the differences between the female engineers and female friends have already been explored in Chapter Six, they will be presented only in summary form in this chapter.

The chapter begins with a restatement of the hypotheses offered in Chapter Five as they apply to specific comparisons between the Kingston Business Studies and Nursery Nursing subjects and the other female groups in London, the Female Friends and Female Engineers. It proceeds to evaluate each of the hypotheses for initial differences between the groups and for the changes shown. There is also a consideration of the differences between the two groups in Kingston. The findings are summarised and discussed in relation to the literature on traditionally feminine occupations.

Hypotheses to be Tested

Initial Differences between Groups

7.1 Women in traditionally feminine fields of work or study will have a lower level of masculinity than female engineers.

7.2 Nursery Nurses will have a higher level of femininity than all other female groups being studied.

7.3 Women in traditionally feminine fields of work or study will be more likely to be feminine sex typed and less likely to be androgynous or masculine sex typed than female engineers.

Changes in Sex Role Self Concept

7.4 Women in traditionally feminine fields of work or study will be less likely to change in sex role self concept than female engineers.

7.5 Nursery nurses will show an increase in femininity.

Results of Study Two

7.1 Women in traditionally feminine fields of work or study will have a lower level of masculinity than Female Engineers.

This prediction was supported for women in Business Studies, but it did not reach the conventional level of significance for women in Nursery Nursing. Differences between women in Business Studies and Female Engineers were significant at the .005 level, using a one-tailed test ($t = 2.76$, 28 df). In the comparison between Nursery Nurses and Female Engineers, the difference was in the expected direction with Nursery Nurses scoring lower; however, it was significant only at the .09 level, using a one-tailed test ($t = 1.40$, 27 df).

Mean scores and standard deviations of masculinity for each of the female groups in London are presented in Table 7.1. As noted in Chapter Six, differences between female engineers and their female friends approached statistical significance ($p = .06$, one-tailed test). No other differences between the groups were statistically significant.

7.2 Nursery Nurses will have a higher level of femininity than Female Engineers, Female Friends and women in Business Studies.

This hypothesis was strongly supported with Nursery Nurses scoring significantly higher on femininity than all other groups. (See Table 7.2.) The largest statistical difference was between the women in Nursery Nursing and Business Studies, which was significant at the .003 level for a one-tailed test ($t = -3.018$, 23 df). Differences between Nursery Nurses and Female Engineers and Nursery Nurses and Female Friends were significant at the .006 level and .007 level, using a one-tailed test. (See Appendix 7.2 for further information.)

Table 7.1

INITIAL LEVELS OF MASCULINITY: Comparison of Mean Scores and Standard Deviations for Women in Business Studies, Women in Nursery Nursing, London Female Friends and London Female Engineers on the Masculinity Scale of the BSRI at Time 1

Group	N	Mean	s.d.
Kingston Business Studies	13	77.08	15.97
Kingston Nursery Nurses	12	84.08	15.70
London Female Friends	14	83.36	15.48
London Female Engineers+	17	91.41	12.55

+ Differences between Business Studies and Female Engineers groups are statistically significant at the .005 level; differences between Female Friends and Female Engineers are significant at the .06 level and differences between Nursery Nurses and Female Engineers are significant at the .09 level. (All significance values are for one-tailed tests.)

Table 7.2

INITIAL LEVELS OF FEMININITY: Comparison of Mean Scores and Standard Deviations for Women in Business Studies and Women in Nursery Nursing, London Female Engineers and London Female Friends on the Femininity Scale of the BSRI at Time 1

Group	N	Mean	s.d.
Kingston Business Studies	13	95.77	8.35
Kingston Nursery Nurses+	12	106.25	9.02
London Female Friends	14	96.29	10.03
London Female Engineers	17	92.94	15.08

+ Differences between Nursery Nurses and Business Studies groups are statistically significant at the .003 level; differences between Nursery Nurses and Female Engineers are significant at the .006 level, and differences between Nursery Nurses and Female Friends are significant at the .007 level. (All significance levels are for one-tailed tests.)

7.3 Women in traditionally feminine fields of work or study will be more likely to be feminine sex typed and less likely to be androgynous or masculine sex typed than Female Engineers.

This prediction was basically supported. As shown in Table 7.3, women in Business Studies and women in Nursery Nursing were significantly more likely to be classified as feminine sex typed and significantly less likely to be classified as androgynous or masculine sex typed than Female Engineers.

When the London Female Friends were compared with the Female Engineers on the proportions who were classified as feminine sex typed, the difference achieved a probability value of .052. However, when the same groups were compared on the proportion of subjects being classified as androgynous or masculine sex typed, the difference between the groups was less marked. As expected Female Engineers were more likely than their Friends to fall into these categories; however, the difference was significant only at the .19 level.

The Business Studies and Nursery Nursing groups did not differ significantly from the London Female Friends in the proportion of subjects who were classified as androgynous/masculine sex typed or the proportion of subjects who were classified as feminine sex typed. See Appendix 7.3 for further information on the statistical analyses carried out.

Table 7.3

ANDROGYNY CLASSIFICATION ON THE BSRI: Four Fold Classification of Kingston Business Studies and Kingston Nursery Nurses, London Female Friends and London Female Engineers on the BSRI at Time 1 + *

		ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	N	N	%	N	%	N	%	N	%
King. Bus. St.	13	3	(23)	-		9	(69)	1	(7)
King. N. Nurse	12	2	(17)	1	(8)	8	(67)	1	(8)
Lon. Friends	14	6	(43)	1	(7)	7	(50)	-	
Lon. F. Eng.	17	9	(53)	3	(18)	3	(18)	2	(12)

+ Group medians for all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Three for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

Changes in Sex Role Self Concept

7.4 Women in traditionally feminine fields of work or study will be less likely to change in sex role self concept than female engineers.

This hypothesis was largely unsupported. Women in one of the traditionally feminine groups, the Kingston Business Studies group, tended to show larger changes in sex role self concept than the female engineers. The changes in masculinity and femininity shown by the four groups participating in this study are presented in Figures 7.1 and 7.2.

The hypothesis was evaluated both in terms of absolute and net changes. Each of the groups was compared with the Female Engineers. As shown in Table 7.4, absolute changes in masculinity were similar for the two Kingston groups and for the female engineers. Only the comparison between the Female Friends and the Female Engineers on absolute change in masculinity favoured the hypothesis, with the Female Engineers showing the larger change ($t = 2.14$, 29 df, $p = .02$, one-tailed test).

There was relatively little difference amongst the groups in the magnitude of absolute change shown on femininity, and none of the differences between groups achieved statistical significance. However, it is notable that the group showing the largest change was the Business Studies group, a group from whom a small change was expected.

Differences between the each of the female comparison groups and the female engineers were assessed, using a between groups t test on the mean net change scores. This procedure

Figure 7.1. Changes in Masculinity Shown by London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing.

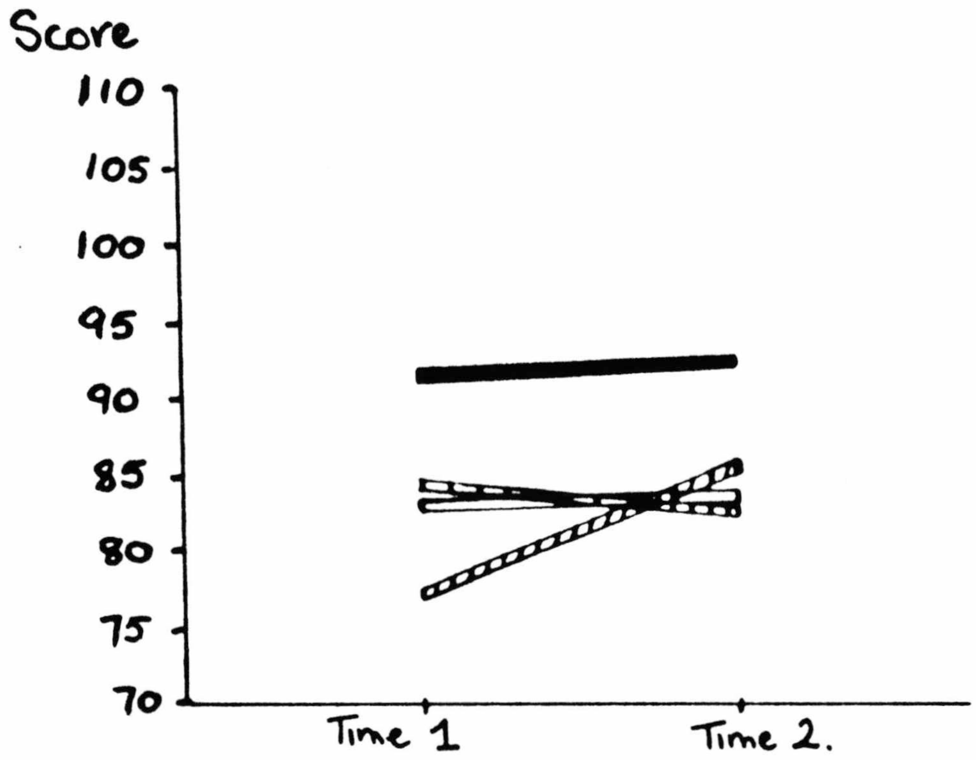
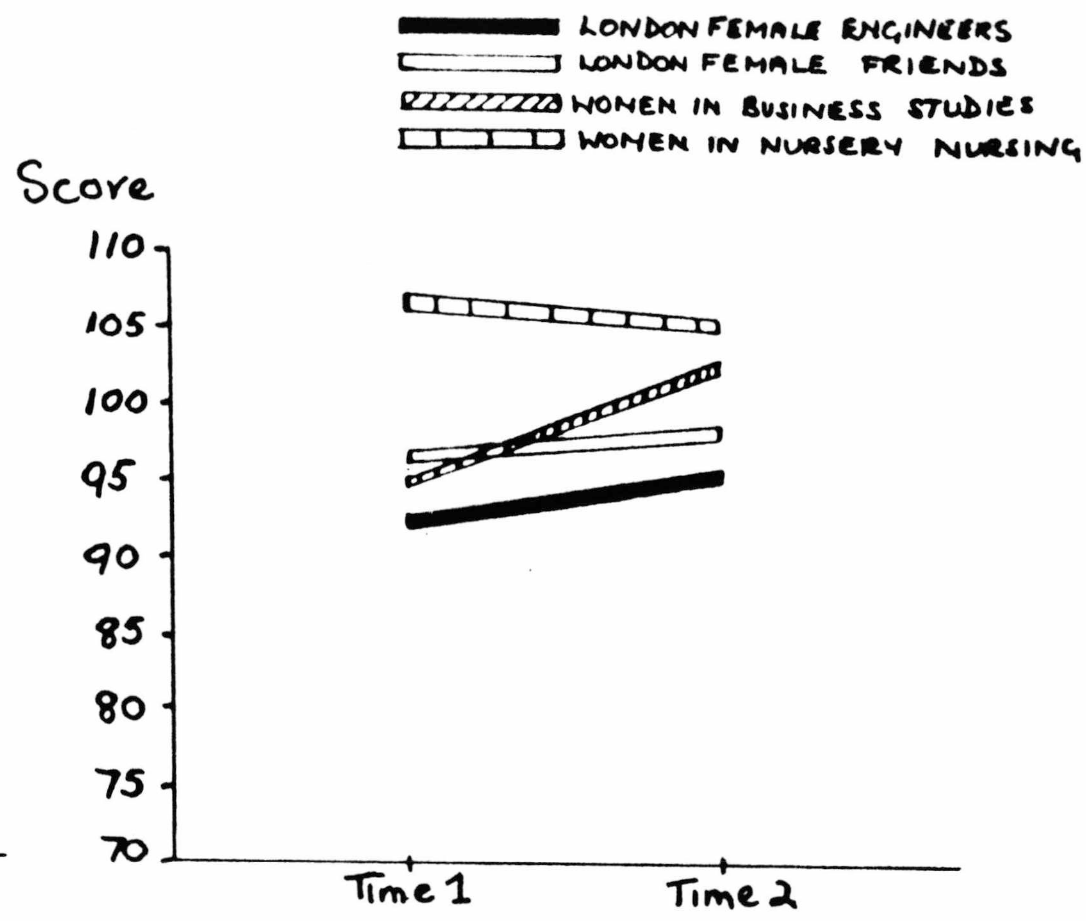


Figure 7.2. Changes in Femininity Shown by London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing.



is comparable to the analyses of variance carried out in Chapters Six and Eight. (See Appendix 7.4 for further information on the analyses carried out.)

Table 7.5 shows the mean values for net changes in masculinity and femininity. Only the comparison between the Business Studies group and the Female Engineers produced a result approaching statistical significance; paradoxically women in Business Studies tended to show a larger change than Female Engineers on both masculinity and femininity. The net change in masculinity achieved a significance level of .07 for a two-tailed test, whilst the change in femininity can only be seen as suggestive, reaching a probability level of .20 for a two-tailed test.

To gain further information on the changes observed, paired t tests were carried out within each group between masculinity scores at time 1 and time 2 and femininity scores between time 1 and time 2. Following the pattern suggested in previous analyses, Kingston Business Studies subjects showed highly significant increases in both masculinity and femininity; both changes were significant at or beyond the .01 level. London Female Engineers showed a tendency to increase in femininity; however, the effect was a marginal one, only reaching the .19 level of significance for a two-tailed test.

Table 7.4

ABSOLUTE CHANGES IN MASCULINITY AND FEMININITY: Change Scores in on the BSRI for Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers+

Group	Chnge in Masculin.	s.d.	Chnge in Feminin.	s.d.
King. Bus. St. (N = 13)	9.39	7.41	9.15	5.91
King. N. Nurse (N = 12)	9.50	7.56	7.50	6.71
Lon. Friends (N = 14)	5.36	4.45	5.43	4.36
Lon. F. Eng (N = 17)	9.29	5.55	6.82	5.73

+ Absolute change scores represent the absolute value of the difference between masculinity (or femininity) scores at time 2 and time 1.

Table 7.5

MEAN NET CHANGES IN MASCULINITY AND FEMININITY: Change Scores in on the BSRI for Kingston Business Studies and Kingston Nursery Nurses, London Female Friends and London Female Engineers+

Group	Chnge in Masculin.	s.d.	Chnge in Feminin.	s.d.
King. Bus. St. (N = 13)	8.15	8.85	7.00	8.52
King. N. Nurse (N = 12)	-1.00	12.43	-1.33	10.22
Lon. Friends (N = 14)	0.93	7.05	1.57	6.94
Lon. F. Eng (N = 17)	1.06	11.02	2.82	8.59

+ Change scores are calculated by subtracting the Time 1 value from the Time 2 value, so that a positive score represents an increase and a negative score represents a decrease in the quality being measured.

7.5 Nursery Nurses will show an increase in femininity.

There was no support for this hypothesis. As seen in Table 7.5, Nursery Nurses showed a small decrease in femininity, and a paired t-test showed that the change within group was not significant ($t = 0.45$, 11 df).

Discussion of Results

Summary of Findings

The differences in initial levels of masculinity and femininity between women in traditionally feminine fields and Female Engineers were less dramatic than predicted. Of the three 'traditional' groups, only the Nursery Nurses were significantly higher on femininity than Female Engineers and only the Kingston Business Studies subjects were significantly lower on masculinity. However, there was a tendency for both the Female Friends and Nursery Nurses to score lower than the Female Engineers on masculinity, thus according with the general pattern of results anticipated.

When the subjects in each of the groups were classified according to their relative levels of masculinity and femininity, the three traditionally feminine groups were more likely to be classified as feminine sex typed than the female engineers. Conversely, women in Business Studies and Nursery Nursing were significantly less likely to be classified as androgynous or masculine sex typed than Female Engineers.

Contrary to prediction, the largest changes observed were in the Kingston Business Studies group, who showed statistically significant increases in both masculinity and femininity. The only evidence in favour of the original hypothesis that female engineers would show greater change than other groups was the finding that female engineers showed a larger absolute change in masculinity than their female friends.

To amplify the differences between the various groups of women in traditional fields, several additional analyses were carried out comparing these groups. These analyses are detailed in Appendix 7.5.

Additional Analyses

Women in Business Studies and Nursery Nursing. The first group of analyses compared the Kingston Business Studies and Nursery Nursing groups, both on levels of masculinity and femininity and on their androgyny classification. The analyses suggested that when they began training the two groups were similar in levels of masculinity; however, the Nursery Nurses scored signicantly higher on femininity than the women in Business Studies. Both groups had a majority of subjects who were classified as feminine sex typed.

Although the two groups were largely similar at time 1, their responses to their training was quite different. When the net changes between the two groups were compared, the Business Studies group showed significantly larger changes in masculinity and femininity than the Nursery Nurses. As noted previously, these changes represented significant increases in both masculinity and femininity. In contrast, the Nursery Nurses showed little change on either scale.

Comparisons between androgyny classifications of the two groups suggested no difference between the two groups at time 1 and little difference between the groups at time 2. As shown in Table 7.6, there was a tendency for the Kingston Business Studies subjects, who were initially predominantly feminine sex typed to become more androgynous after two years of training. However, the difference in the proportion of subjects from this group who were classified as androgynous at time 1 and time 2 achieved only the .16 level of significance. There was no difference between the two groups in levels of masculinity or femininity after two years of training. (See Appendix 7.5 for further information.)

London Female Friends. The two Kingston groups were also compared with the London Female Friends group. These analyses showed that the Friends resembled the women in Business Studies and Nursery Nursing in their initial levels of masculinity. They were also similar to the Business Studies group in level of femininity; however, as noted previously, the Nursery Nurses scored significantly higher on femininity than all other groups. There were also no significant differences in androgyny classification amongst the three groups, although there was a tendency for the Female Friends to be somewhat more androgynous than either the Nursery Nurses ($p = .13$) or the Business Studies group ($p = .18$). (Significance values are for two-tailed tests.)

When the changes shown by the Kingston groups were compared with those shown by the Friends, Kingston Business Studies subjects showed a significantly greater changes than London

Friends on masculinity (net change, p = .03, two-tailed test) and a somewhat greater change on femininity (net change, p = .08, and absolute change, p = .07, two-tailed tests.)

Table 7.6

INITIAL AND FINAL ANDROGYNY CLASSIFICATION FOR KINGSTON BUSINESS STUDIES AND NURSERY NURSES : Four Fold Classification of Kingston Business Studies Group and Kingston Nursery Nurses on the BSRI at Time 1 and Time 2.+ *

			ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	TIME	N	N	%	N	%	N	%	N	%
King. Bus. St.	1	13	3	(23)	-		9	(69)	1	(7)
	2	13	6	(46)	-		7	(54)	-	
King. N. Nurse	1	12	2	(17)	1	(8)	8	(67)	1	(8)
	2	12	2	(17)	-		9	(75)	1	(8)

+ Group medians for all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Three for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

Interpretation of Results

Initial Differences. As predicted, Nursery Nurses saw themselves as being more feminine than women in all other groups. This finding is in keeping with the image of the occupation and suggests that women who select this field of work see themselves as having a large measure of expressive and nurturant qualities. However, these women also perceived themselves as having instrumental characteristics and did not differ significantly from any of the other groups in the extent to which they described themselves as masculine. This pattern of results suggests that Nursery Nurses differ from other groups as seeing themselves as more feminine, rather than less masculine and lends support to Bem's (1974) conceptualisation of masculinity and femininity as independent dimensions. It also suggests that the popular stereotype of a 'nursery nurse' tends to deny the active and instrumental qualities that are an essential part of caring for young children, an observation which has also been made by Oakley (1980).

Although sharing some initial similarities with the Nursery Nurses, the Kingston Business Studies group differed from both the London Female Friends and the London Female Engineers in being significantly lower on masculinity. This finding supports interview data, suggesting that some women in this group did not see their vocational choice as an active decision, but rather as a process of 'drifting'. In individual interviews several women described choosing their course and future secretarial work as a 'safe option' and 'something to fall back on', rather than seeing their choices as agentic and positive (Newton & Brocklesby, 1982a).

Women in all three 'traditional' groups (Friends, Business Studies, Nursery Nurses) resembled the women in traditionally feminine occupations described by Yanico et al. (1978; 1981), Hamby and Shapiro (1982) and Hoffman and Fidell (1979) in being predominantly feminine sex typed. The present results are in keeping with the notion that the major difference between traditional and non traditional women lies in the greater masculinity of non traditional women. However, the finding of 'added femininity' in the Nursery Nurses offers an interesting potential exception or addition to current theory. It suggests the importance of further study of highly feminine groups and the need to replicate the current findings.

Changes in Sex Role Self Concept. The increases in masculinity and femininity shown by the Kingston Business Studies group were unpredicted and were larger than changes in any other group studied in the present programme of research. They are similar to the relatively large changes observed by Gulanick et al. (1979) and reinforce the finding from that study that sex role self concept may be modified over a relatively short period of time.

There are several possible explanations for the changes observed in the Business Studies subjects. These explanations are listed below, and then each is evaluated separately. Most of the explanations deal with only one of the changes, and none of them is mutually exclusive.

1. The increase in masculinity represents a regression towards the mean.

2. The increase in masculinity represents a disillusionment with secretarial work and reflects a more active or instrumental orientation towards work.

3. The increase in femininity represents the effect of socialisation in and for a traditionally feminine field of work.

4. The Business Studies course with an option in Secretarial Studies offered a diversity of experience for its students, who differed in their responses to it.

Alternative Explanations Explored

1. The increase in masculinity represents a regression towards the mean.

There is some evidence supporting this explanation. If the individual scores obtained by subjects in this group are examined, there are two subjects with unusually low scores, a "47" and a "58" who may be described as 'outliers'. (See Appendix 7.6 for a listing of individual scores in this group.) It can be argued that these scores have depressed the mean score disproportionately in a small group. Following this line of interpretation, the increase in masculinity may be seen as a regression towards a population mean.

Evidence against this interpretation is that the variability amongst the Business Studies group on masculinity is no greater than in of the other female groups and is little different at time 1 than time 2. (See Table 7.1 and Appendix 7.1 for a comparison of the standard deviations for masculinity at time 1; See Appendix 7.7 for a listing of group means and standard deviations for masculinity and femininity at time 2.)

2. The increase in masculinity represents a disillusionment with secretarial work and reflects a more active or instrumental orientation towards work.

As mentioned previously, interview data suggests that some of the women on the Business Studies course found secretarial work disillusioning and either did not enter secretarial positions or left them to enter jobs with more career prospects (Newton & Brocklesby, 1982a). The increase in masculinity can also be interpreted as socialisation to more masculine values in the world of business. As discussed below, women were likely to respond to different aspects of the course and see different parts of the course as personally relevant.

3. The increase in femininity represents the effect of socialisation in and for a traditionally feminine field of work.

The pressures of socialisation offer the most obvious explanation for the observed increase in femininity in the Business Studies group. If this explanation were valid, similar changes should be present in the Female Friends and Nursery Nurses group. However, several features of the design of the current study may explain the failure of the Female Friends and Nursery Nurses to show an increase in femininity.

For example, it can be argued that the London Female Friends group is not a 'pure' control group; the members of this group had a diversity of experience during the time observed and the extent to which their experience could be described as 'traditionally feminine' is not known. As noted in Chapter Three, the Female Friends group was drawn from a wider geographical area than the two Kingston groups. It may be argued that women in this group experienced quite different sex role norms and socialisation pressures during the time they were being studied.

The lack of change shown by the Nursery Nurses may be explained by psychometric characteristics of the BSRI. It seems plausible that the Femininity Scale of the BSRI has a natural ceiling and that Nursery Nurses had already reached this level at time 1, so that they were unable to represent any increase in femininity at time 2.

4. The Business Studies course with an option in Secretarial Studies offered a diversity of experience for its students, who differed in their responses to it.

This explanation has several variants. One possible interpretation is that the course provides a variety of models of socialisation to which students respond in different ways. As suggested above, some students may become more masculine in keeping with the masculine values emphasised in business, whereas others may become more feminine in line with the sorts of qualities expected in a secretarial role. This diversity of response fits with Yanico and Hardim's (1981) finding that sex role category did not differentiate between 'persisters' and 'non persisters' on either an engineering or a home economics course.

A slightly different version of this explanation suggests that the course offered a unitary (presumably feminine) model of socialisation but that some students reacted against this model by seeing themselves as different from their classmates on the course. This explanation is similar to the one suggested above in 2. It suggests that occupational experience may polarise subjects' self perceptions, so that they see themselves as either conforming to a particular image or responding against it. With the present data, it accounts for the tendency of women in Business Studies to see themselves as either androgynous or feminine sex typed at time 2.

Unfortunately the present sample is a small one and there is not enough corroborating data to determine the 'correct' explanation for the experimental results observed. However, the theoretical issues concerning occupational socialisation will be considered in greater detail and in relation to the full set of experimental results in Chapter Thirteen. The differences amongst the various control groups will also be explored in Chapter Thirteen, and the experimental results will be compared to the predictions made in Chapter Five.

The results reported in this chapter suggest that to understand the experience of occupational entry and socialisation, there is a need to study people in a variety of occupations. The current findings strongly suggest that all occupations which are labelled as "traditionally feminine" are not alike and that different occupations may have distinctive profiles. The difficulties encountered in interpreting results from the present study also point up the need to have much more detailed information about the training or socialisation undergone by subjects and the extent to which this experience may have affected their self perceptions of femininity and masculinity.

CHAPTER EIGHT

STUDY THREE: A CONTROLLED COMPARISON OF PERCEIVED FEMININITY AND MASCULINITY IN MALE AND FEMALE ENGINEERS IN LONDON AND BIRMINGHAM

Introduction

In this study female engineers are compared with their male counterparts in London and Birmingham. As described in Chapter Three, the male engineers participating in the research were trained separately but on the same sites as the female engineers. The general pattern of their training was quite similar. However, unlike the female engineers, they already had company sponsorship and were very likely to be offered jobs as technicians upon successful completion of their training.

The chapter begins with a restatement of the hypotheses offered in Chapter Five as they apply to the specific comparisons between male and female engineers. It proceeds to evaluate each of the hypotheses for initial differences between the two groups and changes shown by the groups. This section is followed by a summary of the findings and a discussion of the results.

Hypotheses to be Tested

Initial Differences between Male and Female Engineers

8.1 Female engineers will have a higher level of femininity than male engineers.

8.2 A higher proportion of male engineers will be masculine sex typed than female engineers.

8.3 Subjects in Birmginham will be more likely to be masculine or feminine sex typed than subjects in London.

Changes in Sex Role Self Concept: Male and Female Engineers

8.4 Female engineers will be more likely to change in their sex role self concepts than male engineers.

8.5 Female engineers and male engineers will show an increase in masculinity.

Results of Study Three

8.1 Female engineers will have a higher level of femininity than male engineers.

There was no support for this hypothesis when the two groups began training. As shown in Table 8.1 the groups were relatively close on this measure. Female engineers in London were highest on femininity and male engineers in Birmingham were lowest on femininity; however, the differences between males and females were not significant either within region nor when the regions were combined.

There is some evidence for regional differences in levels of femininity. Although differences between the regions are not significant for either sex, when males and females were combined there is a tendency for engineers in London to score higher on femininity than engineers in Birmingham ($t = -1.93$, 66 df, $p = .06$, two-tailed test).

Differences between male and female engineers in levels of masculininity were not predicted and did not occur. There were also no significant differences between the two regions in initial levels of masculinity. The mean masculinity scores for each of the groups are shown in Table 8.2. (See Appendix 8.1 for further information on the t-tests which were carried out.)

Table 8.1

INITIAL LEVELS OF FEMININITY: Comparison of Mean Scores of Male Engineers and Female Engineers on the Femininity Scale of the BSRI at Time 1+

Group	N	Mean	s.d.
London Male Engineers	8	89.00	7.21
London Female Engineers	17	92.94	15.08
Birmingham Male Engineers	23	85.09	9.09
Birmingham Female Engineers	20	87.45	11.49

+ Differences between male and female engineers are not significant; when London male engineers and female engineers are compared with Birmingham male and female engineers, there is a tendency for subjects in London to score higher on femininity ($t = -1.93$, $p = .06$, two-tailed test).

Table 8.2

INITIAL LEVELS OF MASCULINITY: Comparison of Mean Scores of Male Engineers and Female Engineers on the Masculinity Scale of the BSRI at Time 1+

Group	N	Mean	s.d.
London Male Engineers	8	97.63	19.26
London Female Engineers	17	91.41	12.55
Birmingham Male Engineers	23	97.70	11.28
Birmingham Female Engineers	20	94.40	13.00

+ Differences between males and females are not significant within region; when the regions are combined, there is a tendency for male engineers to score somewhat higher on masculinty ($t = -1.47$, $p = .14$, two-tailed test). Regional differences are not significant.

8.2 A higher proportion of male engineers will be masculine sex typed than female engineers.

This hypothesis was evaluated using a chi squared test of association to compare the proportion of subjects who were classified as masculine sex typed with the proportion of subjects falling into all other categories on the BSRI. (The classification of subjects on the BSRI is presented in Table 8.3).

In London the difference between the proportion of male and female engineers who were classified as masculine sex typed approached significance with a Fisher's exact test yielding a significance level of .10 with 1 degree of freedom. The comparable difference in Birmingham was much greater, producing a chi squared value of 6.55, which is significant at the .01 level for 1 degree of freedom. When the regions were combined the difference is highly significant (X = 11.37, 1 df, $p < .00075$). (See Appendix 8.2 for further information on the chi squared analyses performed.)

Table 8.3

INITIAL ANDROGYNY CLASSIFICATION ON THE BSRI: Four Fold Classification of Male and Female Engineers on the BSRI at Time 1 + *

		ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	N	N	%	N	%	N	%	N	%
Lon. M. Eng.	8	3	(38)	4	(50)	1	(13)	--	
Lon. F. Eng.	17	9	(53)	3	(18)	3	(18)	2	(12)
Birm.M. Eng.	23	2	(9)	18	(78)	--		3	(13)
Birm.F. Eng.	20	7	(35)	7	(35)	3	(15)	3	(15)

+ Weighted group medians for all males and all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Four for further information on the scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

8.3 Subjects in Birmingham will be more likely to be masculine or feminine sex typed than subjects in London.

In testing this hypothesis comparisons were made for each sex separately and then the sexes were combined to evaluate the effect of region on sex typing. There was weak evidence supporting this hypothesis when the sexes were combined. In comparisons between male engineers, a Fisher's exact test yielded a probability of .24 with 1 degree of freedom. However, there was little evidence for any effect amongst female engineers. The comparison between London and Birmingham female engineers was not significant, producing a chi squared value of 0.32 (1 df). When the sexes were combined, the chi squared obtained was 2.08, which is significant at the .15 level with one degree of freedom.

An examination of the classification of female engineers suggests that female engineers in Birmingham were somewhat more likely to be classified as masculine sex typed than female engineers in London. When the proportion of subjects who were classified as masculine sex typed was compared with those falling into all other categories the difference is significant at the .15 level using a Fisher's exact test. When the sexes were combined, engineers in Birmingham emerged as significantly more likely to be masculine sex typed than engineers in London (chi squared = 4.62, 1 df, p = .03). (See Appendix 8.3 for a listing of the chi squared analyses performed.)

Changes in Sex Role Self Concept: Male and Female Engineers

8.4 Female engineers will be more likely to change in their sex role self concepts than male engineers.

The changes in perceived femininity and masculinity shown by female and male engineers in London and Birmingham are shown in Figures 8.1 and 8.2. The prediction that female engineers would show more change than male engineers was evaluated both in terms of the amount of absolute change and the net change shown by the two groups. The magnitude of absolute change in the two groups was compared with an independent t test between the two groups, and net changes were considered with a two way analysis of variance of the change scores and associated t tests.

This hypothesis found limited support in Birmingham with female engineers showing a larger absolute change in femininity than male engineers ($t = -1.79$, 41 df). This difference is significant at the .08 level using a two-tailed test or at the .04 level with a one-tailed test. However, there was no difference between female engineers in the absolute change in masculinity ($t = -.513$, 41 df, NS).

In London there was no evidence in favour of the hypothesis. The difference in absolute change in masculinity was not significant ($t = -.984$, 23 df), and male engineers showed a larger absolute change in femininity than female engineers although the difference between the two groups was not significant ($t = 1.094$, 23 df).

Figure 8.1 Changes in Masculinity Shown by London Female Engineers, London Male Engineers, Birmingham Female Engineers and Birmingham Male Engineers.

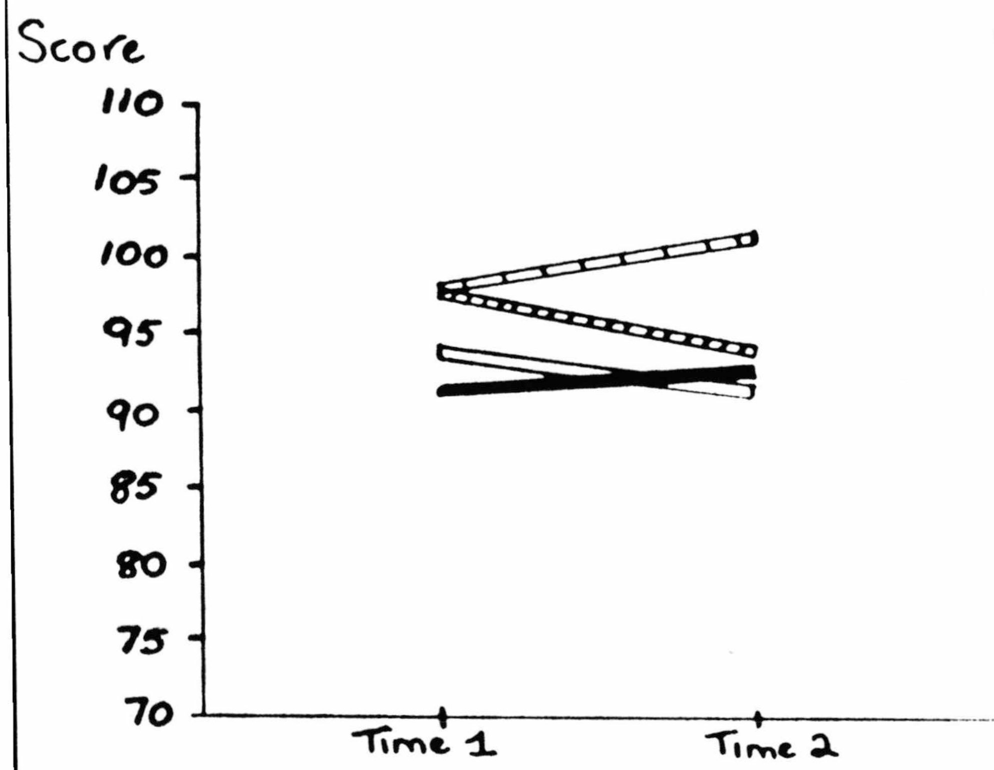
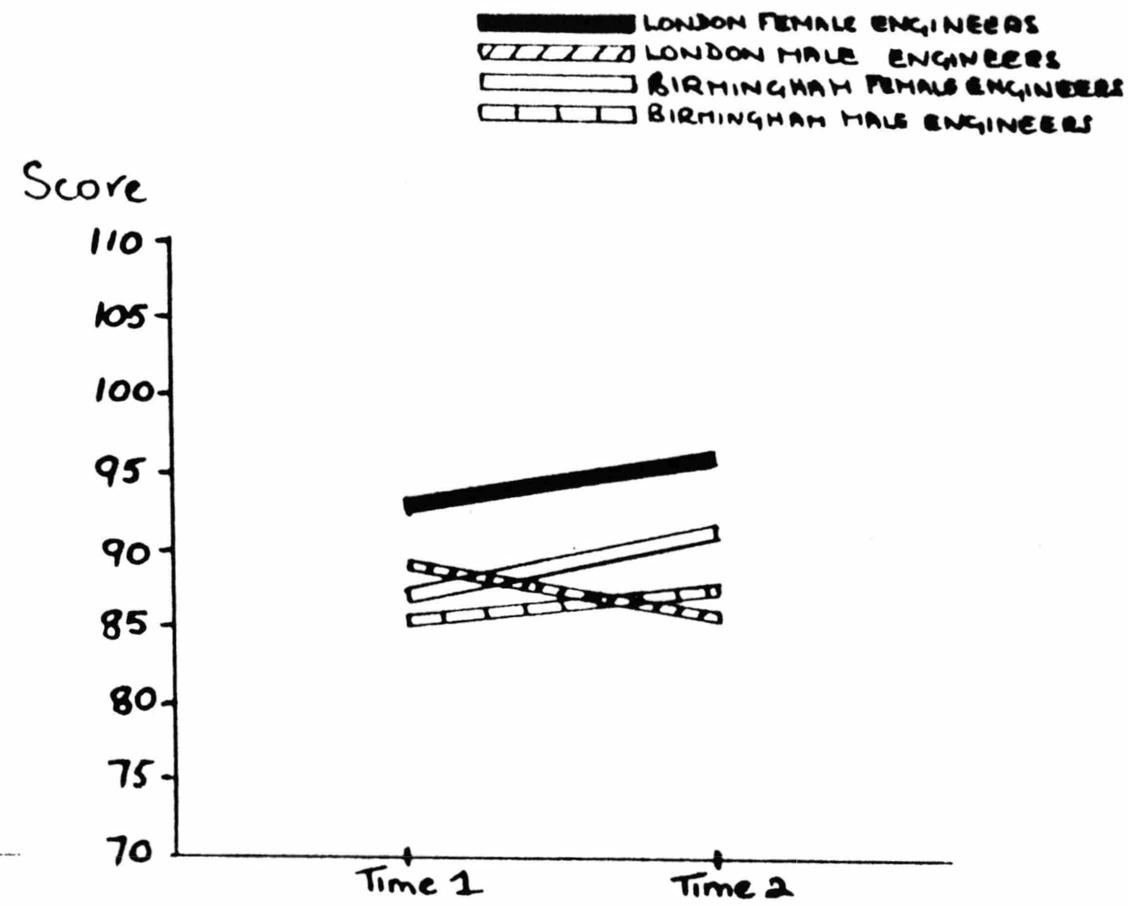


Figure 8.2. Changes in Femininity Shown by London Female Engineers, London Male Engineers, Birmingham Female Engineers and Birmingham Male Engineers.



When the regions were combined the difference between the sexes in the absolute change in masculinity remains non significant (t = -0.885, 66 df). A similar analysis for absolute changes in femininity could not be carried out because the pattern of changes in the two regions was different.

A two way analysis of variance on the change scores for masculinity showed no significant effect for group or place, but there was some evidence of an interaction effect, which is significant at the .08 level. The results of this analysis are presented in Table 8.4. A similar analysis of variance was carried out on change scores for femininity. This analysis showed no significant main effects or interaction effects, as seen in Table 8.5.

Further information on the changes observed is shown in Table 8.6, which presents the mean changes for each of the groups. When the change for each group is evaluated with paired t tests, only the change in femininity shown by the Birmingham female engineers is statistically significant. Female engineers in Birmingham became more feminine during their training (t = -2.39, 19 df, p = .03, two-tailed test). Female engineers in London also increased in femininity; however, this change was not significant (t = 1.36, 16 df, p = .19, two-tailed test). When the regions were combined the change for female engineers in femininity was significant at the .01 level, using a two-tailed test (t = -2.68, 36 df).

8.5 Female engineers and male engineers will show an increase in masculinity.

There was little evidence in favour of this hypothesis. Only two of the four groups actually increased in masculinity and only the change in male engineers in Birmingham approached significance ($p = .08$, one-tailed test).

Table 8.4

ANALYSIS OF VARIANCE ON MASCULINITY CHANGE SCORES: A Two Way Analysis of Variance for Change in Masculinity on the BSRI for Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif.
GROUP (Male-Female)	1	93.9	93.9	0.83	NS
PLACE (Lon-Birm)	1	0.4	0.4	0.00	NS
GROUP X PLACE	1	361.3	361.3	3.17	.08
Residual	64	7282.6	113.8		
Total	67	7738.2			

Table 8.5

ANALYSIS OF VARIANCE ON FEMININITY CHANGE SCORES: A Two Way Analysis of Variance for Change in Femininity on the BSRI for Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif.
GROUP (Male-Female)	1	91.67	91.67	0.98	NS
PLACE (Lon-Birm)	1	151.64	151.64	1.62	NS
GROUP X PLACE	1	66.87	66.87	0.71	NS
Residual	64	6002.55	93.79		
Total	67	6312.72			

Table 8.6

MEAN NET CHANGES IN MASCULINITY AND FEMININITY: Change Scores on the BSRI for Male and Female Engineers+

Group	Mean Change in Masculin.	s.d.	Mean Change in Feminin.	s.d.
Lon. M. Eng (N = 8)	-3.25	8.40	-3.00	11.17
Lon. F. Eng (N = 17)	1.06	11.02	2.82	8.59
Birm. M. Eng (N = 23)	3.00	10.64	2.78	11.12
Birm. F. Eng (N = 20)	-2.70	11.13	4.30	8.05

+ Change scores are calculated by subtracting the Time 1 value from the Time 2 value, so that a positive score represents an increase and a negative score represents a decrease in the quality being measured.

Discussion of Results

Summary of Findings

Male and female engineers did not differ in initial levels of masculinity and contrary to prediction, they were also similar in levels of perceived femininity. As expected, male engineers were significantly more likely than female engineers to be classified as masculine sex typed; however, female engineers were significantly more likely to be classified as androgynous.

Regional differences were not strong and there was only weak evidence supporting the prediction that engineers in Birmingham would be more likely to be sex typed (either masculine or feminine) than engineers in London. However, engineers in Birmingham (sexes combined) were significantly more likely than engineers in London to be masculine sex typed.

Paradoxically many of the predictions of differences between the two regions did not occur; however, significant changes in both female and male engineers occurred only in Birmingham, and most trends observed were stronger in Birmingham than in London, suggesting that this environment was more powerful in producing changes in perceived sex role self concept.

Changes in sex role self concept did occur, but the changes in levels of masculinity and femininity were relatively small. The prediction that female engineers would show greater changes than male engineers received limited support. The largest change observed was an unpredicted increase in femininity shown by female engineers in Birmingham. The increase in masculinity for all engineers did not occur, and male engineers in Birmingham were the only group to show an increase in masculinity which approached significance.

Many of the female engineers who had seen themselves as androgynous when they began training perceived themselves as feminine sex typed after two years of training. This change in androgyny classification is primarily a result of the increase in femininity although female engineers in Birmingham also showed a non significant decrease in masculinity.

Additional analyses were carried out to explore several aspects of the data. These analyses considered four general issues: regional effects, changes in androgyny classification between time 1 and time 2, the levels of masculinity and femininity of male and female engineers at time 2 and the variances of masculinity and femininity scores. The implications of these findings are discussed in relation to the existing literature. The larger theoretical issues, regarding mechanisms of change are explored in Chapter Fourteen.

Additional Analyses

Regional effects. Male engineers in Birmingham were more likely to be classified as masculine sex typed than their counterparts in London ($p = .15$). When male and female engineers in Birmingham were compared with engineers of both sexes in London, engineers in Birmingham were significantly more likely to be classified as masculine sex typed (X = 4.62, p = .03).

<u>Differences in Androgyny Classification at Time 1 and Time 2</u>. A comparison of the androgyny classification of female engineers at time 1 and time 2 is shown in Table 8.7, and a parallel comparison for male engineers is presented in Table 8.8. Female engineers (regions combined) showed a significantly different pattern at the two times (chi squared = 8.18, 3 df, p = .04). [1] There was no difference in the pattern of classification shown by male engineers at time 1 and time 2. (See Appendix 8.6 for further information on these analyses.)

When the individual categories showing change were examined, female engineers (regions combined) were significantly more likely to be feminine sex typed and significantly less likely to be androgynous at time 2 than time 1. They were also significantly more likely to be sex typed at time 2 than time 1. (All chi squared values were signifcant at the .05 level.)

Table 8.7

INITIAL AND FINAL ANDROGYNY CLASSIFICATION FOR FEMALE ENGINEERS: Four Fold Classification on the BSRI Female Engineers in London and Birmingham and Regions Combined at Time 1 and Time 2.+*

GROUP	TIME	N	ANDR.		MASC.		FEMININ.		UNDIFF.	
			N	%	N	%	N	%	N	%
Lon. F. Eng.	1	17	9	(53)	3	(18)	3	(18)	2	(12)
	2	17	4	(24)	3	(18)	7	(41)	3	(18)
Birm.F. Eng.	1	20	7	(35)	7	(35)	3	(15)	3	(15)
	2	20	3	(15)	7	(35)	9	(45)	1	(5)
Regn. Combined	1	37	16	(43)	10	(27)	6	(16)	5	(14)
	2	37	7	(19)	10	(27)	16	(43)	4	(11)

+ Weighted group medians for all males and all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Four for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

Table 8.8

INITIAL AND FINAL ANDROGYNY CLASSIFICATION FOR MALE ENGINEERS: Four Fold Classification on the BSRI Male Engineers in London and Birmingham and Regions Combined at Time 1 and Time 2.+*

GROUP	TIME	N	ANDR.		MASC.		FEMININ.		UNDIFF.	
			N	%	N	%	N	%	N	%
Lon. M. Eng.	1	8	3	(38)	4	(50)	1	(13)	--	
Lon. M. Eng.	2	8	1	(13)	4	(50)	1	(13)	2	(25)
Birm.M. Eng.	1	23	2	(9)	18	(78)	--		3	(13)
Birm.M. Eng.	2	23	4	(17)	15	(65)	--		4	(17)
Regn. Combined	1	31	5	(16)	22	(71)	1	(3)	3	(10)
	2	31	5	(16)	19	(61)	1	(3)	6	(19)

+ Weighted group medians for all males and all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Four for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

When these comparisons were carried out within each region, none of the findings achieved statistical significance. However, several of the chi squared values in Birmingham suggested trends in the data; the data followed a similar pattern in London although the observed differences were much smaller. (See Appendix 8.6 for further information.)

<u>Comparison of Levels of Masculinity and Femininity at Time 2.</u> When the regions were combined, female engineers scored significantly higher on femininity than male engineers ($t = 2.07$, 66 df, $p = .04$, two-tailed test) and significantly lower on masculinity at time 2 ($t = 2.40$, 66 df, $p = .02$, two-tailed test). In London the difference in femininity at time 2 represented a trend in the data ($p = .14$, two-tailed test); in Birmingham the difference was not significant although female engineers did score higher on femininity.

The failure to find a difference between male and female engineers on femininity at time 2 in Birmingham was initially surprising, since female engineers in Birmingham showed a significant increase in femininity. However, male engineers in Birmingham also showed a slight increase in femininity; whereas male engineers in London showed slight declines in both femininity and masculinity. (These changes are shown in Figures 8.1 and 8.2.)

Differences between male and female engineers in masculinity at time 2 were significant in Birmingham ($t = 2.52$, 41 df, $p = .02$, two-tailed test); however, there was little difference in the values obtained by the two groups in

London (t = .353, 23 df).

Differences in Variances for Masculinity and Femininity. When variances for masculinity and femininity at time 1 were compared, there were no differences between male and female engineers in the variances for masculinity. However, male engineers in London showed a significantly smaller variance for femininity than female engineers (F = 4.37; 7df, 16 df; p = .007). Although the same comparison in Birmingham was not statistically significant, the difference between the variance in femininity for male and female engineers (regions combined) was significant (F = 2.36; 30 df, 36 df; p = .007). When variances between masculinity and femininity at time 1 were compared within group, male engineers in London and male engineers (regions combined) showed a significantly larger variance for masculinity than femininity. None of the similar comparisons for female engineers was statistically significant.

Interpretation of Results

Initial Differences. As expected, male and female engineers were similar in levels of masculinity. This finding is consistent with the highly masculine image of engineering as an occupation and fits with previous research findings (Yanico et al. 1978; 1981; Spence & Helmreich, 1978; Hamby & Shapiro, 1982; Harren et al., 1979). However, contrary to prediction, when they began training female engineers did not perceive themselves as significantly more feminine than male engineers. This finding suggests that female engineers initially perceived themselves as highly similar to their male colleagues and supports the general finding that women and men in the same occupation are similar on job relevant characteristics (Lemkau, 1979). It fits with interview data on female engineers (Newton & Brocklesby, 1982a), suggesting that many women attempted to play down any potential differences and emphasise similarities with their colleagues. This strategy has also been noted by Hennig and Jardim (1976) in their study of successful women managers.

However, the lack of difference in perceived femininity between male and female engineers appears to contradict the repeated finding that women in non traditional fields are similar to other women on positive traits related to femininity (Lemkau, 1979; Mandelbaum, 1981). This apparent difference from Lemkau's and Mandelbaum's results is clarified when it noted that these studies dealt primarily with women <u>already</u> <u>working</u> in male dominated fields. The present comparison considers women and men <u>entering</u> a male dominated field.

Perhaps the more surprising finding is that male engineers saw themselves as having a similar proportion of feminine characteristics to their female counterparts. Without other male control groups it is difficult to assess the meaning of this finding. One possible explanation for this finding lies in the characteristics of the BSRI. Although the masculinity and femininity scales of the BSRI were negatively correlated for female subjects ($r = -.16$), they were positively correlated for male engineers. At time 1 the scales achieved a correlation of .33 and at time 2 the correlation rose to .40. It appears that for male engineers in this sample these scores may represent a tendency to describe oneself in terms of socially desirable masculine or feminine characteristics. Certainly the two scales did not prove to be independent as theoretically expected. This finding suggests the need to explore the relationship between the two scales in various research samples and implies the need for extreme caution in drawing conclusions about the present sample of male engineers.

The finding that male engineers are more likely to to be classified as masculine sex typed but less likely to be classified as androgynous than female engineers parallels results obtained by Spence and Helmreich (1978) in their study of male and female scientists. This pattern of findings is also reflected in the standardisation data on the BSRI, where 51% of males were classified as 'masculine' or 'near masculine', and 41% of females were classified as androgynous (Bem & Watson, 1976).

Although many of the regional comparisons were not statistically significant, the majority of the effects observed were stronger in Birmingham. In addition, the only significant change observed was the increase of Birmingham female engineers on femininity. Male engineers in Birmingham also tended to increase in masculinity. These changes can be seen as responses to the strongly 'macho' image of mechanical engineering in Birmingham and to the more traditional sex role norms usually attributed to this region of the country. In this environment male and female engineers would appear to become more differentiated from each other and to see themselves as conforming to traditional sex role stereotypes.

As noted above, the responses of male engineers (especially those in London) to the femininity scale of the BSRI had significantly lower variances than those of female engineers. This finding suggests that male engineers may have been responding to stereotypical notions of femininity and may not have seen the individual traits on the scale suggested as separable or personally relevant. This interpretation with the notion that the meaning and implications of sex role self concept may be different for the two sexes (Bem, 1975; Allegeier, 1975; Heilbrun, 1976).

<u>Changes in Sex Role Self Concept.</u> When they began training female engineers were more likely to see themselves as androgynous than in any other category on the BSRI. (43% of all female engineers were classified as androgynous at time 1.) However, when they had completed two years of training only 19% of female subjects still were classified as androgynous, whereas 43% of subjects now were classified as feminine sex typed. (See Appendix 8.9.) This dramatic change in androgyny classification mirrors results obtained by Gulanick et al. (1979). In the Gulanick et al. study subjects who had been previously feminine sex typed became more androgynous after a programme of assertiveness training and consciousness raising. In addition the changes increased in magnitude a year after the programme had ceased. Although the results in the present study are in the opposite direction to those obtained by Gulanick et al., the type of change observed appears to be similar. It

would be interesting to know if the changes observed in the female engineers persist and/or increase in magnitude.

The change in androgyny classification for female engineers reflects their increase in perceived femininity and lends some support to the prediction that female engineers would show a greater change than male engineers, since male engineers showed no change in their androgyny classification between time 1 and time 2.

It appears that female engineers are likely to respond to working in a male dominated environment by seeing themselves as more feminine. This change in self-labelling may be a response to how others see them and also an effort to counteract the masculine image often applied to them. This change fits with evidence on female managers reported by Hennig and Jardim (1976), who found that although women managers initially emphasised their similarity with their male colleagues, they later were able to assert their femininity and to see it as a strength. (The meaning of femininity for female engineers is explored further in Chapter Thirteen and is also discussed by Newton & Brocklesby (1982a).

By seeing themselves as more feminine than their male colleagues, female engineers appear to be differentiating themselves from their male colleagues. As noted by Newton and Brocklesby (1982a), although a majority of female engineers in their sample believed that they were treated as 'one of the lads' and preferred to be treated this way, many of the women described the situation as paradoxical. They felt that they would always be somewhat different from their male colleagues, and several women found that their feminine status often resulted in their being given preferential treatment.

Although female engineers saw themselves as less masculine than their male counterparts after two years training, this difference was primarily an effect of changes in self perceived masculinity in Birmingham. Male engineers tended to increase in masculinity over the time observed, whereas female engineers showed a small but non significant decline in masculinity.

Footnotes

[1] Owing to the small expected values obtained this statistic may be unreliable.

CHAPTER NINE

SEX ROLE ATTITUDES IN OCCUPATIONAL CHOICE AND SOCIALISATION: A FOCUSSED REVIEW OF THE LITERATURE

Introduction

The literature considered in this chapter and in Chapter Ten provide the rationale for the hypotheses for Experimental Studies Four, Five and Six. Because of the body of literature being surveyed is both large and diverse, the topics of sex role attitudes and sex role ideals have been explored in separate chapters. However, the separation of the issues is to some extent arbitrary, and many of the points raised in this chapter are relevant to both topics.

This chapter provides a focussed review of the literature on sex role attitudes and changes in sex role attitudes. It begins with a general introduction of some of the methodological issues involved in studying sex role attitudes. It then provides a brief review of research findings, giving particular consideration to differences in women's and men's attitudes and links between occupation and sex role attitudes. It also suggests some of the limitations of this research. The final section of the chapter reviews evidence for changes in sex role attitudes and outlines some mechanism by which such changes may occur. The chapter concludes with some hypotheses about sex role attitudes and how they were expected to change in the present research.

Methodological Issues

Virtually all studies of sex role attitudes are concerned with women's and men's attitudes towards women's roles. Although men's roles may be considered indirectly, primary consideration is given to women's rights and responsibilities. This bias in the literature reflects general attitudes in society, so that issues concerning sex roles are seen as a 'women's problem' with little relevance for men's attitudes or behaviour. Consequently, very little is known about men's attitudes towards their own roles, nor of women's attitudes towards men's roles. [1] Furthermore, scales assessing sex role attitudes are likely to have a different salience for women and men; women are more likely to see the issues personally because of direct experience and relevance, whereas men are more likely to see the issues as dealing with abstract principles. [2]

Several writers have suggested that in completing scales of attitudes towards women's roles, some men are liable to be influenced by considerations of social desirability and to represent attitudes which are at odds with their personal views or practice (e.g.,Steinmann & Fox, 1974).[3] Support for this interpretation comes from Auerbach and his colleaques (Gackenbach & Auerbach, 1975; Bowman & Auerbach, 1978), who distinguish between two groups of men who endorse liberal attitudes towards women's roles, 'sincere liberals', whose expressed attitudes appear consistent with their own values and 'well meaning liberals', whose expressed attitudes are not backed by personal commitment. Similar evidence is presented by Nelson and Goldman (1969) who found that men believed in dual roles for women in general but not for their own wives. Williams and Giles (1978) have also commented on this phenomenon, suggesting that there is only a tenuous link between ideological and practical egalitarianism.

The issue of social desirability may be a particular problem in recent studies, since the women's movement has popularised the notion of women's rights and has brought superficial acceptance for the idea of 'equality for women' in some areas of life. Because of the change in social climate in the 1970's and the increase in public awareness of feminist issues, it is especially difficult to compare the results of more recent attitude studies with those conducted before the revival of feminism. There is a similar problem in evaluating change in longitudinal studies, since a profeminist change may reflect prevailing social norms rather than a more personal attitude change.

The literature on sex role attitudes is further complicated by the large number of different measures used by researchers and the fact that relatively few researchers have used the same measures. As Pleck (1978) notes, it cannot be assumed that all of these instruments are measuring the same thing. In addition, there is little evidence for the validity of most of the measures that have been used. Validity has been assumed on the basis of 'face validity' and few, if any, studies have employed two measures, so that concurrent validity can be established. In reviewing the literature on sex role attitudes, I have concentrated on studies employing two of the more widely used measures: the MAFERR Inventory of Feminine Values (Steinmann and Fox, 1968) and the Attitudes towards Women Scale (Spence & Helmreich, 1972). Both measures have been used by several researchers and their authors have provided extensive information on their validity and reliability. [4]

Differences between Women's and Men Attitudes

Most researchers have suggested that women hold more liberal or profemininst views than men on the roles of women (e.g., Ross, 1963; Rossi, 1965; Spence & Helmreich, 1972, 1978; Zey-Ferrell, Tolone & Walsh, 1978; Tomeh, 1978; Ditkoff, 1979; Aneshensel & Rosen, 1980; Feather et al., 1979). However, Pleck (1978) contests this view, suggesting that a comparison of total scores obscures the way in which women and men feel about different issues. He notes several issues on which men are actually more liberal than women and points out that on some topics the views of the two sexes are surprisingly similar.

Some substantiation for Pleck's view is provided by Tavris (1973) who explored endorsement of the women's liberation movement amongst a group of female and male readers of Psychology Today. Although she found that women were more likely to favour the movement than men, the pattern of women's and men's responses was quite different. She found that women were more likely than men to see discrimination as a personal problem rather than a social problem and to see individual achievement (not group action) as the best way to overcome discrimination. However, women were more likely than men to see women as an exploited group and to see full-time child rearing as an unsatisfying job. They were also more likely to believe that women were as reliable as men as employees and that mothers' working did not produce maladjusted children. Tavris also reported dramatic differences between married women and men in their beliefs about division of labour within the home with women being much more likely to be dissatisfied about this issue than men. These findings reinforce the notion that any single sex role attitude scale will have a different meaning and salience for women and men, thus making it difficult to draw comparisons between the two sexes.

Links between Sex Role Attitudes and Occupational Choice

Attitudes towards sex roles appear to be closely allied to intended or actual choice of occupation amongst both women and men. These attitudes also are related to social class and to level of career commitment. As will be suggested below, the relationships between these various factors are complex although most research has considered sex role attitudes in relation to only one or two other factors.

In research on students, differences have been found for both females and males according to discipline and in relation to intended occupation. For example, students of psychology are more profeminist than students of engineering

(Spence & Helmreich, 1978). Male students of agriculture have more traditional views than those studying other fields (Voss, 1980). Females intending to become secretaries are more traditional than those who plan to go into teaching, social work, research or other professions, and conversely those who plan to teach are significantly more liberal than other groups except those who plan to enter 'other professions' (Steinmann, 1963).

Differences similar to those found in student groups have also been found in women who are employed in differing occupations. Steinmann and Fox (1966) reported data for women in six different occupational groups and three student groups. They found the most liberal attitudes amongst female artists and lawyers, followed by doctors. Business women, members of philanthropic organisations and nurses were somewhat less liberal than these groups although it is not reported whether these differences between groups are significant. However, each of these groups was more liberal in attitudes than three samples of female students.

Several studies suggest that women entering non traditional careers are likely to hold more profemininst attitudes than women entering traditionally feminine fields. Rossi (1965) found that women with long-range career plans in predominantly masculine fields to adopt a feminist position than women whose only career goal was to be a housewife. Nagely (1971) found that the women in 'masculine' fields of work were more likely to see their own career as equal in importance to their husband's career and to feel that husbands should help with household tasks than women in traditionally feminine fields of work. The level of commitment to a career also appears to be an important factor in sex role attitudes. Parsons et al. (1978) and Gaskell (1977) found that women with high career aspirations had more profeminist views than women who are not particularly interested in a career.

Sex role attitudes also show clear social class differences. Spence & Helmreich (1978) found sex role attitudes to be related to social class in a large sample of American high school students (aged approximately 16-17). Using four social class categories, they found that attitudes became increasingly more liberal as social class ratings increased. Steinmann (1974) found similar social class differences in samples of female subjects in the United States, Brazil and Czechoslovakia with middle class women holding more profeminist views than working class subjects. As noted in Chapters One and Two, women entering non traditional occupations tend to come from families of high socioeconomic status (e.g., Stanley & Soule, 1974; Helson, 1972; Wolpe, 1971).

It seems likely that there are complex series of relationships between various factors in women's working and family lives. It can be argued that work in a non traditional career often involves greater career commitment than work in a traditionally feminine field. Furthermore, work in male dominated fields has a higher status and is usually better paid. These factors are likely to have feedback into family relationships where power and decision-making in marriages appear to be linked to the financial contribution made by each partner (e.g., Blood & Wolfe, 1960).

Unfortunately most research on sex role attitudes has examined only a few of the potentially relevant variables, so that the relationship between the various factors is unknown. There has been a tendency to see sex role attitudes as static and as a variable which 'explains' occupational choice, but there has been relatively little attention to the extent which the experience of working in a particular occupation may modify sex role attitudes.

Changes in Sex Role Attitudes

There have been relatively few empirical studies of changes in sex role attitudes; furthermore, most of the theoretical models describing attitude change rely either on rather vague notions of developmental changes or on theories derived from contact between members of different ethnic groups. In discussing the empirical research, I have grouped the studies in terms of the type of explanation for attitude change. Although the various explanations are not necessarily incompatible, they tend to draw on different theoretical underpinnings. The first set of studies has tended to account for change by considering 'Individual Factors', emphasising processes such as developmental changes or role transitions. In contrast, the second set of studies has been more concerned with 'Group Processes', seeing change as resulting from interactions between women and men.

Individual Factors

In one of the few longitudinal studies of sex role attitudes, Angrist and Almquist (1975) reported that students became more egalitarian in their attitudes during a four year course of study. However, they also noted that almost one third of their students had attitudes that were inconsistent, shifting between relatively traditional and profeminist views of women's roles.

In a cross-sectional study of couples of women and men occupying different roles, e.g., cohabiting, married, expecting a child and parents, Abrahams et al. (1978) reported that sex role attitudes were most liberal in the cohabiting couples and most traditional in the couples who were parents. They found no correlation between sex role attitudes and age.

Steinmann and Fox (1966) also reported differences in female groups according to role. They found that female students had more traditional attitudes than women who were employed. In explaining their findings, Steinmann and Fox suggested that the experience of employment increased women's awareness of sex role issues. A similar argument has been used by Oakley (1984) who argued that, at least for some women, the experience of becoming a mother may radicalise women's attitudes towards sex roles. Although the findings of both these studies appear to contradict those of Abrahams and her colleagues, they support the basic notion that certain experiences may increase the salience of sex role attitudes.

A clearer specification of how such changes may occur comes from social psychological theory which suggests that the process of justifying attitudes and values may produce attitude change. Several different theoretical accounts have been offered to explain the process of attitude change. Cognitive dissonance theory (Festinger, 1954) offers a sophisticated analysis of how various incompatible attitudes and behaviour are re-evaluated, so that the person's beliefs and behaviour are consistent. Other studies emphasise the importance of active expression of attitudes or behaviour (D. Bem, 1965; 1967) or role-playing (e.g., Zimbardo, 1974) in changing attitudes.

On the basis of these sources of evidence, the process of occupational socialisation may be seen as having considerable potential to produce attitude change. This process may be particularly powerful in the case of the female engineers in the present research, who were frequently required to defend their career choice and justify their position. They were perceived by their friends and male colleagues as having profeminist attitudes (Newton & Brocklesby, 1982a). It may be argued that both the influence of others' expectations (Rosenthal, 1966) and the act of defending a profeminist position will produce an increase in profeminist attitudes. However, there also appear to be a number of additional processes, which are the consequence of group membership. These processes are discussed below, particularly in relation to inter-group theory.

Group Factors

Several group processes have been identified as being likely to produce attitude change: discrimination, token status, contact and social comparison. Each of these processes is discussed separately although many of the issues are related. The discussion is particularly concerned with the situation of the female engineer in the present research and her interactions with her male colleagues.

Discrimination. Studies of women entering male-dominated fields suggested that they meet with considerable prejudice and discrimination (Wolman & Frank, 1975; Kanter, 1977a, 1977b; Hennig & Jardim, 1976). This phenomenon is well documented for women entering engineering (Breakwell & Weinberger, 1983; Taylor, 1982, 1983; Newton & Brocklesby, 1982). Furthermore, it has been argued that the experience of discrimination is likely to make women more profeminist in their attitudes towards sex roles (e.g., Tavris, 1973).

Emprical support for this theoretical position is provided by Taylor's (1982, 1983) research on female technicians. In a well-controlled longitudinal study, Taylor was able to compare female technicians who were on their own as the only woman in the workplace with female technicians who were paired with other women. She found that women who were on their own became more profeminist, whilst those who were paired with another female did not change in their attitudes. Based on data showing that the male engineers who worked with the women in her sample were significantly more prejudiced towards women who were on their own, Taylor (1983) argued that attitude change amongst the women on their own was a function of the discrimination they experienced.

Taylor's research has considerable theoretical importance because of its longitudinal design. It provides strong evidence that the changes observed were related to discrimination, rather than personality and attitudinal factors associated with the original choice of engineering.

Token Status. Kanter (1977a: 1977b) has drawn attention to the position of tokens in inter-group relations. In writing about women and men, Kanter (1977a) suggests that differences between groups are likely to be accentuated when the sex ratio is highly skewed and when a minority group member or 'token' is one of the first of her kind. This situation is likely to heighten boundaries between men and women, leading to an increasing amount of stereotyping of members of both sexes. Although Kanter illustrates her theory with examples of women being introduced at executive level in a large American corporation, her basic notions appear to apply across a wide range of settings in Britain as well as the United States (e.g., Podmore & Spencer, 1982; Newton & Brocklesby, 1982a).

The position of female engineers in the present research fits closely Kanter's description of token status. During their second year of training, all women participated in a series of industrial placements. Although there was an attempt to place women in pairs or occasionally in groups of three or four, almost one quarter of the group of women were on their own. In addition, many women were in the position of being the first women ever to be trained as technicians in a particular company (Newton & Brocklesby, 1982).

Contact. Although Allport (1954) has argued that 'equal status' contact will lead to a positive change in evaluative attitudes, it is not clear that the contact between female and male engineers in the present study fits Allport's paradigm. In amplifying Allport's contact theory, Amir (1969) contends that contact may increase prejudice when there is competition between groups, contacts are involuntary or contacts lower the prestige of one group.

If the relative positions of men and women are considered within the society, the introduction of women into engineering can be seen as enhancing the status of women and threatening the status of men in engineering. This theoretical prediction fits closely with the empirical finding that the social prestige of various occupations drops as the number of women in the field increases (Touhey, 1974).

Furthermore, each of the factors suggested by Amir may be seen as operating in the present study of female and male engineers, particularly when groups were being trained on the same site. Although females and males were trained separately during their first year, there were comparisons made by instructors between the groups. Many of the male engineers felt that the introduction of female trainees lowered their own prestige and actively resented the female engineers.[5]

Social Comparison. Tajfel (1978) suggests that contact between groups is likely to lead to increased competition for positive social identity. This process will produce an increase in hostility unless there is an opportunity to change the relationship between the groups, so that the identities of both groups are redefined. In the present study it may be argued that contact will result in male engineers having increasingly unfavourable attitudes towards women. They will see women as a threat and will be likely to use arguments about the traditional roles of women and men as a means of preserving their own status. By the same process, female engineers will have increasingly positive attitudes towards their own group. [6]

Empirical support for the phenomena described by Tajfel's theory has been provided in Williams' (1980) review of studies using the 'minimum group' paradigm with male and female subjects. Williams noted that both men and women displayed in-group bias and out-group discrimination.

However, Taylor's (1982, 1983) studies of male engineers' attitudes towards one or two women trainees failed to comfirm several predictions from Tajfel's theory. Taylor found no change in male engineers' attitudes towards women's roles as a result of contact with women trainees. She also found a decrease in stereotyping of women by the male engineers. These findings contradict Tajfel's theory, and are of particular interest since the male engineers in Taylor's sample claimed to be quite negative about the introduction of female trainees.

Hypotheses about Sex Role Attitudes

The rationale for the hypotheses about sex role attitudes is outlined in this chapter, whilst the rationale for hypotheses concerning sex role ideals is presented in Chapter Ten. The complete list of hypotheses for Experimental Studies Four, Five and Six are listed in the final section of Chapter Ten.

Initial Differences between Groups

Research on women anticipating or working in non traditional careers (Rossi, 1965; Nagely, 1971) and women in various occupations suggests that women entering engineering will have more profeminist attitudes than their friends, women entering business studies and women entering nursery nursing. In comparison with the other groups of women being studied, women entering nursery nursing are expected to have the most traditional attitudes towards women's roles.

Although male engineers are expected to have more traditional attitudes towards women's roles, their attitudes were not assessed directly. The only measure tapping these attitudes was the measure assessing their attitudes towards an ideal woman. The predictions on this measure are discussed more fully in Chapter Ten.

Regional differences were also predicted with subjects in Birmingham being expected to have more traditional attitudes than subjects in London. This accords with the general finding reported by Davidson (1985) that sex role attitudes are more traditional in the North and Midlands than they are in the South.

Changes Over Time

As suggested in the discussion of attitude change, female engineers are expected to show the greatest changes of all groups being observed. They are expected to become more profeminist in their attitudes. Women in nursery nursing are expected to become more traditional in their attitudes in response to working in a highly female dominated occupation which upholds traditional roles for women. Both female friends and women studying business studies are expected to show smaller changes in their attitudes towards sex roles than either female engineers or nursery nurses. It is assumed that women in these groups will not have had the extreme experiences of working in an occupation with a highly skewed sex ratio and that their notions about sex roles will remain relatively unchallenged.

Male engineers are expected to become more traditional in their attitudes. This prediction is based both on the traditional values and strong male ethos associated with engineering and with the group processes elaborated above.

Footnotes

[1] The only measure I have found which considers attitudes towards the roles of both sexes is the Sex Role Egalitarianism Scale, developed by Beere and her colleagues (1984). However, the problem of the questions having a different meaning and salience for the two sexes remains unresolved.

[2] An excellent discussion of this problem has been presented by Cunningham-Burley (1984) who studied the process of becoming a grandparent. She found that the males in her sample did not find their role as grandfathers a legitimate topic of conversation and that it was very difficult to elicit their opinions on the experience of being a grandfather.

[3] Women are also subject to social desirability influences. However, the argument presented here is basically about personal relevance and the separation of abstract opinions and personal practice. A recent study by Jeans & Reynolds (1984) suggests that women are more familiar with the arguments of the women's movement and find it somewhat easier to 'fake liberal' or 'fake traditional' than men do.

[4] For a much fuller discussion of the problems of methodology in the measurement of sex role attitudes and the difficulty of comparing results between scales, see Brannon, 1978 and Beere, 1979.

[5] Although the amount of contact between female and male trainees is unknown, personal observation suggests that some contact usually occurred. See Taylor (1983) for a description of how female trainees in her sample were perceived by their male counterparts.

[6] It is argued here that profeminst attitudes favour women as a group and that the female engineers attitudes will become more profeminist; however, it could be argued that a change in the direction of more traditional attitudes would emphasise the distinctiveness between the two groups although it appears incongruent with the attempts of women as a group to increase their status.

CHAPTER TEN

SEX ROLE IDEALS: A FOCUSSED REVIEW OF THE LITERATURE AND HYPOTHESES FOR EXPERIMENTAL STUDIES FOUR, FIVE AND SIX

Introduction

This chapter is concerned with the research on sex role ideals and the rationale which this research provides for Experimental Studies Four, Five and Six. The chapter begins with a focussed review of literature on sex role ideals, touching on measurement issues and summarising research on sex role ideals using the MAFERR. It is particularly concerned with how each sex is influenced by its perception of the attitudes and ideals of the opposite sex. It also includes a discussion of the dynamics of the relationships between the sexes and the extent to which ratings of sex role ideals represent problems in communication between women and men. The remaining sections of the chapter deal specifically with the hypotheses for Experimental Studies Four, Five and Six. The rationale for the hypotheses is outlined and related to the literature discussed both in this chapter and Chapter Nine, and then the formal hypotheses for the experimental studies are presented at the conclusion of the chapter.

Research on Sex Role Ideals

Measurement Techniques

The discussion of sex role ideals is complicated by the fact that researchers have tended to use two different approaches to measurement of ideals. The first approach employs what I have termed 'stereotyping' measures (e.g., adjective checklists, Rosenkrantz Stereotype Questionnaire, the Bem Sex Role Inventory), whereas the second approach uses measures of sex role attitudes such as the MAFERR. In the stereotyping studies, a subject is usually asked to use a list of adjectives to describe a variety of individuals of the same and of the opposite sex. In contrast, in the sex role attitude studies, subjects are usually asked to describe how they believe various figures would respond to an attitude scale. Various target figures have been employed, but most studies of women have used ratings for 'self', an 'ideal woman' and 'man's ideal woman'.

Whilst there may be some correspondence between these two sorts of measures of 'ideals', it should be noted that stereotyping measures require representational judgments, "To what extent does the target figure resemble a consensual cultural stereotype?," whereas attitude measures require evaluative judgments about the appropriate social roles occupied by the two sexes. In addition, stereotyping studies usually describe their results in terms of the amount of stereotyping or in the profile of stereotypes in the case of the BSRI, whereas attitude studies usually describe their results in terms of position on a bi-polar scale ranging from profeminist to traditional. Although a high degree of stereotyping probably corresponds most closely to traditional attitudes towards sex roles, the two types of measures are assessing different dimensions and cannot be compared directly. Given this problem of comparability, I focussed on attitude studies in this review. However, the interested reader is referred to Appendix 10.1 for a brief summary of studies employing stereotyping measures and a discussion how the pattern of results obtained with these measures compares with results obtained with attitude measures.

Findings from Empirical Studies

The research reviewed in this section deals primarily with studies employing the MAFERR. In addition to ratings of subjects' own attitudes, research with the MAFERR has considered three types of ideals: an ideal of the same sex (an ideal woman rated by a woman or an ideal man rated by a man), an ideal of the opposite sex (an ideal man rated by a woman or an ideal woman rated by a man) and perception of the ideal held by the opposite sex (a woman's perception of man's ideal woman) or (a man's percepton of woman's ideal man). Although not all of these ratings of ideals are used in the present research, the research findings on each of them are presented briefly below. Explanations for the overall pattern of results are also explored, and a summary of the major findings is presented in Figure 10.1.

<u>Ideals of the Same Sex.</u> In a study of college student women

and their mothers, Steinmann (1963) used the MAFERR to ask her subjects to describe the sex role attitudes of an ideal woman. She found that the students tended to see an ideal woman as having somewhat more traditional attitudes than their own; however, the differences between the two values were not significant. The mothers of the students saw their own attitudes as very similar to those of an ideal woman although there was a small nonsignificant difference in the two values with the ideal woman being viewed as slightly more liberal.

In samples of middle class women employed as professionals, Steinmann (1974) found that these women viewed their 'ideal woman' as being somewhat more self-achieving and profeminist than themselves. In contrast, more representative national samples of women tended to view their 'ideal woman' as being somewhat more home-oriented and traditional in attitudes than themselves. This pattern of viewing an 'ideal woman' as having more traditional attitudes than one's own was also found amongst college and university students in the United States and England (Steinmann, 1974).

In reviewing research with the MAFERR, Crovitz and Steinmann (1980) suggested that although attitudes towards women's roles have changed significantly during the last decade, women are still uncertain about being 'liberated'. They hypothesised that the finding that women in the 1970's described their ideal selves as more traditional than their actual selves was indicative of ambivalence and misgivings about their current status.

As discussed in Chapter Nine, there is relatively little known about how men see their own sex roles or how they view the sex role attitudes of an ideal man. In one of the few studies on this topic Steinmann and Fox (1974) found that middle class American men described their ideal as having more self achieving attitudes than themselves.

Ideals of the Opposite Sex. In a series of studies using the MAFERR, Steinmann and Fox (1966, 1970, 1974) have investigated how the two sexes describe ideals of the opposite sex. They have shown that women describe their ideal man as having strongly self achieving values and resembling the image of a man who fits with the cultural masculine stereotype. In contrast, men describe an ideal woman who is balanced between self achieving and traditional concerns (Steinmann & Fox, 1974; Hipple, 1976; Voss, 1980). [1]

Perceptions of Ideals Held by the Opposite Sex. The situation is further complicated if we ask how one sex perceives the ideals of the other sex, i.e., how women view men's 'ideal woman' and how men view women's 'ideal man.' However, research from several sources suggests that both women and men are inaccurate in predicting the responses of the opposite sex and that men tend to overestimate and women tend to underestimate their power in family decision making (e.g., Olson, 1969; Bernard, 1972; Steinmann & Fox, 1974).

Steinmann and her colleagues (1963, 1966, 1974) have reported a series of studies on how the two sexes perceive each other's ideals. These studies have consistently shown that women view 'man's ideal woman' as having highly traditional or family-centred attitudes. This finding is in sharp contrast to the 'balanced' position they use to describe their own attitudes and the attitudes of an ideal woman. It also differs dramatically from men's actual description of an ideal woman, who is seen as having balanced attitudes. (See Figure 10.1 for a summary of the pattern of these findings.)

Similar findings have been reported for samples of female subjects in England, Czechoslovakia and Brazil. The only exception to this pattern has been found in a series of studies of the sex role attitudes of black women in the United States (Steinmann & Fox, 1970; Crovitz & Steinmann, 1980); unlike white women, black women perceive men's views of their 'ideal woman' in the same way that black men describe their 'ideal woman'.

Steinmann (1974) and Hawley (1971, 1972) have presented complementary evidence suggesting that perception of men's attitudes towards women's roles may be a function of one's own sex role attitudes and/or the type of occupation being followed. However, the direction of their findings is different.

Steinmann (1974) found that female psychologists belonging to a feminist organisation perceived men's attitudes towards women's roles as significantly more traditional than did a national sample of women representing a wide variety of occupations. She also reported that women employed as professionals were more likely than working class women to see men as having traditional views of women's roles.

Like Steinmann, Hawley (1971, 1972) found that perceptions of men's attitudes were related to a woman's career field or status. However, Hawley found that women studying for or employed in male dominated fields were less likely to see men as holding traditional attitudes towards women's roles. They also believed that significant men in their lives felt that women's career involvements did not conflict wih their femininity. Somewhat surprisingly they were more concerned with having good relationships with men than women in more traditionally feminine fields. [2]

Although there has been some concern about how women's views of sex role attitudes are influenced by their perception of men's attitudes, there has been very little research on the parallel topic of how men's attitudes may be influenced by their perception of women's attitudes. Steinmann and Fox (1974) appear to be the only research team to have considered this topic. Their empirical evidence suggests that there may be similar processes of distortion or selective perception occurring in the two sexes.

In a study of white males Steinmann and Fox (1974) reported that men's perceptions of women's 'ideal man' were at variance with the ideal man actually described by women. They found that men believed that women desired a man who was highly involved in family concerns and not particularly interested in self achievement. In fact, women described a man who was highly involved in his own achievement. This ideal man was significantly more self achieving than the self or ideal described by men, themselves.

Comparison between Own Ideals and Perception of Ideals Held by the Opposite Sex. Perhaps the most interesting finding in the MAFERR studies of men's and women's ideals and their perceptions of ideals of the opposite sex is that both sexes see the other sex as having an ideal which is markedly different from their own ideal and from the ideal actually described by the opposite sex. Women perceive 'man's ideal woman' as having highly traditional values and men perceive 'woman's ideal man' as having strongly home-centred values. Both sexes assume that the other places a primary value on the home and family. It should be noted that the women see man's ideal as fitting with traditional stereotypes, whereas men perceive women's ideal as moving away from traditional stereotypes. However, further information is needed to know the actual role prescriptions for ideal figures and the extent to which women and men perceived as having the same degree of self achieving or family-centred values actually resemble each other. For example, a woman who was described as being balanced between self achieving and family-centred values may still be expected to see the family as her first responsibility, whereas a man who is also described as 'balanced' would be expected to see work and achievement as his primary responsibility.

Figure 10.1

Summary of the Pattern of Major Findings for Women and Men in Research Using the MAFERR+

Measure	Women	Men
SELF	Balanced	Balanced
SAME SEX IDEAL	Balanced*	Self-Achieving
IDEAL OF OPPOSITE SEX	Self-Achieving	Balanced
PERCEPTION OF IDEAL HELD BY OPPOSITE SEX	Family-centred	Family-centred

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+ This figure is intended as a rough guide to the relative ratings given by each sex to various scales of the MAFERR. (See Steinmann, 1974 and Steinmann & Fox, 1974 for a summary of research using the MAFERR.)

* In some studies women have rated an ideal woman as having slightly more traditional attitudes than their own. In others the result has been in the reverse direction. However, differences between the two ratings have tended to be small and with both ratings have reflected a relative balance between self-achieving and family-centred values.

<u>Explanations for the Pattern of Findings.</u> Like Steinmann and Fox (1974), Bernard (1968; 1972) has suggested that there is a serious communication gap between the sexes. She describes the phenomenon of 'his' and 'her' marriage, where couples report conflicting data on the same marriage. Women tend to underestimate and men tend to overestimate their power in the relationship, and both sexes remain relatively unaware of each other's opinions.

In their research Steinmann and Fox (1974) found that both women and men believed that family decisions should be shared equally, but that both sexes felt that women made the majority of decisions and held too much power in the family. According to Steinmann and Fox (1974), both women and men are unwilling to express their true opinions in many situations, so that each sex behaves in way that they believe is in accordance with the other's expectations. Part of the problem is a gulf between expressed attitudes and behaviour. Steinmann and Fox (1974) suggest that men may express egalitarian ideas but still expect their wives to perform traditional duties in the home. Women perceive this discrepancy and take their cues from their husband's behaviour rather than his expressed views on women's roles.

As noted earlier, Steinmann and Fox (1974) believe that women are uncertain about sex role values and attitudes. Although they endorse the notion of self-achieving woman and the more traditional home-centred woman, they are unclear about how to resolve the inevitable conflicts between the two positions. Their perception of men's attitudes towards women's roles involves a degree of projection and rationalisation. Thus they blame their ambivalence about achievement on men who want women to occupy traditional roles.

Hypotheses to be Tested

As described in Chapter Four, all female groups participating in the research completed three forms of the MAFERR Inventory of Feminine Values: the Self form (Form A), the Ideal form (Form B), and the Man's Ideal Woman form (Form C). Male subjects completed the Ideal Woman Form (Form IW) of the Inventory of Feminine Values; they also completed the Self form (Form H) and the Ideal form (Form I) of the MAFERR Inventory of Masculine Values. Unfortunately it is not possible to make direct comparisons between the Inventory of Feminine Values and the Inventory of Masculine Values. Therefore, the only direct comparisons between female and male subjects are between Forms B and C (for female subjects) and Form IW (for male subjects). The forms completed by female and male subjects are summarised in Figure 10.2.

Based on the literature discussed above and in Chapter Nine, a series of general hypotheses has been generated. These hypotheses are elaborated in Chapters Eleven, Twelve and Thirteen. The hypotheses predict how the experimental groups will differ in their initial attitudes and ideals and how these perceptions will change over time.

Figure 10.2

Summary of the Forms of the MAFERR Inventories of Feminine and Masculine Values Completed by Females and Males in the Present Research+

Measure	Females	Males
SELF	Form A (Fem. Values)	Form H (Masc. Values)
SAME SEX IDEAL	Form B (Fem. Values)	Form I (Masc. Values)
IDEAL OF OPPOSITE SEX*	-----	Form IW (Fem. Values)
PERCEPTION OF IDEAL HELD BY OPPOSITE SEX*	Form C (Fem. Values)	------

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\+ The Inventories of Feminine and Masculine Values cannot be directly compared.

* Although it would have been desirable to have administered forms representing the same categories to both female and male subjects, it was not practical to ask any group of subjects to complete more than three forms of the MAFERR. The difficulties in arranging the fieldwork precluded seeing subjects in more than one session.

The predictions made are described in two sections: those relating to initial differences between the groups being studied and those which predict changes in sex role ideals. (See Chapter Nine for a discussion of the predictions for initial differences and changes in sex role ideals.) The chapter concludes with a summary of the hypotheses about sex role attitudes and ideals for Experimental Studies Four, Five and Six, which are reported in Chapters Eleven, Twelve and Thirteen.

Initial Differences between Groups

Following the same line of argument used to predict differences between groups for attitudes ascribed to self (see Chapter Nine), it is predicted that female engineers will describe an ideal who has more profeminist attitudes than women in any of the other groups. Female engineers are also expected to have more profeminist attitudes than men entering engineering, so that they are expected to describe an 'ideal woman' as having more profeminist attitudes than the 'ideal woman' described by male engineers. This latter prediction is based on the general finding that women have more liberal attitudes towards women's roles than men (Rossi, 1965; Feather et al., 1979; Spence & Helmreich, 1979). (See Chapter Nine for further information.)

Since the male engineers and female nursery nurses are occupying highly traditional roles, they are expected to have more traditional attitudes towards women's roles than all other groups. [3]

No predictions are made about the relation between the attitudes of self and same sex ideal, since the literature appears conflicting on this point and changing sex role norms make prediction from earlier studies relatively difficult. Although the majority of studies have suggested that women describe ideals with more traditional attitudes than their own (Crovitz & Steinmann, 1980), studies of professional women suggest that their ideals have more profeminist attitudes than their own.

It is predicted that women in all groups will describe an ideal as having more liberal attitudes than their perception of 'man's ideal woman'. This prediction is based on the consistent finding of this phenomenon in the literature (e.g., Steinmann & Fox, 1974; Voss, 1980). It is further predicted that female engineers will describe an 'ideal woman' as having more profeminst attitudes than the'ideal woman' described by male engineers but that they will describe 'man's ideal woman' as having more traditional attitudes than the 'ideal woman' described by male engineers.

Although differences between female groups are expected in the perception of 'man's ideal woman', no prediction as to the direction of the differences is made, since two studies imply contradictory predictions. Steinmann's (1974) research on feminist psychologists suggests that female engineers will perceive 'man's ideal woman' as having highly traditional attitudes; however, Hawley's findings (1971; 1972) suggest that the female engineers may see men as preferring women with relatively profeminist attitudes.

Regional differences are predicted with subjects in Birmingham being expected to have more traditional attitudes than their London counterparts. Differences will be expected on all relevant measures: self, ideal and 'man's ideal woman' (female groups) and 'ideal woman' (male engineers).

Changes Over Time

I have been unable to find any literature describing changes in sex role ideals. Therefore, I have assumed that sex role ideals will change by the same general mechanisms described for changes in sex role attitudes in Chapter Nine. I have made predictions for changes in perceptions of ideals of the opposite sex (Man's Ideal Woman) only for the female engineers, although analyses to detect changes on this measure have been carried out for the other groups.

Based on the theoretical notions from Tajfel's theory (1978) described in Chapter Nine, it is predicted that female engineers will become more profeminist in their attitudes, whereas male engineers will become more traditional in their attitudes. When these predictions are considered in terms of the experimental measures, it is hypothesised that both the 'self' and the 'ideal woman' described by female engineers will become more profeminst over time. Conversely, for male engineers, it is hypothesised that the attitudes for 'self', the 'ideal man' and an 'ideal woman' will become more traditional. (This prediction is consonant both with Tajfel's theory and with concepts of occupational socialisation discussed in previous chapters.)

Like male engineers, women in nursery nursing are expected to become more traditional in their attitudes owing to the pressures of occupational socialisation. Nursery nurses are expected to become more traditional in their own attitudes and to see their ideal woman as having more traditional attitudes than when they began training. As in attitudes describing 'self', women studying business studies and female friends are expected to show relatively little change in their conceptions of their ideal selves.

Predictions for change in 'man's ideal woman' are made only for the female engineers. It is predicted that as a result of discrimination and inter-group contact, they will describe 'man's ideal woman' as having more traditional attitudes than when they began training.

When the predictions made are summarised the following formal hypotheses are offered. They are considered under two headings: 'Initial Differences between Groups' and 'Changes in Sex Role Attitudes and Ideals'. The relevant forms of the MAFERR are listed for each of the comparisons.

Initial Differences between Groups in Sex Role Attitudes and Ideals

1. Female engineers will describe themselves as having more profeminist attitudes than women in any other group. (Comparisons: Form A). Female engineers will describe their 'ideal woman' as having more profeminist attitudes than women in any other group. (Comparisons: Form B).

2. Women in nursery nursing will describe themselves as having more traditional attitudes than women in any other group. (Comparisons: Form A). Women in nursery nursing will describe their ideal woman as having more traditional attitudes than women in any other group. (Comparisons: Form B).

3. Male engineers will describe an ideal woman' as having more traditional attitudes towards women's roles than female engineers. (Comparisons: Form IW and Form B).

4. Women in all groups will describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman'. (Comparisons within each group between Form B and Form C).

5. Female engineers will describe 'man's ideal woman' as having more traditional attitudes than an 'ideal woman' described by male engineers. (Comparison between Form C and Form IW).

6. There will be regional differences with subjects in Birmingham having more traditional attitudes than their London counterparts. (Comparisons between regions on all forms of the MAFERR: Forms A, B and C for female subjects; Forms H, I, and IW for male subjects)

<u>Changes in Sex Role Attitudes and Ideals</u>

1. Female engineers will show a greater change in their attitudes as shown in their description of 'self' than subjects in all other groups. (Comparison between change scores on Form A for female subjects; comparison between change score on Form A for female engineers and Form H for male engineers.) Female engineers will show a greater change in the attitudes ascribed to a same sex ideal than subjects in all other groups. (Comparison between change scores on Form B for female subjects; comparison on Form B for female engineers and Form I for male engineers.)

2. Female engineers own attitudes will be more profeminist than when they began training. (Within group comparison on Form A). Female engineers will describe a more profeminist ideal than when they began training. (Within group comparison on Form B). Female engineers will describe 'man's ideal woman' as having more traditional attitudes than when they began training. (Within group comparison on Form C).

3. Women in nursery nursing will hold more traditional attitudes than when they began training. (Within group comparison on Form A). Women in nursery nursing will describe an ideal woman as holding more traditional attitudes than when they began training. (Within group comparison on Form B).

4. Female friends and women in business studies will show little or no change in their own attitudes (Within group comparisons on Form A). Female friends and women in business studies will shown little or no change in their description of the attitudes of an ideal woman. (Within group comparisons on Form B).

5. Male engineers will describe their own attitudes and those of an ideal man as more traditional than when they began training. (Within group comparisons on Form H and on Form I). Male engineers will describe an 'ideal woman' as having the more traditional attitudes than when they began training. (Within group comparisons on Form IW).

Footnotes

[1] This pattern of results is virtually the mirror image of results obtained using stereotype measures. In the stereotype measure studies women tend to prefer men who are androgynous, whereas men prefer women who are traditionally sex typed. (See Appendix 10.1 for further discussion of the empirical studies and the comparison betweeen the two types of measures.)

This incompatibility between results from the two types of measures supports the notion that each measure represents a different aspect of gender or sex role identity. This is an important theoretical issue. Bem (1985) implies that various aspects of gender or sex role identity are closely linked, whereas Spence (1985) argues for an independence between various aspects of gender identity.

[2] The contradictory findings reported by Steinmann and Hawley may reflect differences in methodology or in the samples employed. Steinmann used the MAFERR in her research, whereas Hawley designed a 35 item Likert scale which she subjected to factor analysis. These two types of measures are unlikely to be strictly comparable. In addition, Steinmann used a sample of adult women who were established in various occupations, whereas Hawley relied on female students preparing for various occupations.

[3] Because of the problems of comparability between measures for female and male subjects, the prediction for women in nursery nursing has been tested by comparing the attitudes ascribed to Self in all female groups in London. The prediction for male engineers has been tested by comparing male engineers rating of an Ideal Woman (Form IW) with the ratings of an Ideal Woman (Form B) by members of each of the female groups. (See Chapter Thirteen for a more detailed description of this analysis.)

CHAPTER ELEVEN

STUDY FOUR: A CONTROLLED COMPARISON OF SEX ROLE ATTITUDES AND SEX ROLE IDEALS IN FEMALE ENGINEERS AND FEMALE FRIENDS IN LONDON AND BIRMINGHAM

Introduction and Overview

In this study female engineers in London and Birmingham were compared with their female school friends. Subjects in the study were 33 female engineers (16 trained in London and 17 in Birmingham) and 53 female friends (20 in London and 33 in Birmingham). Female engineers began the EITB programme in September, 1977 and were interviewed and completed the MAFERR during their first two weeks of training. They were interviewed again in July, 1979 and completed the MAFERR for a second time in the same session. Their female friends were recruited by the female engineers and completed the interview and the MAFERR in October, 1977. They were interviewed for the second time and completed the MAFERR in July or August, 1979. (Further information on the procedure for this study is available in Chapter Four.)

Based on the findings of Steinmann and Fox (1966), Spence and Helmreich (1978), and Rossi (1965) on female students intending to following non traditional careers, it was predicted that women entering engineering would be more profeminist in their sex role attitudes than their female friends who were entering traditionally feminine fields of work. Prospective female engineers were also expected to view their ideal woman as having more profeminist attitudes than their female friends.

The experience of working in a male-dominated industry and encountering discrimination was expected to produce more profeminist attitudes in female engineers, so that they would describe both themselves and their 'ideal woman' as having more 'liberated' attitudes than when they began training. The female engineers were also expected to change in their perceptions of 'man's ideal woman', coming to see her as having more traditional attitudes than when they began training. In contrast, women in the 'female friends' group were expected to show little or no change in their own attitudes, in their perception of the attitudes of an 'ideal woman' or in their view of 'man's ideal woman'.

Regional effects were predicted for both groups of subjects. It was expected that subjects in London would have more profeminist attitudes than those in Birmingham and that subjects in Birmingham would see 'man's ideal woman' as having more traditional attitudes than subjects in London.

The remainder of this chapter details the specific hypotheses to be tested in this study, describes the results of the study in terms of these hypotheses and discusses the interpretation of the findings.

Hypotheses to be Tested

The general hypotheses set out in Chapter Ten and summarised in the introduction are presented in the following specific predictions regarding female engineers and their female friends in London and Birmingham:

Initial Differences between Groups

11.1 Female engineers will have more profeminist attitudes towards women's roles than their female friends. Female engineers will describe their 'ideal woman' as having more profeminist attitudes than their female friends.

11.2 Female engineers will describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman'. Female friends will describe an 'ideal woman as having more profeminist attitudes than 'man's ideal woman'.

11.3 There will be regional effects with female subjects in London holding more profeminist attitudes towards women's roles than female subjects in Birmingham.

Changes in Sex Role Attitudes and Ideals

11.4 Female engineers will show a greater change in their own attitudes than their female friends. These changes will be shown on the Self, Ideal Woman and Man's Ideal Woman scales of the MAFERR.

11.5 Female engineers' attitudes on the Self and Ideal Woman scales will be more profeminist than when they began training. However, they will have more traditional views of Man's Ideal Woman than when they began training.

11.6 Female friends will show little or no change in their attitudes as measured by their responses to the Self, Ideal Woman and Man's Ideal Woman scales of the MAFERR.

Results of Study Four

The results are presented below in terms of the formal hypotheses. Hypotheses 11.1 - 11.3 deal with the initial differences between groups, whereas Hypotheses 11.4 - 11.6 concern changes over time. The discrepancy between values ascribed to 'self' and an 'ideal woman' is also considered as an additional analysis. The interpretation of the results of this study are explored in the Discussion, and further information about the statistical tests carried out is presented in Appendices 11.1 - 11.7.

Initial Differences

11.1 Female engineers will have more profeminist attitudes towards women's roles than their female friends. Female engineers will describe their 'ideal woman' as having more profeminist attitudes than their female friends.

The prediction that female engineers would have more profeminist attitudes than their friends was not supported. (See Table 11.1.1) Although the female engineers in Birmingham were slightly more profeminist than their female friends, the differences between the two groups were not significant ($t = 0.834$, 48 df). In London the difference between the two groups was in the opposite direction although it was also not significant. (See Appendix 11.1.1 for a complete list of the t tests computed.)

Contrary to the prediction made, subjects in the 'female friends' groups saw their 'ideal woman' as having slightly more liberal attitudes than the 'ideal woman' described by the groups of female engineers (See Table 11.1.2.). However, neither of these differences was statistically significant (See Appendix 11.1.2.)

Table 11.1.1

SELF AT TIME 1: Comparison between London Female Engineers, London Female Friends, Birmingham Female Engineers and Birmingham Female Friends on the MAFERR+

Group	N	Mean++	Stnd. Dev.
London F. Eng	16	90.19	12.99
London F. Frnd	20	89.10	10.46
Birm F. Eng	17	88.82	10.24
Birm F. Frnd	33	91.49	10.92

\+ This measure has been scored so that higher scores represent relatively traditional attitudes towards women's roles and lower scores represent relatively profeminist attitudes towards women's roles.

++ The differences between group means are not statistically significant.

Table 11.1.2

IDEAL AT TIME 1: Comparison between London Female Engineers, London Female Friends, Birmingham Female Engineers and Birmingham Female Friends on the MAFERR+

Group	N	Mean++	Stnd. Dev.
London F. Eng	16	89.06	15.57
London F. Frnd	20	88.55	16.55
Birm F. Eng	17	90.65	10.59
Birm F. Frnd	33	87.33	13.61

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ The differences between group means are not statistically significant.

11.2 Female engineers will describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman'. Female friends will describe an 'ideal woman as having more profeminist attitudes than 'man's ideal woman'.

Results related to this hypothesis are presented in Table 11.2. As predicted, female engineers and female friends in both regions attributed more profeminist attitudes to an 'ideal woman' than they did to 'man's ideal woman'. Differences were highly significant for all groups. Somewhat surprisingly the discrepancy between the two values was smallest for the female engineers in London.

Both groups also saw 'man's ideal woman' as having more traditional attitudes towards sex roles than their own. The differences for the female engineers in London were significant at the .02 level using a two-tailed test ($t = -2.67$, 15 df); comparable differences for the female engineers in Birmingham were significant at beyond the .001 level, using a two-tailed test ($t= -4.92$, 16 df). Differences between 'self' and 'man's ideal woman' were also highly significant for the two groups of female friends. (See Appendix 11.2 for further information on all analyses relating to Hypothesis 11.2.)

Table 11.2

COMPARISONS BETWEEN SELF, AN IDEAL WOMAN AND MAN'S IDEAL WOMAN: Comparisons between Scores on Ideal1 and Man's Ideal1 for London Female Engineers, Birmingham Female Engineers, London Female Friends and Birmingham Female Friends on the MAFERR+

Group	N	Self1++	Ideal1+++	Man's Ideal1
London F. Eng	16	90.19	89.06	106.00
Birm F. Eng	17	88.82	90.65	118.65
London F. Frnd	20	89.10	88.55	115.00
Birm F. Frnd	33	91.49	87.33	120.97

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ For London Female Engineers the differences between Self and Man's Ideal Woman are significant at the .02 level (t = -2.67, 15 df, two- tailed test). For Birmingham Female Engineers the differences between Self1 and Man's Ideal Woman are significant at the .002 level (t = -4.92, 16 df, two-tailed test).

For London Female Friends the differences between Self and Man's Ideal Woman are significant at the .0001 level (t = -7.50, 19 df., two-tailed test). For Birmingham Female Friends, the differences between Self and Man's Ideal Woman are significant at the .0001 level (t = -7.93, 32 df, two-tailed test).

+++ For London Female Engineers the differences between Ideal Woman and Man's Ideal Woman are significant beyond the .01 level (t = -2.69, 15 df, one-tailed test. For Birmingham Female Engineers the differences between Ideal Woman and Man's Ideal woman are significant beyond the .001 level (t = -5.23, 16 df, one-tailed test).

For London Female Friends and Birmingham Female Friends the differences between Ideal Woman and Man's Ideal Woman are significant at beyond the .001 level. (See Appendix 11.2 for further information.)

11.3 There will be regional effects with female subjects in London holding more profeminist attitudes towards women's roles than female subjects in Birmingham.

There was only weak evidence supporting the prediction that subjects in London would have more profeminist attitudes than subjects in Birmingham. Inspection of Table 11.3 reveals that of the six within group comparisons, only four were in the expected direction, and most of the differences between the means were small and not significant. (See Appendix 11.3 for the relevant t-tests.) However, female engineers and 'female friends' in Birmingham tended to see 'man's ideal woman' as having more traditional attitudes than their counterparts in London. When the female engineers and female friends groups were combined within region, Birmingham subjects were more traditional in their view of 'man's ideal woman'. This difference was significant at the .025 level, using a one-tailed test ($t = 2.21$, 84 df).

Table 11.3

REGIONAL DIFFERENCES ON SELF, IDEAL AND MAN'S IDEAL WOMAN: A Comparison between Scores of Female Engineers and Female Friends in London with Female Engineers and Female Friends in Birmingham on the MAFERR at Time 1+

Group	N	Self1++	Ideal1++	Man's Ideal1+++
London F. Eng	16	90.19	89.06	106.00
London F. Frnd	20	89.10	88.55	115.00
Birm F. Eng	17	88.82	90.65	118.65
Birm F. Frnd	33	91.49	87.33	120.97

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ There are no significant differences between Female Engineers in London and Birmingham on Self1 or Ideal1; the differences between Female Friends in London and Birmingham are also not significant.

+++ The differences between London Female Engineers and Birmingham Female Engineers are not statistically significant. The differences between London Female Friends and Birmingham Female Friends are also not statistically significant. However, if the groups are combined, so that London subjects (Female Engineers + Female Friends) are compared with Birmingham subjects (Female Engineers + Female Friends) the differences between the two regions on Man's Ideal Woman are significant at the .025 level, using a one-tailed test ($t = 2.21$, 84 df).

Changes over Time

The changes in scores on the 'self', 'ideal woman' and 'man's ideal' woman scales of the MAFERR are shown in Figure 11.1 for female engineers and in Figure 11.2 for female friends. The hypotheses about change were explored using several statistical techniques. Analyses of variance on the change scores for 'self', an 'ideal woman' and 'man's ideal woman' were to assess differences between female engineers and their friends. The changes shown were further explored using t-tests to compare changes between groups and within each group on all of the measures. Each of the analyses is discussed separately, and the analyses are related to the relevant hypotheses.

11.4 Female engineers will show a greater change in their own attitudes than their female friends. These changes will be shown on the Self, Ideal Woman and Man's Ideal Woman scales of the MAFERR.

Analyses of Variance. The results of the analyses of variance for 'self', 'ideal woman' and 'man's ideal woman' are presented in Tables 11.4.1, 11.4.2 and 11.4.3. In each analysis of variance, the two factors in the analysis have been labelled 'group' (Engineers-Friends) and 'place' (London-Birmingham). In general, these analyses showed little support for the hypothesis that female engineers would show greater changes than their female friends.

The analysis of variance on the Self scores was the only analysis which provided any support for hypothesis 11.4. Although the main effect for group (Engineers-Friends) did not reach the conventional level of statistical

Fig 11.1 CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY LONDON FEMALE ENGINEERS AND BIRMINGHAM FEMALE ENGINEERS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.

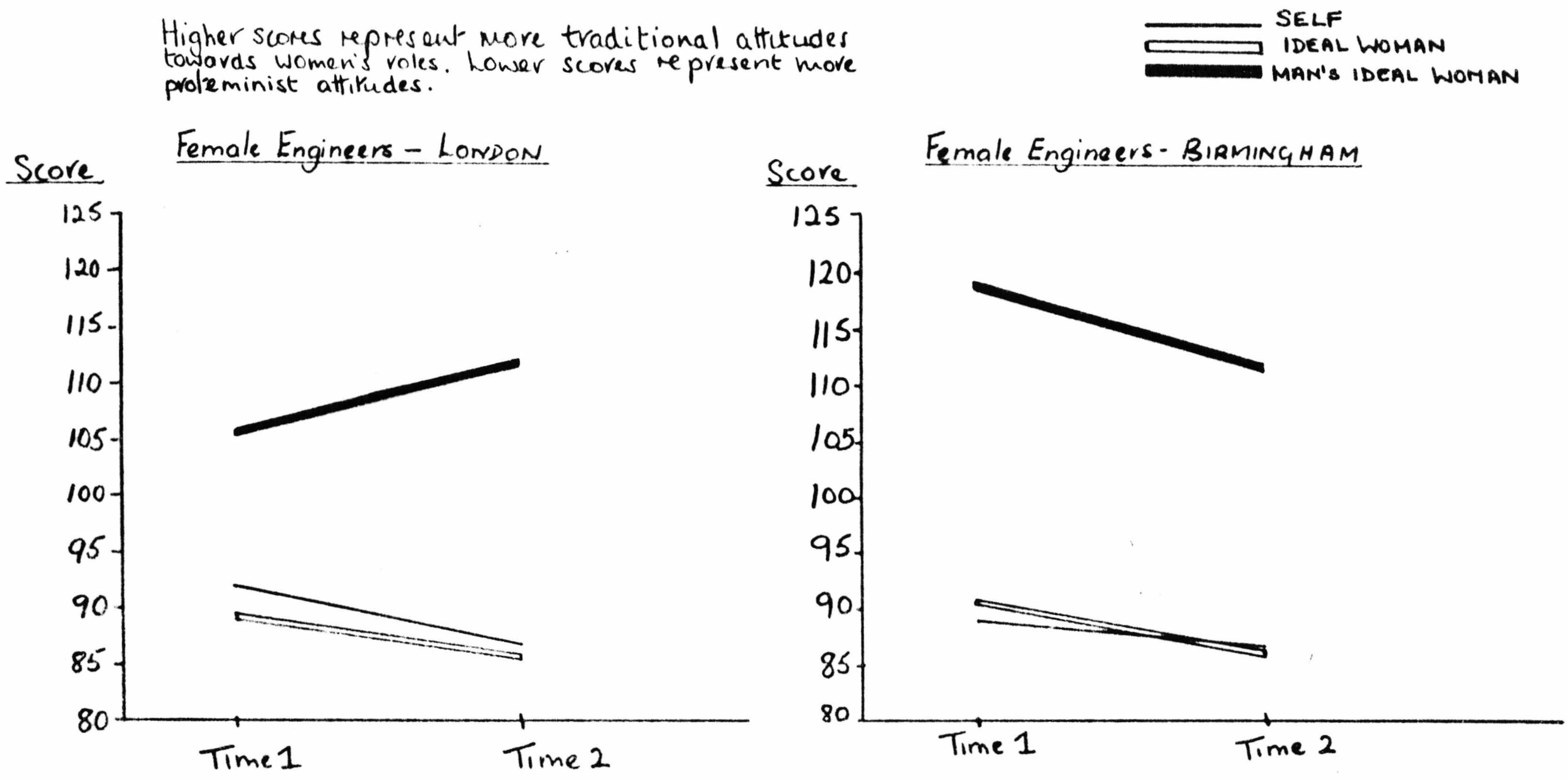
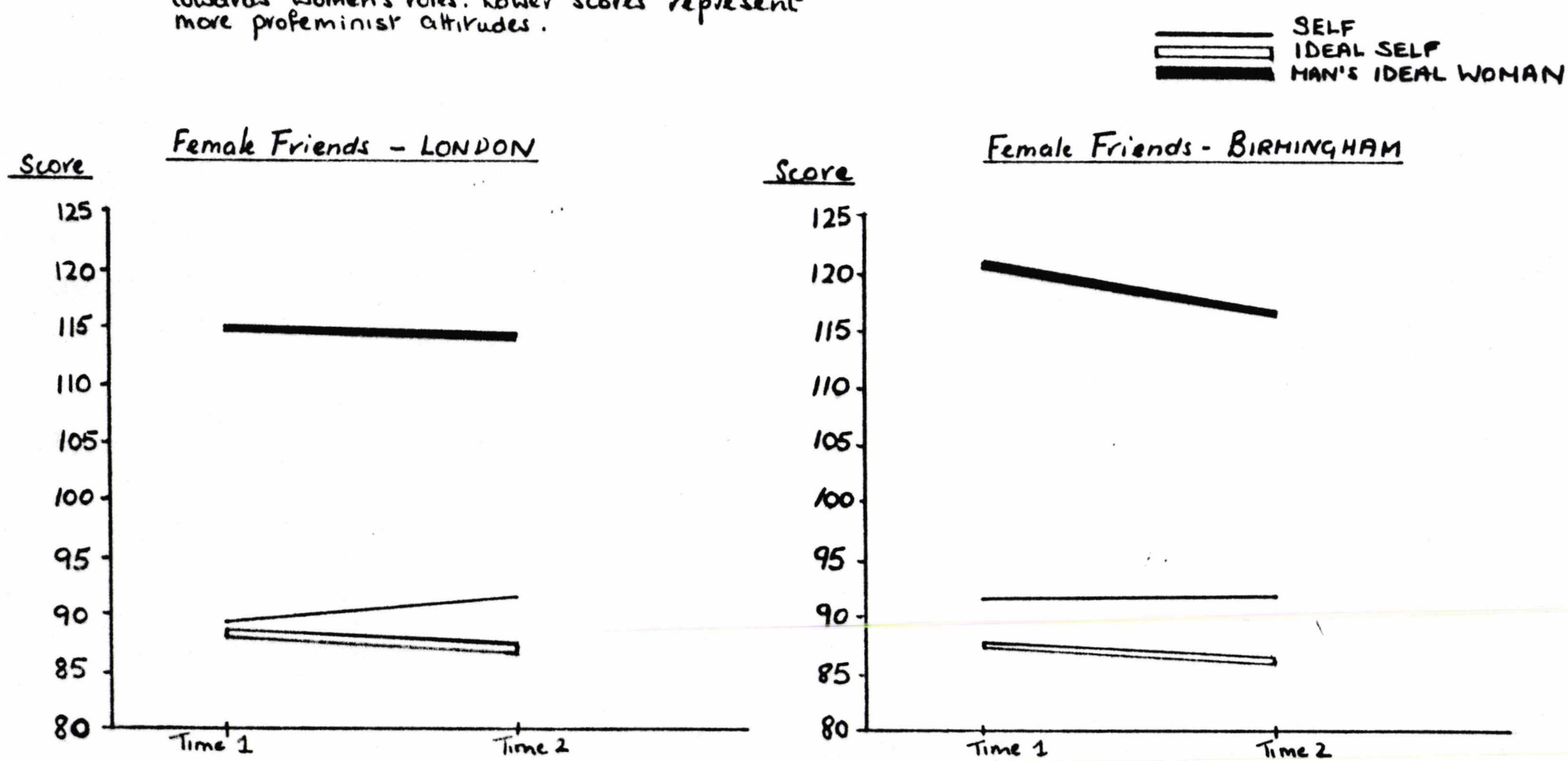


Fig 11.2 CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY LONDON FEMALE FRIENDS AND BIRMINGHAM FEMALE FRIENDS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.



significance, it was significant at the .07 level. There was no evidence for an effect for place or for an interaction between group and place. (See Table 11.4.1.)

The analysis of variance on change scores for the 'Ideal Woman' measure showed no significant main effects or interaction effects (See Table 11.4.2). In a similar fashion, the analysis of variance on change scores for the 'Man's Ideal Woman' measure also failed to show any significant main effects or an interaction effect (See Table 11.4.3).

Table 11.4.1

ANALYSIS OF VARIANCE FOR SELF CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham on the MAFERR

Source	df	SS	MS	F	signif.
GROUP (Eng-Frnds)	1	307.68	307.68	3.38	.07
PLACE (Lon-Birm)	1	10.13	10.13	0.11	NS
GROUP X PLACE	1	37.54	37.54	0.00	NS
Residual	82	7456.36	90.93		
Total	85	7811.71			

Table 11.4.2

ANALYSIS OF VARIANCE FOR IDEAL CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham on the MAFERR

Source	df	SS	MS	F	signif.
GROUP (Eng-Frnds)	1	29.4	29.4	0.19	NS
PLACE (Lon-Birm)	1	1.9	1.9	0.01	NS
GROUP X PLACE	1	88.1	88.1	0.58	NS
Residual	82	12462.2	152.0		
Total	85	12581.7			

Table 11.4.3

ANALYSIS OF VARIANCE FOR CHANGE SCORES ON MAN'S IDEAL WOMAN: A Comparison of Female Engineers and Female Friends in London and Birmingham on the MAFERR

Source	df	SS	MS	F	signif.
GROUP (Eng-Frnds)	1	25.6	25.6	0.06	NS
PLACE (Lon-Birm)	1	1130.7	1130.7	2.60	NS
GROUP X PLACE	1	407.7	407.7	0.94	NS
Residual	82	35641.6			
Total	85	37205.6			

11.5 Female engineers' attitudes on the Self and Ideal Woman scales will be more profeminist than when they began training. However, they will have more traditional views of Man's Ideal Woman than when they began training.

11.6 Female friends will show little or no change in their attitudes as measured by their responses to the Self, Ideal Woman and Man's Ideal Woman scales of the MAFERR.

T Tests on Self Measures. Evidence from t-tests suggests that female engineers in London were becoming more profeminist and that their female friends were becoming somewhat more traditional in their attitudes. (See Table 11.5.1.) When a t-test was used to compare the self-change scores (Self2 - Self1) between these two groups, the difference was significant at the .05 level, using a one-tailed test. ($t = 1.96$, 34 df). The equivalent comparison in Birmingham was not significant ($t = 0.896$, 48 df).

It should also be noted that all changes are in the expected direction, although there was virtually no change in the scores of the 'friends' group in Birmingham. When the two regions were combined, the difference in self change between the female engineers and their female friends was also significant at the .03 level ($t = 1.86$, 84 df, one-tailed test).

Paired t tests were used to assess within group changes. There was some evidence of a profeminist change for female engineers in London ($t = 1.54$, 15 df, $p = .07$); however, the equivalent comparison in Birmingham was not significant ($t = 0.90$, 16 df). When the regions were combined, differences between female engineers' attitudes at time 1 and time 2 almost reached the conventional .05 level of significance when using a one-tailed test (t = 1.68, 32 df).

When similar comparisons between the 'self' values between time 1 and time 2 were carried out for female friends, none of the differences was statistically significant. (See Appendix 11.5 for further information.)

Table 11.5.1

SELF1, SELF2 AND SELF CHANGE: A Comparison of Mean Scores for Self1, Self2 and Self Change (Self2 - Self1) for London Female Engineers, London Female Friends, Birmingham Female Engineers and Birmingham Female Friends on the MAFERR+

Group	N	Self1	Self2++	Self Change+++
London F. Eng	16	90.19	86.73	-3.25
London F. Frnd	20	89.10	91.35	2.25
Birm F. Eng	17	88.82	86.53	-2.29
Birm F. Frnd	33	91.49	91.94	0.45

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ Within group comparisons using paired t tests suggest that London Female Engineers are somewhat more profeminist at time 2 than time 1 ($t = 1.54$, 15 df, $p = .07$) and that Female Engineers (regions combined) are also becoming increasingly liberal in their attitudes ($t = 1.68$, 32 df, $p = .05$).

None of the within group comparisons for Female Friends indicates a significant change between time 1 and time 2.

+++ Differences between London Female Engineers and London Female Friends on Self Change are significant at the .05 level ($t = 1.96$, 34 df, one-tailed test). Differences between Birmingham Female Engineers and Birmingham Female Friends are not statistically significant. However, when the regions are combined the difference between Female Engineers and Female Friends is significant at the .05 level ($t = 1.86$, 84 df, one-tailed test).

<u>T tests on Ideal Measures.</u> Table 11.5.2 shows changes on the 'Ideal Woman' measure of the MAFERR for female engineers and female friends in London and Birmingham. These changes were evaluated by comparing net change scores on Ideal Woman (Ideal2 - Ideal1) for differences between female engineers and their female friends. Like the analysis of variance, these t tests suggested that there was no difference between the two groups on any of the Ideal Change measures. (See Appendix 11.5 for further information.)

Paired t tests were carried out within each group to evaluate any changes which occurred. For the female engineers, the perceived attitudes for an 'ideal woman' were somewhat more profeminist than at time 1. When a paired t-test is used to compare the description of an 'ideal woman' at time 1 with an 'ideal woman' at time 2, the difference for the London Female Engineers approaches significance, using a one-tailed test ($t = 1.54$, 15 df, $p<.08$); when the regions are combined the difference between the values for time 1 and time 2 falls slightly short of the conventional .05 level for statistical significance ($t = 1.69$, 32 df, $p<.06$). None of the other within-group comparisons for Female Engineers or Female Friends approaches statistical significance. (See Appendix 11.5 for further information.)

Table 11.5.2

IDEAL1, IDEAL2 AND IDEAL CHANGE FOR FEMALE ENGINEERS AND FEMALE FRIENDS: A Comparison of Mean Scores for Ideal Woman at Time 1 (Ideal1), Ideal Woman at Time 2 (Ideal2) and Ideal Change (Ideal2-Ideal1) on the MAFERR+

Group	N	Ideal1	Ideal2++	Ideal Change+++
London F. Eng	16	89.06	85.75	-3.31
London F. Frnd	20	88.55	87.15	-1.40
Birm F. Eng	17	90.65	86.06	-4.59
Birm F. Frnd	33	87.33	86.12	-1.21

+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ Differences between Ideal1 and Ideal2 are significant only for the Female Engineers as a group. When the regions are combined differences between Ideal1 and Ideal2 are significant at the .06 level for Female Engineers (t = 1.69, 32 df, one-tailed test). None of the comparisons for Female Friends was statistically significant.

+++ There are no significant differences between Engineers and Friends in either region on Ideal Change.

T tests on Man's Ideal Woman Measures. Table 11.5.3 shows how female engineers and their female friends describe 'Man's Ideal Woman' at time 1 and time 2. In London female engineers saw 'Man's Ideal Woman' as having more traditional attitudes than they did when they began training; however, their counterparts in Birmingham showed change in the opposite direction, now perceiving Man's Ideal Woman as having more liberal attitudes.

When differences between female engineers and female friends on change on Man's Ideal Woman are compared, neither the difference in London or Birmingham is statistically significant. This lack of statistical significance may be attributed to the large variances for this measure. (See Appendix 11.5 for further information.) As noted above, the changes observed in female engineers were in the opposite direction, so that the regions could not be combined. The Female Friends groups in both regions showed non significant changes, with their perceiving of Man's Ideal Woman as having somewhat more liberal attitudes.

Table 11.5.3

MAN'S IDEAL1, MAN'S IDEAL2 AND MAN'S IDEAL CHANGE FOR FEMALE ENGINEERS AND FEMALE FRIENDS: A Comparison of Mean Scores for Man's Ideal Woman at Time 1 (Man's Ideal1), Man's Ideal Woman at Time 2 (Ideal2) and Man's Ideal Change (Man's Ideal2-Man's Ideal1) on the MAFERR+

Group	N	Man's Ideal1	Man's Ideal2	Man's Ideal Change++
London F. Eng	16	106.00	111.69	5.69
London F. Frnd	20	115.00	114.50	-0.50
Birm F. Eng	17	118.65	111.65	-7.00
Birm F. Frnd	33	120.97	116.85	-4.12

+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ None of the changes is statistically significant.

Discussion of Results

Summary of Findings

Comparisons between female engineers and their female friends on the MAFERR showed that, contrary to expectation, female engineers and their female friends did not differ in their attitudes towards women's roles when they began training. This similarity between the two groups was also present in their description of their 'ideal woman' and 'man's ideal woman'. Both groups described their 'ideal woman' as being more concerned with self achievement than family values, but believed that 'man's ideal woman' would hold more traditonal attitudes than their own or those of their ideal woman. Although there was some evidence that subjects in Birmingham held more traditonal views towards women's roles, there were relatively few regional differences.

As predicted, female engineers became somewhat more profeminist in their attitudes towards women's roles and their perception of the attitudes of 'an ideal woman' also became slightly more liberal. In contrast, their counterparts in the 'friends' group showed relatively little change in their own views or in their perception of an 'ideal woman'. Although the 'friends' in London became slightly more traditional in their own attitudes, this change did not approach statistical significance. These findings for the female friends fit with the prediction that this group would show little or no change over the time observed.

Working in a male-dominated occupation did not significantly affect female engineers' view of 'man's ideal woman'. Their friends' perception of 'man's ideal woman' also remained relatively constant. However, both groups continued to see 'man's ideal woman' as having significantly more traditional attitudes than their own.

Interpretation of Results

Initial Differences between Groups. The finding that female engineers and their female friends did not differ initially in their attitudes towards women's roles nor in their view of an 'ideal woman's' attitudes contradicts previous research studies (Rossi, 1965; Spence & Helmreich, 1978). There are several explanations which may account for the present results.

The procedure used to recruit the control group of 'friends' may have maximized the similarity between the two groups. Female engineers were asked to invite two or three friends who would be willing to participate in the research. It seems likely that most female engineers and their female friends would have similar attitudes towards a variety of issues, including women's roles and that this similarity of attitudes may have been an important basis for their friendship.

Another factor which should be considered is that most of the young women in engineering (approximately two-thirds of the group) chose engineering relatively late in their school careers (Newton, 1984). If they had made the choice earlier, they might have been labelled as 'different' by their peers and have been expected to hold more profeminist attitudes. However, because their career choice was a recent one, the female engineers may have just begun experiencing the social implications of their choice when they began training. This interpretation is supported by the finding that most of the subjects in the 'friends' group expressed surprise when their schoolmates chose engineering as a career and felt that there were relatively few differences between their friends doing engineering and themselves.

An additional reason for failing to find a difference between engineers and their friends may lie in the relative conservatism of engineers as an occupational group. Data from Cotgrove and Weinreich-Haste (1982) suggests that girls who choose a career in engineering may see their choice as radical and be willing to be seen as 'different'; however, their social and politcal attitudes tend to be conservative. This interpretation is reinforced by informal conversations with practising female engineers who maintain that they are not particularly interested in feminist causes and that they are somewhat startled and annoyed when others expect them to be strongly partisan on 'women's issues.'

Finally, in drawing comparisons between the present research and previous studies, the limitations of some of the previous research must be noted. Because of the problems of small samples, most other researchers who have studied women in 'non traditional' jobs have tended to combine groups of women who are preparing for or working in different occupations. Very few have focussed on engineers or have included engineers as a significant proportion of their sample. However, on the basis of these studies it has been incorrectly assumed that all women in non traditional jobs will hold relatively profemininst attitudes.

Studies by Steinmann and Fox (1966) and Mandlebaum (1981) suggest the importance of distinguishing between occupational groups in describing their sex role attitudes. The label 'non traditional' has provided an important focus for past research, but it may be obscuring real differences between groups.

Changes over Time. The finding that female engineers become somewhat more profeminist in their attitudes may be related to several factors. As described by Newton and Brocklesby (1982a), the female engineers encountered considerable discrimination in their work; this is a factor which Tavris (1973) suggests is important in producing attitude change. They were also often obliged to defend their career choice, which is, in itself, a statement about the equality of women and men. Their attitude change may be seen as bringing their attitudes more in line with their own behaviour. The expectations of others may also have encouraged subjects to hold more profeminist views. However, the change observed was relatively modest, and the question remains, 'Why didn't the female engineers show greater changes?'

There are several related explanations which suggest that the female engineers were under pressure to maintain relatively traditional attitudes. As described by Newton and Brocklesby (1982a) and noted in Chapter Thirteen, their male colleagues held conservative views on women's roles. They were highly unlikely to encourage or support the expression of feminist views amongst female trainees and were likely to reinforce the general political attitudes associated with the profession.

It should also be noted that the female engineers were in a vulnerable and exposed position. At the time these subjects completed the MAFERR for the second time, they were finishing their second year of EITB sponsorship. Their position was marginal in several respects. They were female; they were apprentices; they were uncertain about their future employment. Most of them did not know for certain that they would be employed for the remaining years of their apprenticeship. Therefore, the subjects were very much in a position of being 'on trial'.

This position of vulnerability makes it difficult for a female engineer to hold extreme attitudes. She is more likely to want to 'blend in' with the attitudes of her male colleagues and not to appear too controversial. Evidence from interview data suggests that this was a conscious strategy that at least some engineers employed (Newton & Brocklesby, 1982a).

The relatively small change amongst the engineers may also be attributed to the fact that female engineers continue to hold relatively traditional attitudes towards the division of labour in the household and towards child care. It appears that most female engineers believe in and defend equality in the workplace but that they do not not expect similar equality in the home (Newton & Brocklesby, 1982a). Since the MAFERR contains a high proportion of questions about reponsibilities in the home, the responses to these questions may have relatively swamped changes in attitudes about the rights of working women.

As predicted, the attitudes of the women in the 'friends' group remained relatively stable. One explanation of this finding is that the issue of 'women's roles was less important in their daily lives. Whilst female engineers were constantly challenged and asked to defend their career choices, their female friends were less likely to meet with this sort of questioning. Subjects in the 'friends' group may have been relatively isolated from issues of prejudice and discrimination and may not have been exposed to pressures for or against sex role conformity. In addition, some of the possible changes in this group may have been masked by the heterogeneity of the jobs and courses entered by these subjects.

The regional differences observed were in the expected direction, giving mild support to the notion that attitudes towards sex roles are more traditional in the north than in the south of the country. There also appeared to be a tendency for subjects in London to show a greater change in their attitudes than subjects in Birmingham. One possible interpretation for this finding is that there is greater 'openess' in the South with subjects feeling freer to explore a wider variety of ideas about appropriate sex roles.

In line with many previous investigations using the MAFERR, both female engineers and their friends saw 'man's ideal woman' as having relatively traditional attitudes towards womens roles. The discrepancy between the two perspectives was significant at both times of measurement. (See Appendix 11.6 for further information.)

There was no support for Steinmann's finding (1974) that more feminist women saw 'man's ideal woman' as having more traditional views than other women in the comparison with female engineers and their female friends. Since Steinmann's original research on this issue was with a small (N=54) and atypical group (feminist psychologists) in the United States, it may not generalise to a younger, less educated and different occupational group in Britain several years later. In my examination of the literature on the MAFERR, I have been unable to find any replication of Steinmann's (1974) finding, which suggests that this phenomenon may be a limited one.

Other findings. In her extensive programme of research using the MAFERR, Steinmann (1974) has found that the discrepancy between 'self' attitudes and those of an 'ideal woman' is usually small and not statistically significant. However, she suggested that this discrepancy may have clinical importance when it is relatively large.

The pattern of self-ideal discrepancy for each of the four groups in the present study may be seen in Figures 11.1 and 11.2, and the values for Self and Ideal at time 1 and time 2 are presented in Table 11.6. The initial differences between values on the Self and Ideal Woman scales were not statisically significant for either group of female engineers or the female friends in London. However, the female friends in Birmingham described Ideal Woman as having more profeminist attitudes than their own ($t = 2.58$, 32 df, $p<.02$, two-tailed test.) There also appeared to be a difference in the pattern of self-ideal discrepancy between the female engineers and 'friends' group at time 2. The two values were quite similar for female engineers; whereas for female friends the two values were more discrepant. When the attitudes ascribed to self and an ideal woman at time 2 were compared, London Female Friends described an ideal woman as having slightly more liberal attitudes than themselves ($t = 1.43$, 19 df, $p = .17$, two-tailed test). In Birmingham, Female Friends described their ideal woman as having significantly more profeminist attitudes than their own ($t = 2.91$, 32 df, $p<.005$, two-tailed test). This difference was also highly significant for the Female Friends group when the regions were combined ($t = 3.15$, 52 df, $p<.003$, two-tailed test).

Based on Steinmann's (1974) description of clinical use of the MAFERR, the discrepancy observed in the 'friends' group does not appear large enough to suggest a serious lack of adjustment. However, it does suggest some dissatisfaction felt by women in the 'friends' group. Their relatively liberated description of an 'ideal woman' implies an interest in being more self-achieving. This pattern of self-ideal discrepancy was also present in the Kingston Nursery Nurses and Business Studies groups, suggesting that it may be a general effect for women who are pursuing traditionally feminine roles. (See Chapter Twelve for further information.)

Table 11.6

DISCREPANCY BETWEEN SELF AND AN IDEAL WOMAN: Scores on the Self and Ideal Woman Scales of the MAFERR for London Female Engineers, Birmingham Female Engineers, London Female Friends and Birmingham Female Friends at Time 1 and Time 2+

Group	Self1	Ideal1	Self2	Ideal2
London F.Eng (N = 16)	90.19	89.06	86.94	85.75
Birm F. Eng (N = 17)	88.82	90.65	86.53	86.06
London F. Frnd++ (N = 20)	89.10	88.55	91.35	87.15
Birm F. Frnd+++ (N =33)	91.49	87.33	91.94	86.12

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

++ Values for Self2 and Ideal2 tend to be different when compared using a paired t test ($t = 1.43$, 19 df, $p<.17$).

+++ Values for Self1 and Ideal1 are significantly different ($t = 2.58$, 32 df, $p = .02$); values for Self2 and Ideal2 are also significantly different ($t = 2.91$, 32 df, $p = .005$).

Overview. In the present study female engineers became somewhat more profeminist whilst their friends' attitudes remained relatively stable. Further longitudinal studies are needed to see if this pattern of group differences is maintained over a longer period of time.

In comparing the results of the current study with previous research, it is apparent that the current sample of female engineers is a somewhat unusual one which does not correspond very closely with other samples of women preparing for or working in 'non traditional' jobs. The female engineers in the present research were both younger and more likely to be working class than the groups previously studied. They were preparing for an occupation, which, while male-dominated, has an ambiguous status in the present culture and is often seen as particularly unsuitable for women. This position provides a sharp contrast with much of the American research which has concentrated on middle class university students preparing for careers in science and medicine.

The present research points up the need for more studies, which provide comparisons between well-defined groups of subjects. There is a need to look at women and men not only when they are preparing for their careers or undergoing training but also in later phases of the occupational cycle. It might be predicted that the female engineers in the present sample would be more comfortable in expressing profeminist views when they are settled and secure in their jobs than they were as eighteen year old apprentices in their second year of training.

CHAPTER TWELVE

STUDY FIVE: SEX ROLE ATTITUDES AND IDEALS OF WOMEN IN BUSINESS STUDIES AND NURSERY NURSING: SOME PARTIAL COMPARISONS WITH FEMALE ENGINEERS AND FEMALE FRIENDS IN LONDON

Introduction

This study considers sex role attitudes and ideals in two groups of women preparing for traditionally feminine fields of work: women on a business studies course with a secretarial studies option and women on a nursery nursing course. Women in these two groups, known as the 'Business Studies' and 'Nursery Nursing' groups, are compared with the London Female Engineers and London Female Friends. As noted in Chapter Three, the Business Studies and Nursery Nursing groups come from a smaller geographical area, thus limiting the strict comparability between the four groups. Since the major findings for the London Female Engineers and London Female Friends have been discussed in Chapter Eleven, the focus of this chapter is on the women in Business Studies and Nursery Nursing. The first part of the chapter involves a restatement of the hypotheses offered in Chapters Nine and Ten as they apply to the groups being considered in the present study. Each hypothesis is evaluated individually, and the findings are then discussed and interpreted.

Hypotheses to be Tested

Initial Differences between Groups

12.1 Women entering or preparing for traditionally feminine occupations will describe themselves and their 'ideal woman' as having more traditional attitudes towards women's roles than female engineers.

12.2 Nursery Nurses will describe themselves, their 'ideal woman' and 'man's ideal woman' as having more traditional attitudes than other women in traditionally feminine occupations.

12.3 All women will describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman'.

Changes in Sex Role Attitudes and Ideals

12.4 Women entering or preparing for traditionally feminine occupations will show less change in their attitudes (both 'self' and 'ideal') than female engineers.

12.5 Female Friends and women in Business Studies will show little or no change in their attitudes and ideals.

12.6 Nursery Nurses will become more traditional in their attitudes as shown by changes in their own attitudes and their ideals.

Results of Study Five

12.1 Women entering or preparing for traditionally feminine occupations will describe themselves and their 'ideal woman' as having more traditional attitudes towards women's roles than female engineers.

The prediction that women in traditonal fields would have more traditional attitudes towards women's roles received weak support when subjects described their own attitudes, but no support in their description of an ideal woman. Mean scores for both SELF and IDEAL at time 1 are presented in Table 12.1.

When their own attitudes (scores on the SELF mesure of the MAFERR) were compared, only the Business Studies group had scores which were significantly more traditional than the Female Engineers (t = -1.96, 28 df, p = .03, one-tailed test). Although an inspection of the mean scores for each of the groups shown in Table 12.1 suggests that the Nursery Nurses were also more traditional in their attitudes than Female Engineers, differences between the two groups did not approach statistical significance ($t = -0.645$, 29 df). The scores for the London Female Friends and London Female Engineers were also not statistically significant. None of the differences between groups in their descriptions of an ideal woman approached statistical significance.

12.2 Nursery Nurses will describe themselves and their 'ideal woman' and 'man's ideal woman' as having more traditional attitudes than women in other traditionally feminine occupations.

There was little support on any of the three measures for the notion that Nursery Nurses would have more traditional attitudes towards women's roles. As shown in Table 12.2, Nursery Nurses tended to have more profeminist scores than the Business Studies group; this difference was in the opposite direction from that which was predicted and reached the .19 level of significance for a two-tailed test. Whilst Nursery Nurses appeared to describe an ideal woman with more traditional attitudes than women in the other 'traditional' groups, the differences between means were not significant. There were virtually no differences between groups in their descriptions of 'man's ideal woman'.

Table 12.1

SELF AND IDEAL AT TIME 1: Comparison of Mean Scores on the Self and Ideal Scales of the MAFERR for Women in Business Studies, Women in Nursery Nursing, London Female Friends and London Female Engineers

GROUP	SELF	s.d.	IDEAL	s.d.
Kingston Bus. Studies* (N = 14)	98.59	9.92	86.57	11.43
Kingston Nursery Nurses (N = 15)	93.07	11.76	92.00	12.08
London Female Friends (N = 20)	89.10	10.46	88.55	16.55
London Female Engineers (N = 16)	90.19	12.99	89.06	15.57

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

* The SELF score for the Kingston Business Studies group is significantly different from the SELF scores obtained by London Female Engineers and London Female Friends. It is also significantly different from the score for IDEAL. (See Appendix 12.1 for further information.)

Table 12.2

SELF, IDEAL AND MAN'S IDEAL WOMAN AT TIME 1: Comparison of Mean Scores on the Self, Ideal and Man's Ideal Woman Scales of the MAFERR for Kingston Nursery Nurses, Kingston Business Studies and London Female Friends+

GROUP	SELF	s.d.	IDEAL	s.d.	M.IDEAL	s.d.
King. N. Nurs. (N = 15)	93.07	11.76	92.00	12.08	114.33	12.79
King. Bus. St.* (N = 14)	98.59	9.92	86.57	11.43	114.00	13.76
Lon. F. Frds (N = 20)	89.10	10.46	88.55	16.55	115.00	15.64

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

* The SELF score for Kingston Business Studies is significantly more traditional than the SELF score for London Female Friends. None of the other comparisons between groups on the same measure is statistically significant.

12.3 All women will describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman'.

The prediction that women would describe an 'ideal woman' as having more profeminist attitudes than 'man's ideal woman' was strongly supported in all groups being studied. The values for 'ideal woman' and 'man's ideal woman' for each of the groups in the present study are shown in Table 12.3. Differences between the two scores were significant at or beyond the .01 level for all of the groups. (See Appendix 12.3 for further information.)

Table 12.3

IDEAL AND MAN'S IDEAL AT TIME 1: Comparison of Mean Scores on the IDEAL and MAN'S IDEAL Scales of the MAFERR for Women in Business Studies, Women in Nursery Nursing, London Female Friends and London Female Engineers

GROUP	IDEAL	s.d.	M.IDEAL	s.d.
Kingston Bus. Studies* (N = 14)	86.57	11.43	114.00	13.76
Kingston Nursery Nurses* (N = 15)	92.00	12.08	114.33	12.79
London Female Friends* (N = 20)	88.55	16.55	115.00	15.64
London Female Engineers* (N = 16)	89.06	15.57	106.00	24.27

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

* Scores for an Ideal Woman are significantly more profeminist than scores for Man's Ideal Woman.

12.4 Women entering or preparing for traditionally feminine occupations will show less change in their attitudes (both SELF and IDEAL measures) than female engineers.

Changes shown in attitudes on all measures of the MAFERR (SELF, IDEAL and MAN'S IDEAL WOMAN) are shown for all groups in Figure 12.1, whereas changes on these measures for the Women in Business Studies and Nursery Nursing are also shown in Figure 12.2.

The prediction that women in traditionally feminine occupations would show less change than female engineers was evaluated by comparing the net change shown by Female Engineers with the net change shown by each of the three comparison groups. Net change scores were computed for both the SELF and IDEAL measures of the MAFERR. These scores have been termed 'self change' and 'ideal change' scores. The six analyses carried out are more fully described in Appendix 12.4.

Somewhat surprisingly only the comparison between London Female Engineers and London Female Friends for 'self change' approached significance; this change was significant at the .06 level for a one-tailed test. None of the other comparisons for either 'self change' or 'ideal change' was statistically significant. Analyses of changes in 'man's ideal woman' were also carried out between groups, and none of these comparisons was statistically significant.

Fig 12.1 CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY WOMEN IN BUSINESS STUDIES, WOMEN IN NURSERY NURSING, LONDON FEMALE ENGINEERS AND LONDON FEMALE FRIENDS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more pro-feminist attitudes.

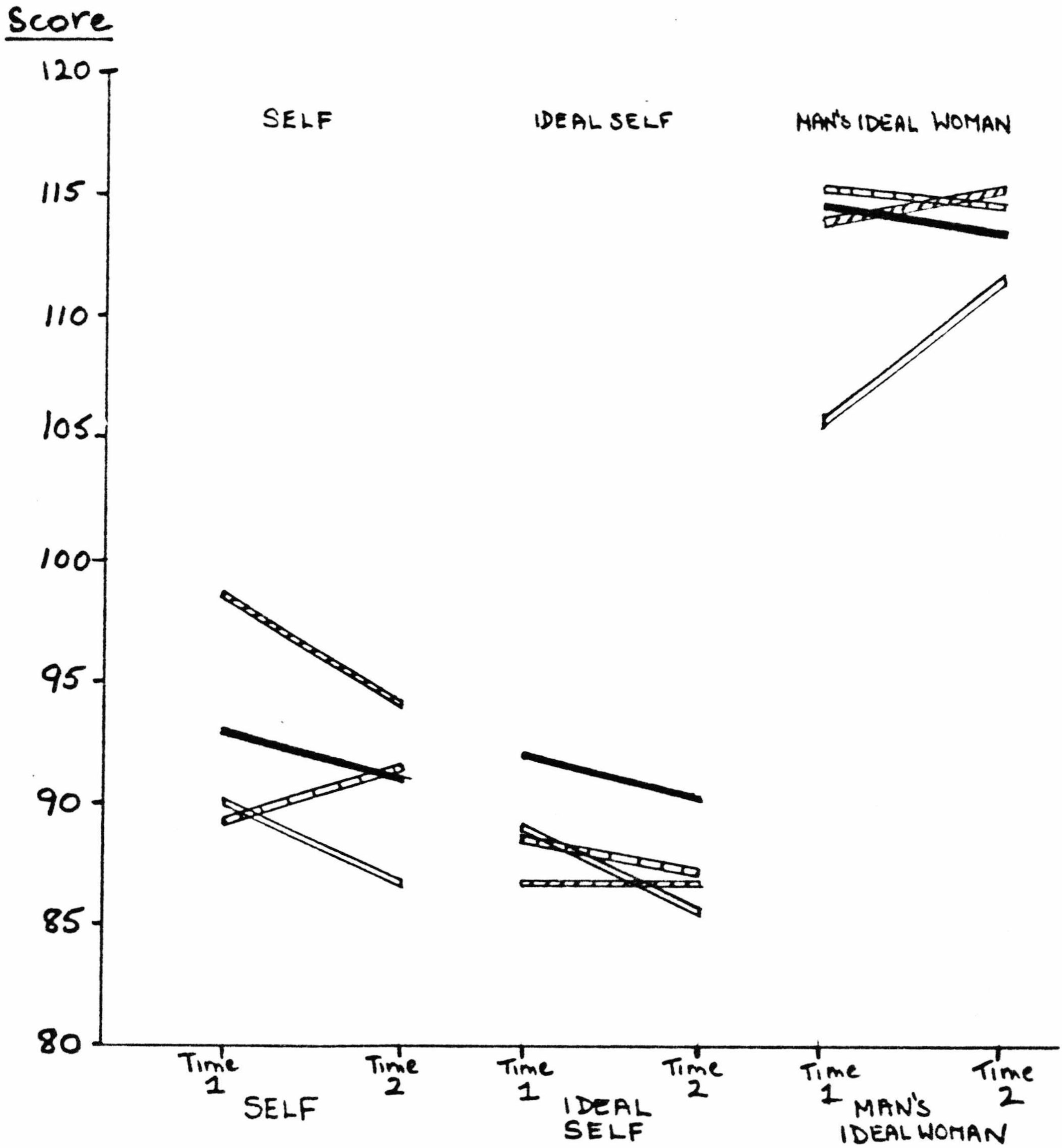
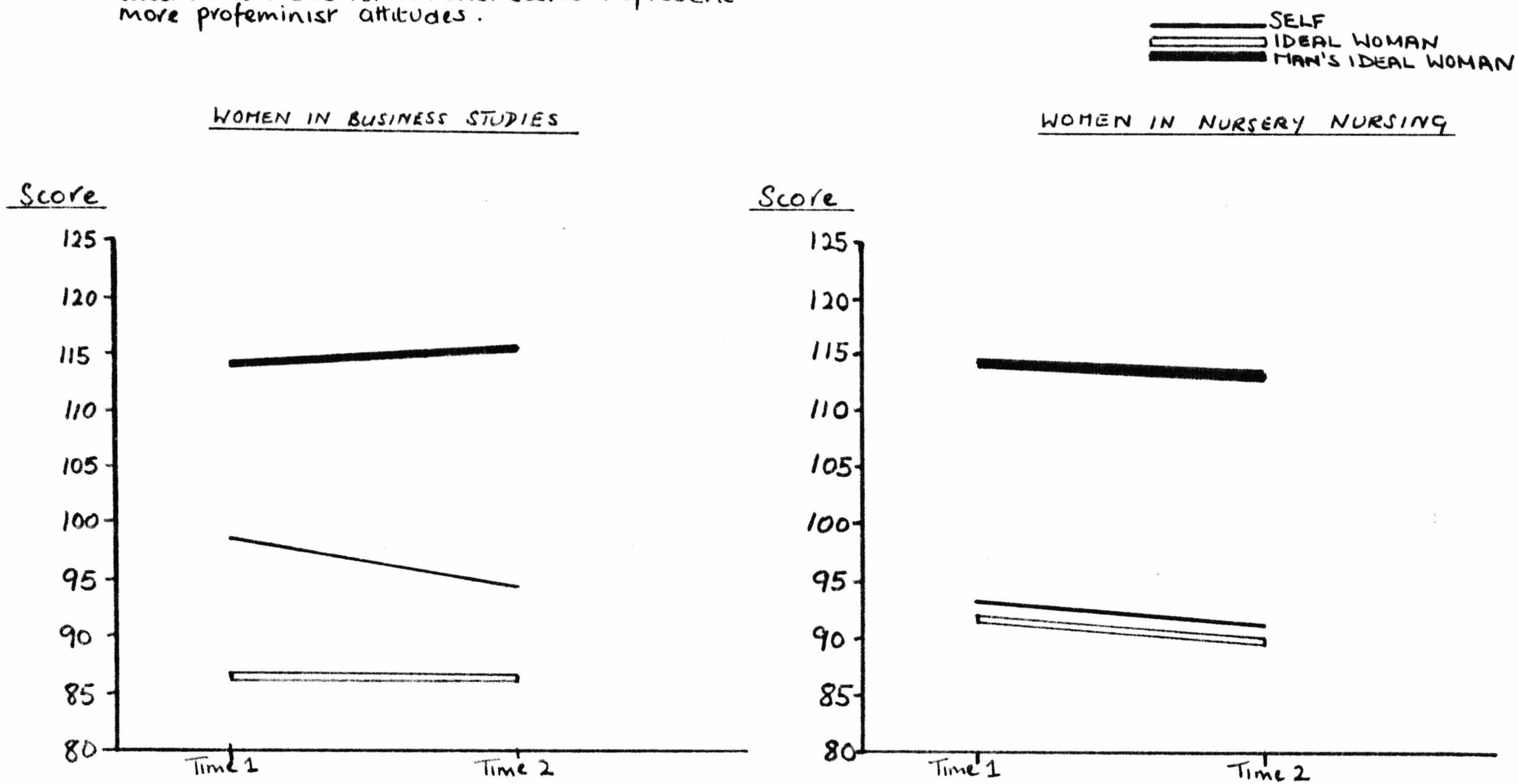


Fig 12.2. CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY WOMEN IN BUSINESS STUDIES AND WOMEN IN NURSERY NURSING.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.



12.5 Female Friends and women in Business Studies will show little or no change in their attitudes and ideals.

The prediction that the London Female Friends and the the Business Studies group would show little change in attitudes ascribed to themselves or their ideal woman was evaluated using paired t tests within each group.

Table 12.5 shows the values for SELF and IDEAL at time 1 and time 2 for each of the groups. Although the prediction was supported for the London Female Friends; it was not supported for the Business Studies group, who became significantly more profemininst ($t = 3.26$, 13 df, $p = .007$, two-tailed test). Neither group showed a significant change in attitudes ascribed to an 'ideal woman'. (See Appendix 12.5 for a list of the t tests calculated.)

Table 12.4

NET CHANGES IN SELF, IDEAL AND MAN'S IDEAL WOMAN: Comparison of Mean Change Scores on the MAFERR for Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers+

GROUP	S.CHNGE	s.d.	I.CHNGE	s.d.	M.I.CHNGE	s.d.
King. Bus. St. (N = 14)	-4.36	5.00	0.00	8.89	1.29	12.50
King. N. Nurs. (N = 15)	-2.00	7.45	-1.87	14.22	-1.00	13.23
Lon. F. Frds (N = 20)	2.25	8.35	-1.40	15.25	-0.50	12.83
Lon. F. Eng. (N = 17)	-3.25	8.42	-3.31	11.25	5.69	28.82

+ Change scores are calculated by subtracting the time 1 value from the time 2 value. A negative score indicates that the change is in the profeminist direction; a positive score represents a change towards more traditional attitudes.

Table 12.5

SELF AND IDEAL AT TIME 1 AND TIME 2: Comparison of Mean Scores on the Self and Ideal Scales of the MAFERR for Women in Business Studies and Women in Nursery Nursing+

GROUP	TIME	SELF	s.d.	IDEAL	s.d.
King. Bus. St. (N = 14)	1	98.59	9.92	86.57	11.43
	2	94.21++	9.33	86.57	12.01
King. N. Nurses (N = 15)	1	93.07	11.76	92.00	12.08
	2	91.07	8.15	90.13	9.83

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

++ Differences between SELF at time 1 and time 2 are statistically significant. (See Appendix 12.5 for further information.)

12.6 Nursery Nurses will become more traditional in their attitudes as shown by changes in their own attitudes and their ideals.

There was no support for the notion that Nursery Nurses would become more traditional in their attitudes. As shown in Table 12.5, there was a slight tendency for Nursery Nurses to change in the direction of more profeminist attitudes although neither change approached statistical significance.

Discussion of Results

Summary of Findings

When they began training, women in the Business Studies group had significantly more traditional attitudes towards women's roles than the London Female Engineers and the London Female Friends. All groups saw 'man's ideal woman' as having significantly more traditional attitudes than their 'ideal woman'. Contrary to prediction, the largest change in 'self' attitudes was shown by the Business Studies group; London Female Engineers showed the second largest change in their own attitudes. Both changes were significantly larger than the change shown by London Female Friends. The Nursery Nurses showed relatively little change on any of the measures and did not become more traditional in their attitudes.

Interpretation of Results

Initial Differences. The differences between the two groups based in Kingston (Business Studies and Nursery Nurses) and the London Female Engineers in 'self' attitudes supported the prediction that women in traditional occupations would have more traditional attitudes towards women's roles than women in engineering. This pattern of results fits with previous evidence reported by Spence and Helmreich (1978), Steinmann and Fox (1974) and Nagely (1971). However, the lack of difference between the London Female Friends group and the London Female Engineers was unexpected. Several explanations for this result have been advanced in Chapter Eleven. It should also be noted that the London Female Friends and two Kingston groups offered different types of comparison groups in the programme of research. Given the diversity of courses and occupations being followed by women in the Female Friends group, it can be argued that this group is less suitable as a control group for exploring the effect of entering traditional and non traditional fields of work.

The relative position of the Nursery Nurses and Business Studies was contrary to the original prediction. It had been assumed that Nursery Nurses would have more traditional attitudes towards women's roles and that their attitudes would become more traditional during their training. One explanation for the observed differences between the two groups lies in the type of women choosing the two courses. Although nursery nursing is often seen as a highly feminine occupation, it may attract some young women with relatively liberal values and a concern for helping others. They may see their future roles more flexibly than women entering Business Studies.

Differences between the Business Studies and Nursery Nursing groups may also be attributed to the nature of the courses they followed and the degree of career commitment the women felt when they began their training. As noted in Chapter Seven, Nursery Nurses tended to see themselves as possessing more active and instrumental characteristics than women in Business Studies. Interview data suggests that they had faced stiff competition to get a place on their course and that they viewed their field of work as highly desirable.

In contrast, several lines of evidence suggest that the women in Business Studies were less committed to their course and were more undecided about their future careers. Many women saw the secretarial aspect of the course as providing a 'safe option' and 'useful skills for the future'; however, they were uncertain about the relevance of various parts of the course work. It can be argued that unlike nursery nursing or engineering, the course provided a wide but extremely varied range of opportunities and potential careers. Women on the Business Studies course may have lacked a clear picture of their future work roles and have focussed more on their future domestic roles. Because they could not identify their future careers, they could not assign importance to them, so that they relied more heavily on traditional definitions of women's roles. This interpretation is supported by the large and statistically significant difference between sex role attitudes ascribed to 'self' and to an 'ideal woman'.

Figure 12.2 shows the SELF and IDEAL scores at time 1 and time 2 for the Business Studies and Nursery Nursing groups. According to Rogers' self theory (1951) and Steinmann's interpretation of the MAFERR, the large and highly significant discrepancy between the two values for the

Business Studies group suggests a dissatisfaction with their current selves and a desire for change. Although women in this group became significantly more profeminist in their attitudes, the discrepancy between SELF and IDEAL remained large and statistically significant, implying a continuing discomfort with the current attitudes and their ideals. However, this interpretation of the observed SELF-IDEAL discrepancy may be questioned. (See Appendix 12.6 for analyses of the SELF-IDEAL discrepancy for all groups in the present study.)

In the present study, the IDEAL measure failed to discriminate amongst the four groups, suggesting that this score may reflect a stereotypic or consensual image of an 'ideal woman' and not represent individuals' attitudes. This view is supported by the narrow range of scores shown for 'Ideal' by female groups on the MAFERR. Although Steinmann (1963, 1974) has seen this agreement amongst widely differing groups as a strength of the scale, the meaning of the scale for individual subjects is less clear. Whilst Steinmann (1963, 1974) has suggested that a small discrepancy between SELF and IDEAL is normal, another possibility is that subjects have difficulty in understanding and remembering the instructions for the IDEAL scale and may complete it in a similar way as the SELF scale. [1]

The present study does not provide sufficient information to clarify the meaning of IDEAL scale of the MAFERR. However, it does suggest that this measure is problematic and is apparently less sensitive to group differences than the SELF measure.

The final set of findings for initial differences confirms previous research with the MAFERR in suggesting that women view 'Man's Ideal Woman' as having more traditional attitudes than their own 'Ideal Woman' (Steinmann and Fox, 1974). This difference was present and highly significant in all groups in the present study. This result has important implications for how the two sexes view each other and may act as a barrier towards women adopting strongly profeminist views. (See Chapters Nine and Ten for further discussion of the theoretical implications and empirical investigations of how women and men view each other.)

Changes in Sex Role Attitudes and Ideals. The prediction that women in traditionally feminine occupations would show less change than women in engineering received little support. The only support for this hypothesis came from the finding that London Female Friends showed less change in 'self' attitudes than Female Engineers. Paradoxically the Business Studies group was the only group in this study to show a significant difference between attitudes attributed to 'self' at time 1 and time 2. Since this group was expected to show little change, a further consideration of this finding is necessary.

There are at least three possible explanations for the observed change in the Business Studies group. Each of these explanations will be explored separately, although it should be noted that not all of the explanations are mutually exclusive.

Perhaps the simplest explanation for the change is that it represents a statistical artefact or regression towards the mean. Whilst this is a plausible explanation, the parallel change in sex role self concept shown by the Business Studies group in Study Two suggests that this was unlikely to be the sole factor involved.

A second interpretation of the finding suggests that the experience of discrimination produced an increase in profeminist attitudes. Interviews with women in the Business Studies group suggested that some subjects became disillusioned with secretarial work, particularly those aspects of the work which reflected traditional feminine roles. It is notable that at least three women in the present group had left secretarial work during their first 18 months of employment to seek jobs that held more prospects. [2] An alternative explanation suggests that the change in the Business Studies group in the present study may represent the effects of occupational socialisation. As suggested previously, women in this group appeared to be uncertain about their future careers when they began their course. However, the experience of doing the course, which included work placements, may have helped to crystallise their occupational identity. Their more profeminist attitudes at time 2 may represent their coming to hold attitudes and values which were more congruent with other women in business.

Whilst it might be expected that contact with the business world would produce increasing conservatism, women in this group began their course with extremely traditional attitudes. In spite of their becoming more profeminist, they retained their relative position in the present study in continuing to hold the most traditional attitudes towards women's roles at time 2. This position fits with the conservative attitudes associated with people in business and confirms Steinmann and Fox's (1966) finding that women in business had relatively traditional attitudes in comparison with other groups of women professionals.

Although the changes shown by the Business Studies group may be explained by the 'socialisation' model, the pattern of results from the Nursery Nursing group provided no support for the model. It had been hypothesised that women in this group would become more traditional in their attitudes, in keeping with the highly traditional image of their job. [3] One explanation for the lack of change observed is that in working in a predominantly female environment, Nursery Nurses were relatively isolated from the issues of women's and men's roles and had no reason to reconsider their views on this issue. This isolation was in strong contrast to the experience of discrimination felt by both female engineers and women in Business Studies.

The original hypotheses for this study predicted changes in both 'ideals' and 'man's ideal woman'; however, no significant changes in either measure were observed for any of the groups. There were also no significant differences between groups. This failure to discriminate between groups and to show changes suggests that these measures are relatively insensitive. They appear quite stable and, as suggested previously, may be more useful in reflecting stereotypical rather than personally held attitudes.

Overview

The results of the current study point up the need to consider various occupations which are termed 'traditionally feminine' separately. It seems plausible that some courses or programmes of training attract individuals who are already strongly identified with a particular occupation, whereas others attract or select individuals who are much less clear in their goals. Furthermore, there are likely to be differences between courses in the extent to which sex role issues are salient during the process of training.

The pattern of findings from the current study cannot be adequately explained by conventional 'socialisation' theories, thus suggesting that there may be several processes which account for attitude change or stability. A more promising explanation for attitude change is the experience of discrimination. It is notable that it does not appear to be discrimination, per se, which produces attitude change but the recognition that discrimination has occurred. Both the issues of occupational socialisation and discrimination will be more fully explored in Chapter Fourteen.

Footnotes

[1] Both Wylie (1979) and Brannon (1978) have been critical of Steinmann's methodological approach in the MAFERR; Wylie also questions the entire notion of measuring ideal self concepts and believes that such measurement has little to contribute to the assessment of self concept.

[2] See Newton and Brocklesby (1982a) for further information on how some women in this sample viewed secretarial work.

[3] Although I have assumed that people in nursery nursing hold traditional views towards women's roles and tend to have these views reinforced during the process of training, this assumption may be incorrect. Perhaps some of the 'liberal' ideas associated with permissive child rearing are also reflected in attitudes towards women's roles. I had reasoned that women involved in this field would have strong beliefs about the place of mothers being in the home. However, it can be argued that by training for the job of nursery nurse, these young women are enabling other women to be less involved with child care and that they see these arrangements as a suitable way to care for young children.

CHAPTER THIRTEEN

STUDY SIX: SEX ROLE ATTITUDES AND IDEALS IN MALE AND FEMALE ENGINEERS

Introduction

This study is concerned with how male and female engineers view an 'ideal woman'; it explores the differences between female engineers' perceptions of 'man's ideal woman' and their own ideals and changes in these ideals over time. It also examines regional differences in the sex role attitudes and ideals of male engineers. The chapter begins with a restatement of the hypotheses offered in Chapter Ten as they apply to comparisons between male and female engineers' attitudes and ideals. The results are reported in terms of the original hypotheses and are followed by a summary of the findings and a discussion of the results and their implications. As noted in Chapter Three, the MAFERR does not provide direct comparisons between women's and men's attitudes towards women's roles. Therefore, the major comparisons in this study are concerned with concepts of an 'ideal woman'.

Hypotheses to be Tested

Initial Differences between Groups

13.1 Male engineers will describe an'ideal woman' as having more traditional attitudes towards women's roles than female engineers will describe an 'ideal woman'.

13.2 Male engineers will describe an 'ideal woman' with more profeminist ideas than 'man's ideal woman' described by female engineers.

13.3 The sex role attitudes and ideals of male engineers in Birmingham will be more traditional than the sex role attitudes and ideals of male engineers in London.

Changes in Sex Role Attitudes and Ideals

13.4 Male engineers will become more traditional in their attitudes on all measures of the MAFERR. Female engineers will become more profeminist in their attitudes and in their description of an 'ideal woman'; they will become more traditional in their description of 'man's ideal woman'.

Results of Study Six

Initial Differences between Groups

13.1 Male engineers will describe an'ideal woman' as having more traditional attitudes towards women's roles than female engineers will describe an 'ideal woman'.

This prediction was supported in both regions with male engineers describing an 'ideal woman' as significantly more traditional than female engineers described an 'ideal woman'. In London the difference between the scores was significant at the .05 level, using a one-tailed test ($t = 1.73$, 33 df) and in Birmingham the difference was significant at the .03 level, using a one tailed test ($t = 1.92$, 35 df). When the two regions were combined the differences between female and male engineers were significant at the .005 level. The means and standard deviations for the values of each of the groups are presented in Table 13.1.

13.2 Male engineers will describe an 'ideal woman' with more profeminist ideas than 'man's ideal woman' described by female engineers.

As in previous research with the MAFERR, this prediction was supported with male engineers in both regions describing an 'ideal women' who held more liberal attitudes than the attitudes of 'man's ideal woman' described by female engineers. These differences, which are presented in Table 13.2, are statistically significant at the .06 level in London (t = -1.62, 33 df) and at the .0001 level in Birmingham (t = -4.18, 35 df). (Unless otherwise noted, significance levels are quoted for one-tailed tests.)

Table 13.1

INITIAL DIFFERENCES IN PERCEPTION OF AN IDEAL WOMAN: Comparison of Male and Female Engineers in London and

Group	N	Ideal Woman'	s.d.
London Male Eng.++	19	96.32	8.83
London Female Eng.	16	89.06	15.57
Birm. Male Eng.+++	20	96.55	8.06
Birm. Female Eng.	17	90.65	10.59
All Male Eng	39	96.44	8.33
All Female Eng.	33	89.88	13.06

\+ This measure has been scored so that higher scores represent relatively traditional attitudes towards women's roles and lower scores represent profeminist (self achieving) attitudes towards women's roles.

++ Differences between female engineers and male engineers in London are significant at the .05 level ($t = 1.73$, 33 df, one-tailed test).

+++ Differences between Female Engineers and Male Engineers in Birmingham are significant at the .03 level ($t = 1.92$, 35 df, one-tailed test).

Table 13.2

'MAN'S IDEAL WOMAN': A Comparison between an 'Ideal Woman' described by Male Engineers in London and Birmingham and 'Man's Ideal Woman' described by Female Engineers in London and Birmingham

Group	N	'Man's Ideal Woman'@	s.d.
London Female Eng.	16	106.00	24.27
London Male Eng.++	19	96.32	8.83
Birm. Female Eng.	17	118.65	22.03
Birm. Male Eng.+++	20	96.55	8.06

\+ This measure has been scored so that higher scores represent relatively traditional attitudes towards women's roles and lower scores represent profeminist (self achieving) attitudes towards women's roles.

@ Female engineers completed the attitude scale for 'Man's Ideal Woman,' whereas male engineers completed the scale for their 'Ideal Woman'.

++ Differences between Female Engineers and Male Engineers in London are significant at the .06 level (t = -1.62, 33 df).

+++ Differences between Female Engineers and Male Engineers in Birmingham are significant at the .0001 level (t = -4.18, 35 df).

13.3 The sex role attitudes and ideals of male engineers in Birmingham will be more traditional than the sex role attitudes and ideals of male engineers in London.

Although there was a tendency for male engineers in Birmingham to have more traditional attitudes towards their own sex roles than male engineers in London, neither of these differences was statistically significant. As shown in Table 13.3, there was virtually no difference between the attitudes ascribed to an ideal woman by the male engineers in the two regions.

Table 13.3

REGIONAL DIFFERENCES FOR MALE ENGINEERS: Comparison of Mean Scores for SELF1, IDEAL1 and 'MAN'S IDEAL WOMAN' for Male Engineers in London and Birmingham+

Group	SELF1	s.d.	IDEAL1	s.d.	MIW1	s.d.
London Male Eng. (N = 19)	97.90	11.63	98.63	9.26	96.32	8.83
Birm. Male Eng.++ (N = 20)	102.05	7.22	101.55	12.31	96.55	8.06

+ These measures have been scored so that higher scores represent relatively traditional attitudes towards the division of labour between women and men and lower scores represent a division of labour based on women and men performing similar tasks at home and in the workplace. The SELF and IDEAL measures consist of questions about men's roles, whereas the MIW measure consists of questions about the roles of an 'ideal woman'.

++ None of the differences between Male Engineers in the two regions is statistically significant. (See Appendix 13.3 for information on the t tests calculated.)

13.4 Male engineers will show less change than female engineers on all measures of the MAFERR.

13.5 Male engineers will become more traditional on all measures of the MAFERR. Female engineers will become more profeminist in their attitudes and in their description of an 'ideal woman'; they will become more traditional in their description of 'man's ideal woman'.

Figures 13.1 - 13.6 show changes on each of the three measures of the MAFERR for male and female engineers in London and Birmingham. The changes on the SELF measure for male and female engineers in London are shown in Figure 13.1, whereas the comparable changes for male and female engineers in Birmigham are shown in Figure 13.2. The changes on the IDEAL measure for male and female engineers in London are depicted in Figure 13.3, and similar changes for Birmingham engineers are detailed in Figure 13.4. Changes in MAN'S IDEAL WOMAN are shown in Figure 13.5 for London engineers and in Figure 13.6 for Birmingham engineers of both sexes.

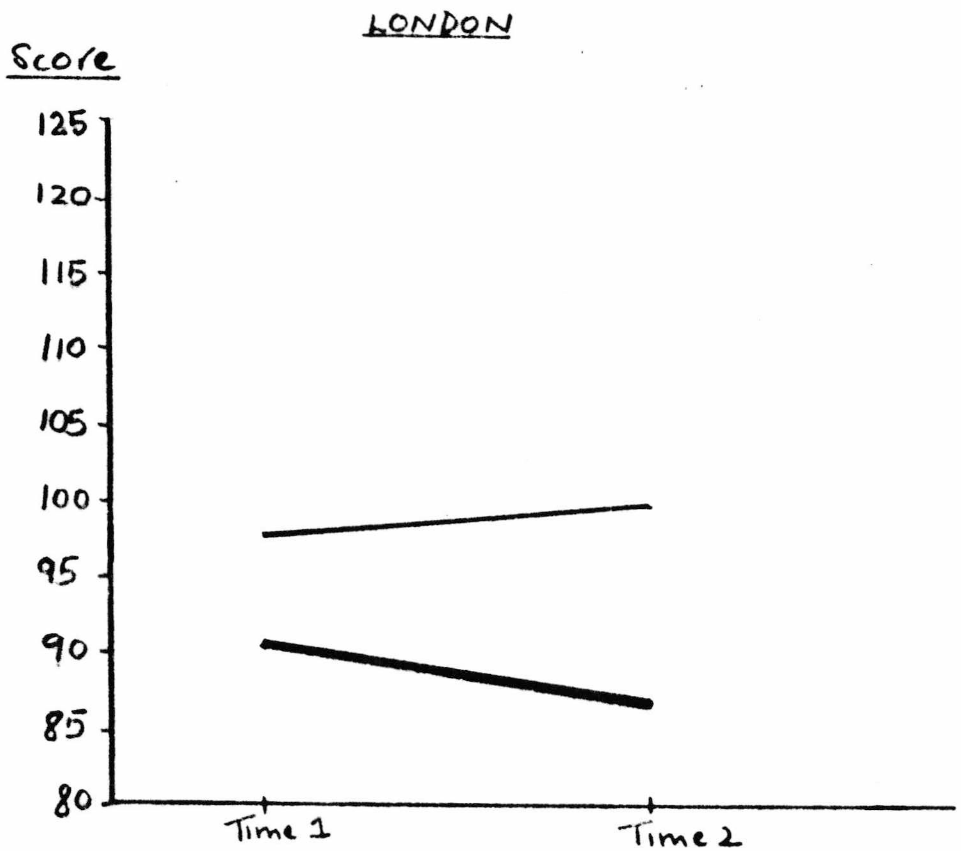
These hypotheses were evaluated using several statistical techniques. Two way analyses of variance on the change scores showed no significant main effects or interaction effects on scores for SELF, IDEAL and MAN'S IDEAL WOMAN. [1] These analyses are presented in Tables 13.4, 13.6 and 13.8. The associated means and change scores are detailed in Tables 13.5, 13.7 and 13.9.

The change suggested in Hypothesis 13.4 was further evaluated by comparing the absolute values of changes for male and female engineers on the SELF, IDEAL and MAN'S IDEAL WOMAN measures of the MAFERR.

Fig 13.1 CHANGES IN SELF SHOWN BY LONDON MALE ENGINEERS AND LONDON FEMALE ENGINEERS

Fig 13.2. CHANGES IN SELF SHOWN BY BIRMINGHAM MALE ENGINEERS AND BIRMINGHAM FEMALE ENGINEERS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.



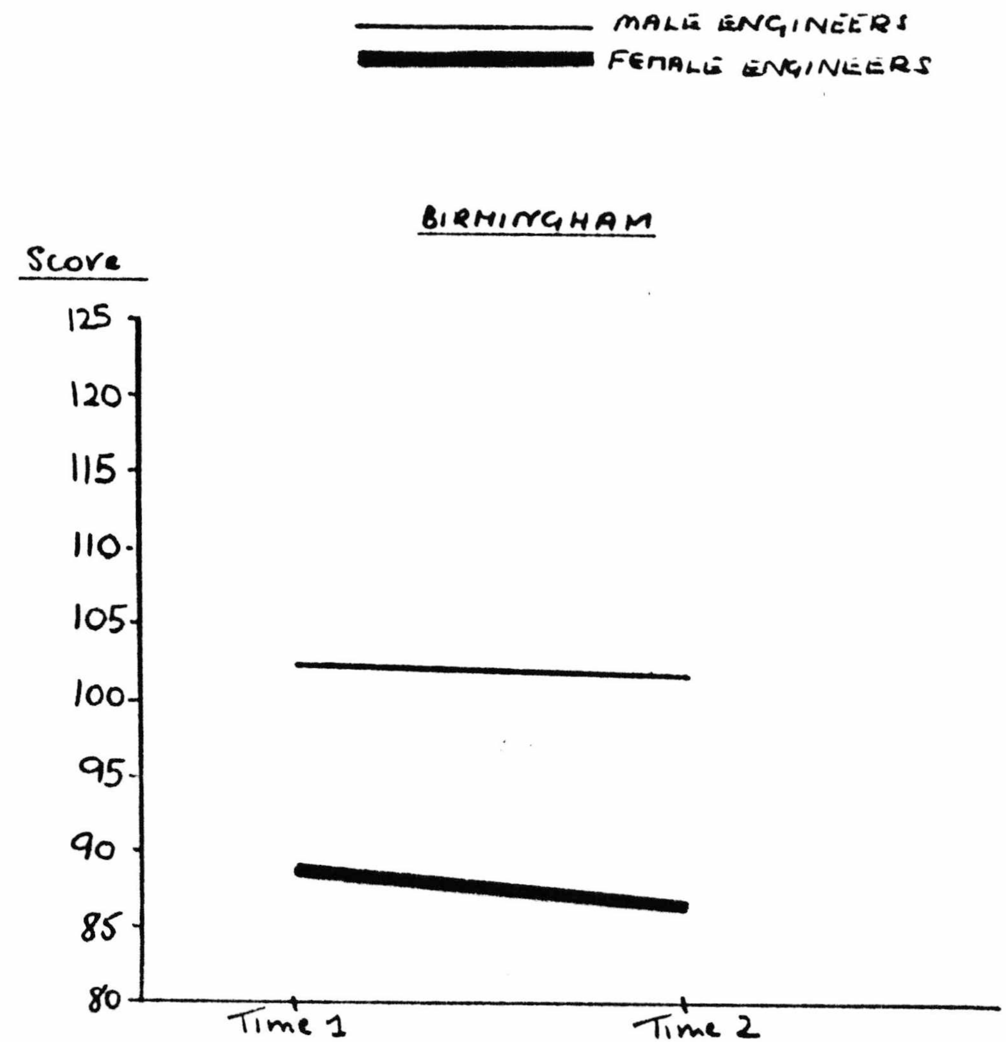
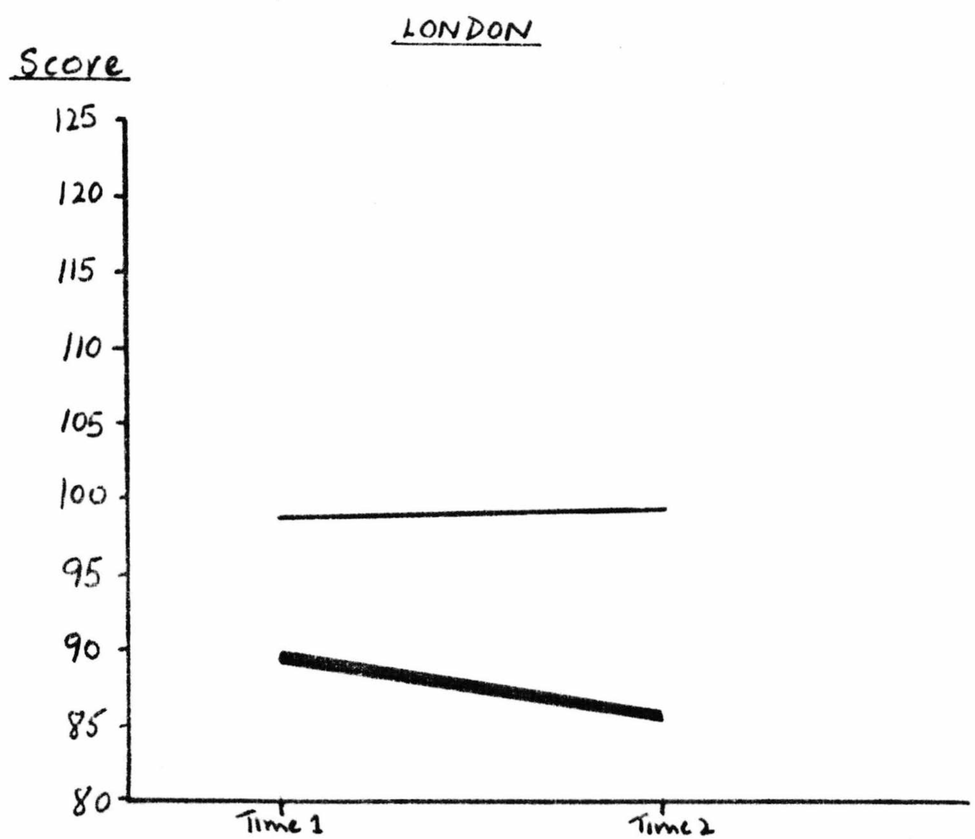


Fig. 13.3. CHANGES IN IDEAL SHOWN BY LONDON MALE ENGINEERS AND LONDON FEMALE ENGINEERS

Figure 13.4. CHANGES IN IDEAL SHOWN BY BIRMINGHAM MALE ENGINEERS AND BIRMINGHAM FEMALE ENGINEERS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.



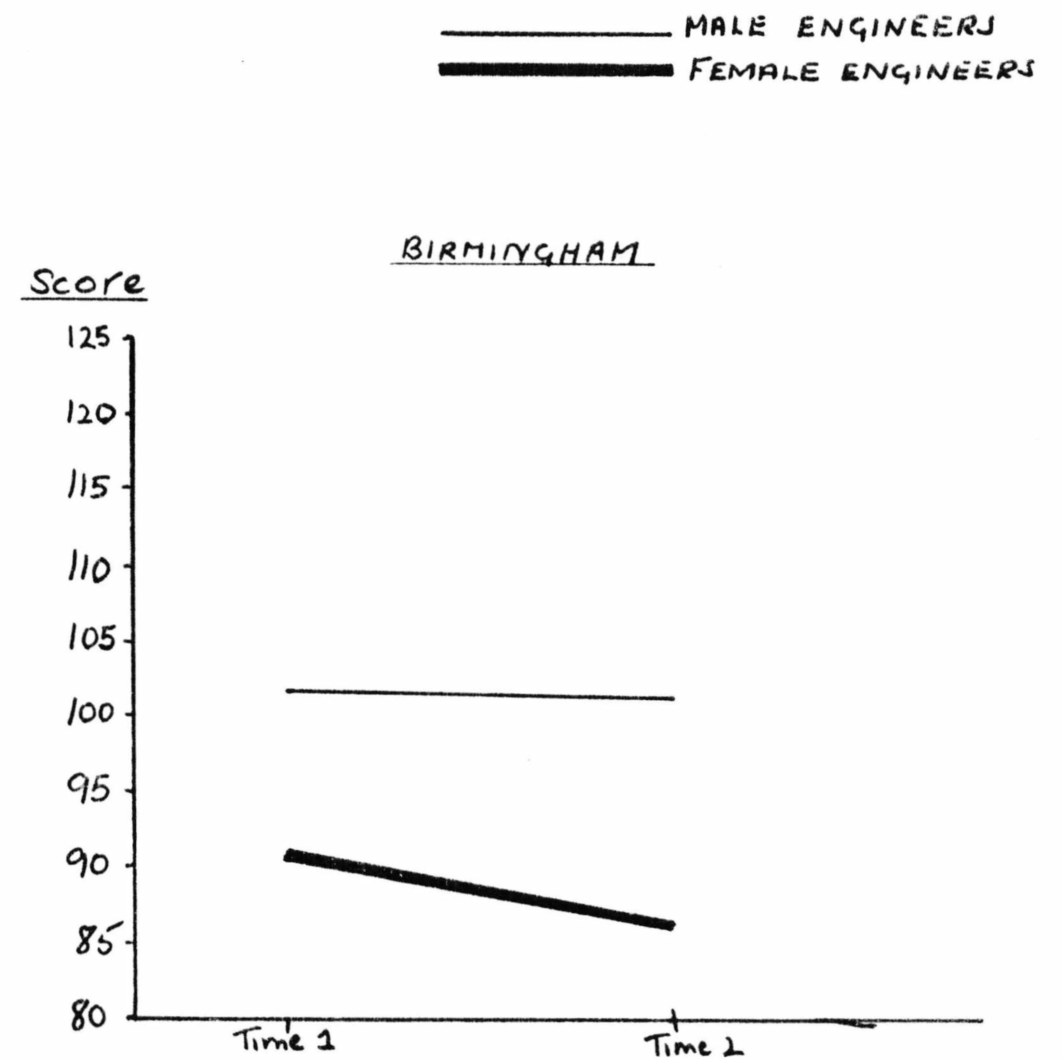
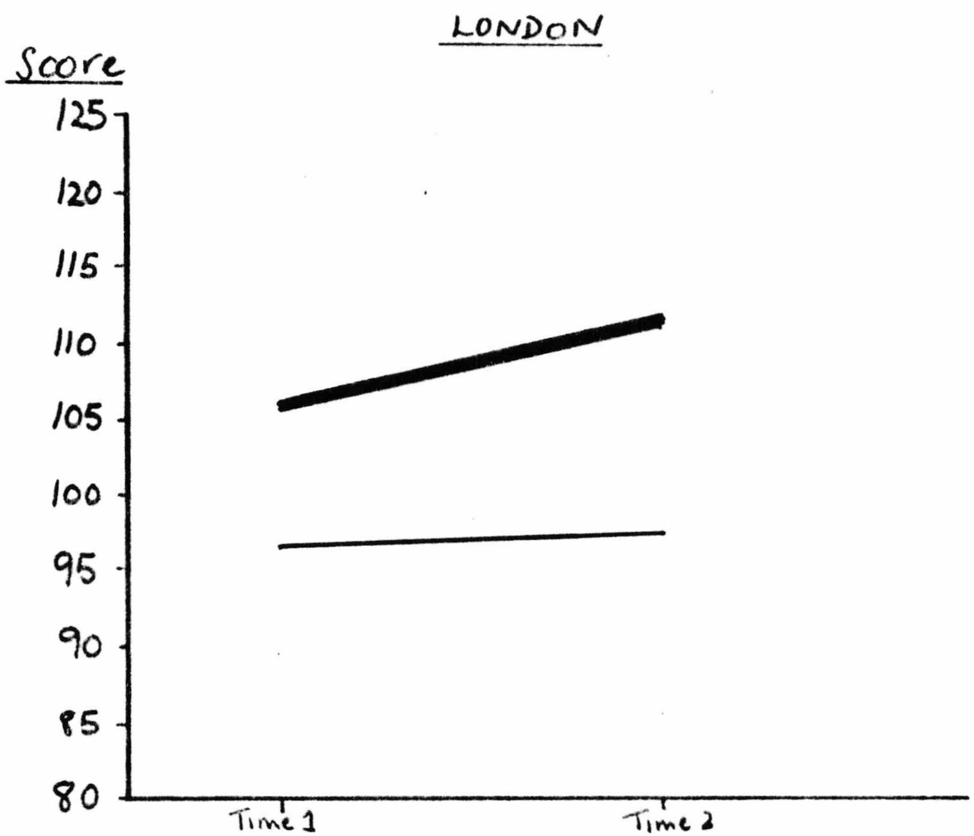


Figure 13.5. CHANGES IN MAN'S IDEAL WOMAN SHOWN BY LONDON MALE ENGINEERS AND LONDON FEMALE ENGINEERS

Figure 13.6. CHANGES IN MAN'S IDEAL WOMEN SHOWN BY BIRMINGHAM MALE ENGINEERS AND BIRMINGHAM FEMALE ENGINEERS

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.



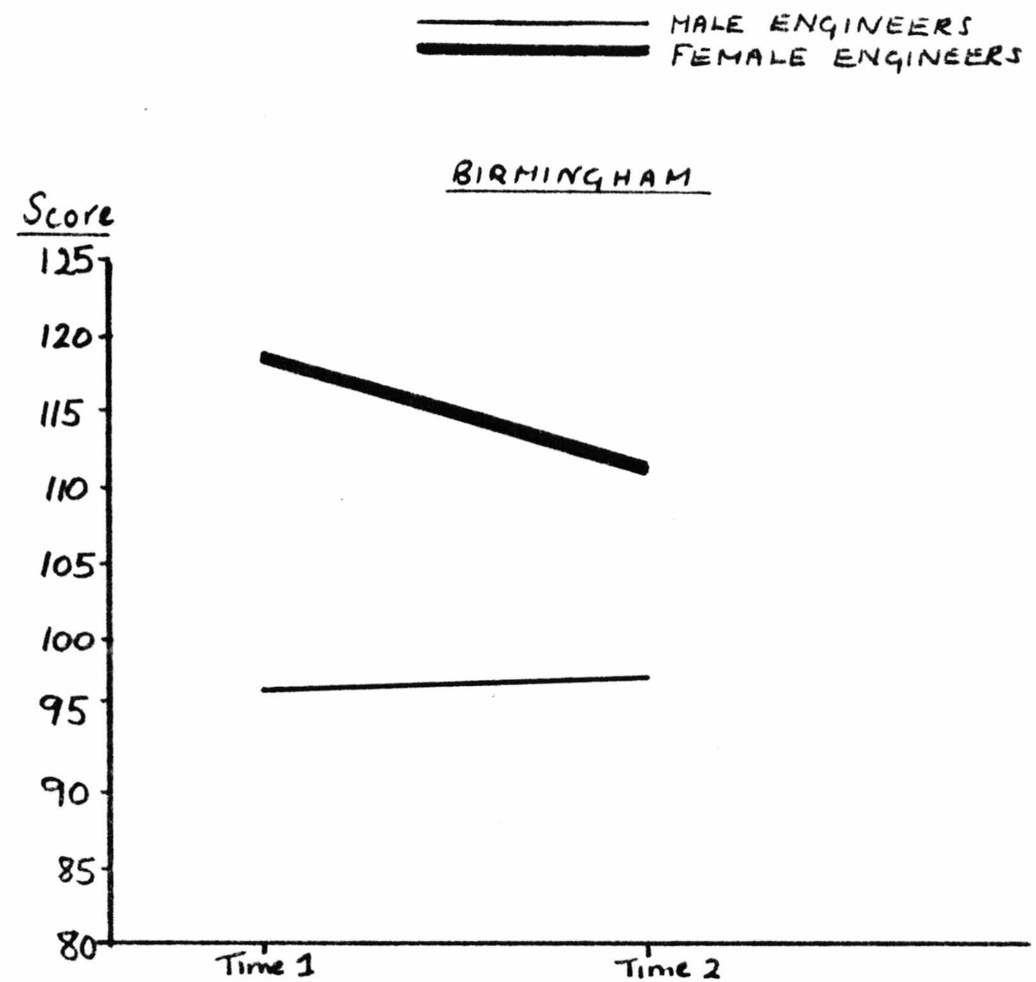


Figure 13.7. CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY LONDON FEMALE ENGINEERS AND COMPARED TO CHANGES IN MAN'S IDEAL WOMAN SHOWN BY LONDON MALE ENGINEERS.

Higher scores represent more traditional attitudes towards women's roles. Lower scores represent more profeminist attitudes.

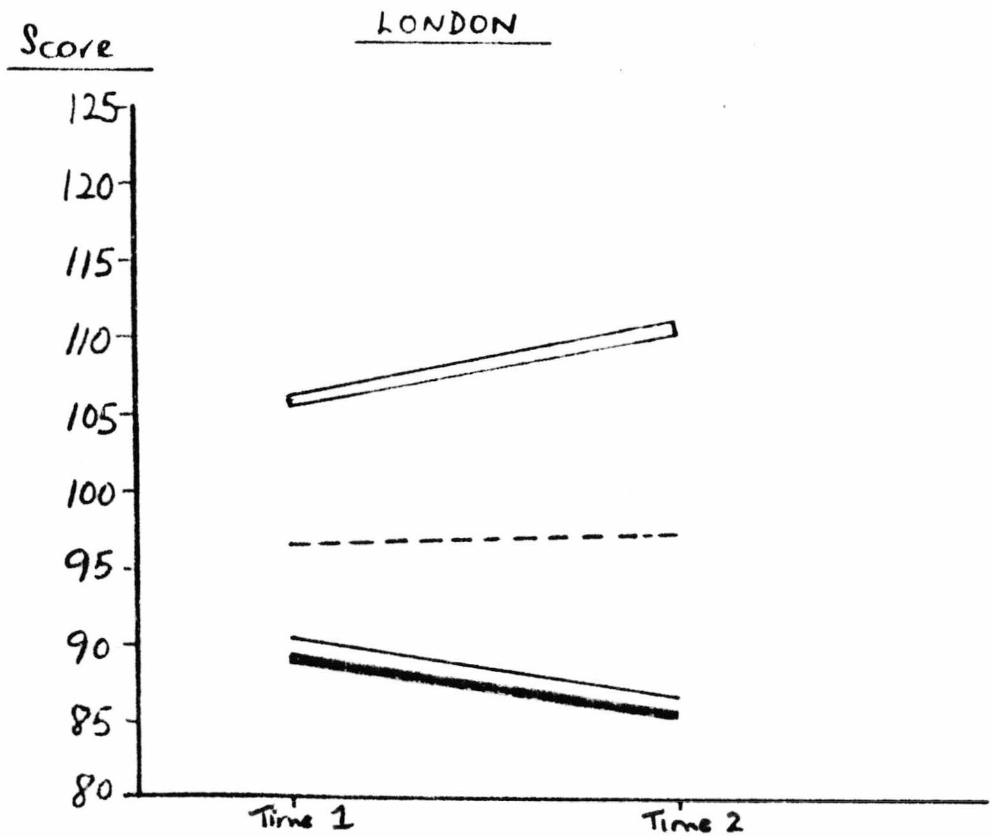
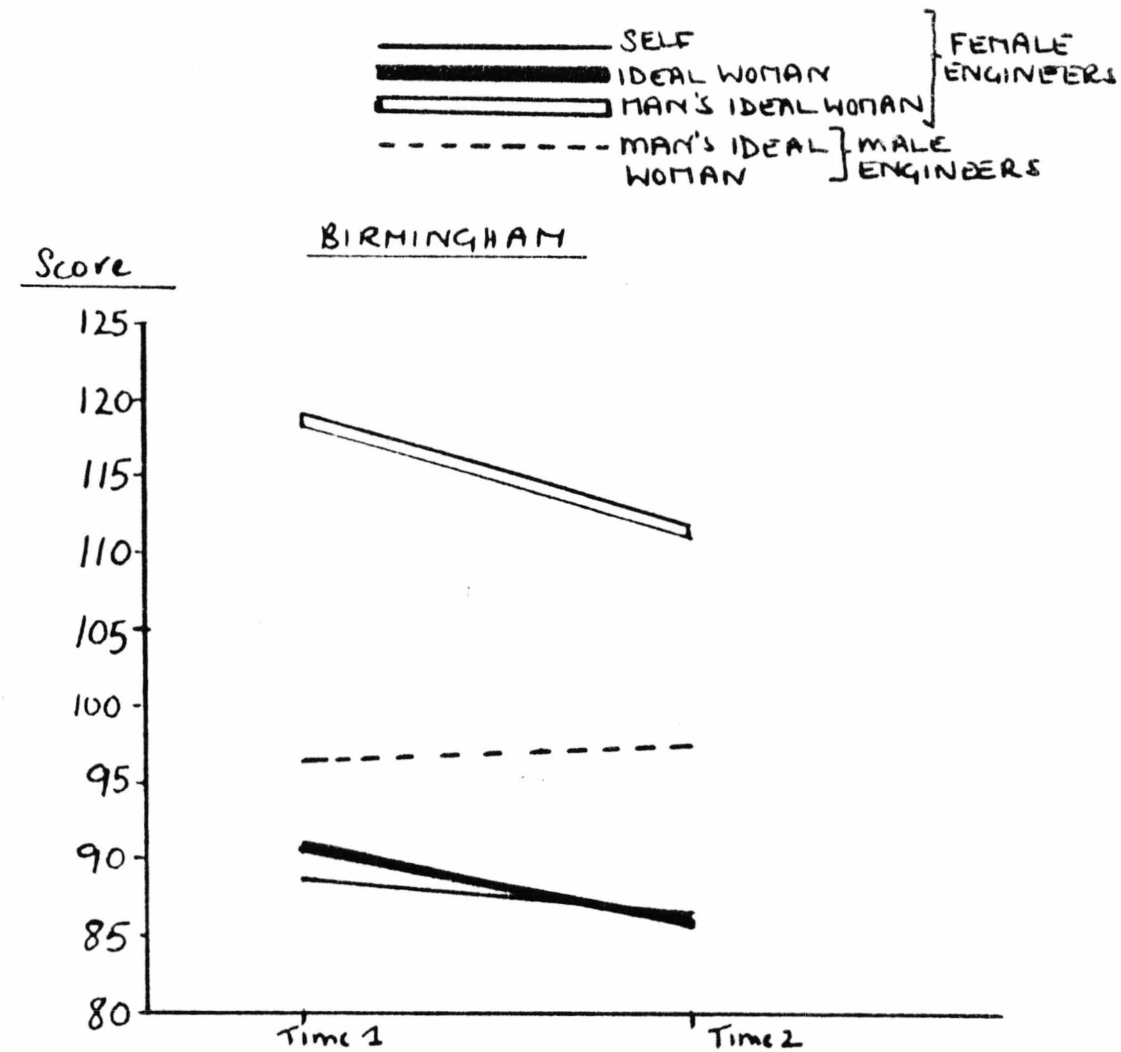


Figure 13.8. CHANGES IN SELF, IDEAL WOMAN AND MAN'S IDEAL WOMAN SHOWN BY BIRMINGHAM FEMALE ENGINEERS AND COMPARED TO CHANGES IN MAN'S IDEAL WOMAN SHOWN BY BIRMINGHAM MALE ENGINEERS



Comparisons were made within each region. In London there was no support for the hypothesis that female engineers would show more change; in fact, contrary to prediction, there was a tendency for male engineers to show a larger absolute change on the SELF measure than female engineers ($t = 1.61$, 33 df, $p < .12$). However, in Birmingham female engineers showed significantly larger changes than male engineers on SELF ($t = -2.31$, 35 df, $p < .03$) and MAN'S IDEAL WOMAN ($t = -3.21$, 35 df, $p < .003$). The difference was also in the expected direction for changes in IDEAL in Birmingham; the difference between men and women was significant at the .12 level for a two-tailed test ($t = -1.61$, 35 df). (These results are presented in Table 13.10.)

An examination of the net change scores shown for Male and Female Engineers in Tables 13.5, 13.7 and 13.9 suggests limited support for Hypothesis 13.5. For female engineers five of the six changes were in the expected direction. The only exception to this pattern was the non significant change shown by Birmingham Female Engineers who became somewhat more liberal in their view of Man's Ideal Woman. Four of the six changes made by male engineers were also according to prediction, with the men becoming slightly more traditional; however, in Birmingham male engineers showed small changes in the direction of becoming more liberal on self (mean = -0.35) and ideal self (mean = -0.45). Given that none of the changes observed was statistically significant, these findings can only be seen as suggestive.

Table 13.4

ANALYSIS OF VARIANCE ON SELF CHANGE SCORES: A Two Way Analysis of Variance Comparing Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif
GROUP (Male-Female)	1	222.33	222.33	2.35	0.13
PLACE (Lon-Birm)	1	11.7	11.7	0.12	NS
GROUP X PLACE	1	47.26	47.26	0.50	NS
Total	71	6713.24			

Table 13.5

SELF1, SELF2 AND SELF CHANGE FOR MALE AND FEMALE ENGINEERS: Comparison of Mean Scores for Self1, Self2 and Self Change (Self2 - Self1) on the MAFERR+

Group	N	Self1	Self2	Self Change
Lon Male Eng	19	97.90	99.84	1.95
Birm Male Eng	20	102.05	101.70	-0.45
Lon Female Eng	16	90.19	86.94	-3.25
Birm Female Eng	17	88.82	86.53	-2.30

+ Scores for Self1 and Self2 cannot be compared directly for men and women because the MAFERR uses separate forms for men and women. A higher score indicates a more traditional attitude.

Table 13.6

ANALYSIS OF VARIANCE ON IDEAL CHANGE SCORES: A Two Way Analysis of Variance Comparing Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif
GROUP (Male-Female)	1	281.7	281.7	1.71	.20
PLACE (Lon-Birm)	1	21.2	21.2	0.13	NS
GROUP X PLACE	1	0.6	0.6	0.00	NS
Residual	68	11235.1	165.2		
Total	71	11538.5			

Table 13.7

IDEAL1, IDEAL2 AND IDEAL CHANGE FOR MALE AND FEMALE ENGINEERS: Comparison of Mean Scores for Ideal1, Ideal2 and Ideal Change (Ideal 2 - Ideal1) on the MAFERR+

Group	N	Ideal1	Ideal2	Ideal Change
Lon Male Eng	19	98.63	99.11	0.47
Birm Male Eng	20	101.55	101.10	-0.45
Lon Female Eng	16	89.06	85.75	-3.31
Birm Female Eng	17	90.65	86.06	-4.59

+ Scores for Ideal1 and Ideal2 cannot be compared for men and women because the MAFERR uses separate forms for men and women. A higher score indicates a more traditional attitude.

Table 13.8

ANALYSIS OF VARIANCE FOR MAN'S IDEAL WOMAN CHANGE SCORES: A Two Way Analysis of Variance Comparing Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif
GROUP (Male-Female)	1	61.9	61.9	0.20	NS
PLACE (Lon-Birm)	1	614.9	614.9	1.98	0.16
GROUP X PLACE	1	712.8	712.8	2.29	0.13
Residual	68	21152.2	311.1		
Total	71	22541.8			

+ Female engineers described 'Man's Ideal Woman; male engineers described their 'Ideal Woman'.

Table 13.9

MAN'S IDEAL1, MAN'S IDEAL2 AND MAN'S IDEAL CHANGE FOR MALE AND FEMALE ENGINEERS: Comparison of Mean Scores for M. Ideal1, M. Ideal2 and M. Ideal Change (Ideal 2 - Ideal1) on the MAFERR+

Group	N	M.Ideal1	M.Ideal2	M.Ideal Change
Lon Male Eng	19	96.32	97.37	1.05
Birm Male Eng	20	96.55	97.55	1.00
Lon Female Eng	16	106.00	111.69	5.69
Birm Female Eng	17	118.65	111.65	-7.00

+ Men completed the scale for their Ideal Woman, whereas women completed the scale for Man's Ideal Woman. A higher score indicates a more traditional attitude.

When these changes were evaluated using paired t tests within group the only changes which approached significance were those made by female engineers on the SELF and IDEAL measures, and by London male engineers on the IDEAL measure. The female engineers became somewhat more profeminist in their attitudes towards women's roles, whereas the London male engineers became slightly more traditional in their view of the sex role attitudes of an 'ideal man'. (See Chapter Eleven and Appendix 13.4 for further information.)

Table 13.10

ABSOLUTE CHANGE FOR MALE AND FEMALE ENGINEERS: A Comparison of the Absolute Values of Change on Self, Ideal and Man's Ideal Woman+ for Male Engineers and Female Engineers in London and Birmingham

Group	S.Chnge	s.d.	I.Chnge	s.d.	M.I.Chnge	s.d.
London M. Eng! (N = 19)	10.47	7.54	9.32	6.88	8.32	6.05
London F. Eng (N = 16)	6.75	5.79	9.31	6.76	16.69	4.08
Birm M. Eng* (N = 20)	4.25	3.31	7.75	9.50	5.30	3.85
Birm F. Eng (N = 17)	8.18	6.70	12.82	9.65	15.24	13.24

+ Men completed the scale for their Ideal Woman, whereas women completed the scale for Man's Ideal Woman. A higher score indicates a more traditional attitude.

! The differences between male and female engineers in London approach significance on self change ($t = 1.61$, 33 df, $p <.12$, two-tailed test). However, the change is in the opposite direction from that which was predicted.

* The differences between male and female engineers in Birmingham are statistically significant for the absolute changes on Self ($t = -2.31$, 35 df, $p <.03$) and Man's Ideal Woman ($t = -3.21$, 35 df, $p <.003$) and the difference on Ideal approaches significance ($t = 1.61$, 35 df, $p <.12$) (All significance levels are for two-tailed tests.)

Discussion of Results

Summary of Findings

At the beginning of training, male engineers described an 'ideal woman' who had significantly more traditional sex role attitudes than the 'ideal woman' described by female engineers. However, female engineers perceived 'man's ideal woman' as having significantly more traditional attitudes towards sex roles than the 'ideal woman' described by male engineers. There was little evidence to suggest that male engineers in Birmingham had more traditional attitudes towards women's roles than male engineers in London.

The magnitude and pattern of changes shown was different in the two regions. In Birmingham female engineers showed larger changes on all measures of the MAFERR than male engineers. (Changes on SELF and MAN'S IDEAL WOMAN were statistically significant, whilst changes on IDEAL approached significance. See Chapter Eleven for further information.) However, in London there was tendency for male engineers to show a larger absolute change in their own attitudes towards sex roles than female engineers. There were no differences between male and female engineers in the magnitude of changes on IDEAL or MAN'S IDEAL WOMAN.

There was a tendency for female engineers in both regions to see themselves and their Ideal Woman as having more profeminist attitudes at Time 2 than Time 1. The mean scores of male engineers towards their own roles showed relatively little change. Changes in female engineers' perception of Man's Ideal Woman were not statistically significant in either region, and contrary to prediction, female engineers in Birmingham saw Man's Ideal Woman as having somewhat more liberal attitudes at Time 2 than Time 1.

<u>Interpretation of Results</u>

<u>Differences between Men and Women.</u> The differences observed between male and female engineers in their description of an 'ideal woman' are consistent with previous research on the MAFERR (Steinmann & Fox, 1974; Voss, 1980) and fit with the burgeoning literature suggesting that men have more traditional attitudes towards women's roles than women. The importance of this finding is underlined when we observe that female engineers' own attitudes are more profeminist than an 'ideal woman' described by male engineers. As shown in Figures 13.7 and 13.8 the distance between female engineers description of their own attitudes and male engineers' description of an 'ideal woman' increased over the first two years of training, suggesting a growing disparity between their views of the appropriate roles for women. [2] [3] The change shown is indicative not only of the increasingly profeminist attitudes of female engineers but also of the marginally more traditional view of an 'ideal woman' held by male engineers.

The fact that women see themselves and an 'ideal woman' as having more liberal attitudes than the ideal woman described by men has important practical implications, both in terms of women's achievement and in the dymanics of the relationship between men and women in the family. Since men tend to favour a traditional division of labour, they are likely to see their own roles as primarily work-related and those of women as being primarily in the home. Many men do not expect or feel it appropriate for women to achieve equality in the workplace. Even fewer are willing to share equal responsibility for household duties and child care, which would enable women to have an equal investment in their jobs or careers.

The importance of this difference between men's and women's attitudes should not be underestimated, particularly given men's greater control of economic resources. Although men are able to exercise power directly, their attitudes towards women are often expressed more subtly. In their various roles they convey their belief in differences in the basic capabilities of and the appropriate roles for women and men. They strongly differentiate between their male and female children (e.g., Block, 1973); they see women as less competent (Feldman-Summers & Kiesler, 1974; Rosen & Jerdee, 1978) less committed to work and more suited to domestic tasks (Rosen & Jerdee, 1978). The extent of these beliefs is seen clearly in Hunt's (1975) survey of the attitudes of British male managers towards women employees. She found that male managers believed women to be inferior employees on virtually every characteristic rated.

Women's awareness of men's more traditional attitudes is seen clearly in their description of 'Man's Ideal Woman'. As in many other studies using the MAFERR, female engineers in the present research saw men as preferring a woman who has extremely traditional attitudes towards women's roles. This discrepancy between women's perception of men's ideal woman and men's description of their 'ideal woman' has been the focus of most research using the MAFERR. As noted previously, there are several complementary interpretations of this frequently replicated finding. However, rather than trying to assess the dynamics of the situation, it appears more useful to consider its potential meaning.

Female engineers in the present research appeared to believe that men want women to maintain traditional roles. Although they may have overestimated the extent of men's conservatism, they saw men as disapproving and unsupportive of many aspects of equality between the sexes. This perception, whether accurate or not, may serve to limit their aspirations and achievements. However, Hawley's research (1971; 1972) suggests that female engineers may perceive men's attitudes differently from their friends and acquaintances who have chosen more traditionally feminine careers.

Hawley (1971, 1972) found that women studying for or employed in careers involving mathematics and science believed that 'significant' men in their lives felt that women should have the opportunity to compete with men in all areas of work. They felt that men had positive attitudes towards women working outside the home and that they saw such women as more interesting than women who worked primarily within the home. Women in these fields were also very concerned about maintaining good relationships with men and valued their support and approval. They believed that women should play feminine roles within the home and that they should be supportive of their husbands or partners.

Hawley (1972) suggests that women in scientific fields have a model of femininity which allows them a wide range of career choices without a violation of their sexual identity (p. 313). This interpretation fits well with Bem's (1981, 1983, 1985) gender schema theory. It suggests that female engineers do not see gender as a distinction which is relevant to many of their activities. In situations where they are aware of gender-labelling they may be less likely than their more traditional sisters to expect others to disapprove of their behaviour.

In comparing the present study with Hawley's research, it is important to note that Hawley asked her subjects to describe the attitudes of 'significant' men in their lives. It may be that some people make sharp distinctions between 'significant' figures in their lives and a more general conception of 'other people'. In this way women in scientific fields might differ from other women in feeling support and approval from 'significant' men in their lives and yet either being unaware of the attitudes of 'men in general' or seeing their attitudes as personally irrelevant. If this latter interpretation is correct, such women might see 'significant men' as having quite liberal attitudes towards sex roles and yet view the majority of men as having relatively traditional attitudes. [4]

Methodological Issues. There is some evidence to suggest that female and male engineers in the present sample approached the rating task quite differently when asked to describe Man's Ideal Woman. If the variances of the ratings given by female and male engineers for Man's Ideal Woman are compared, women's ratings tend to have a very large standard deviations whilst men's ratings have very small standard deviations (See Table 13.2). When the variances are compared using an F test, the differences are highly significant. (For further information, see Appendix 13.5.)

It would appear that there are large individual differences in the way female engineers describe 'Man's Ideal Woman' and that these differences may reflect uncertainty or confusion about men's opinions. Another possibility is that women in the sample have formed their impressions of men's attitudes based on contacts with men holding widely varying attitudes. [5] In contrast, male engineers in the present study appeared to have a highly uniform view of an ideal woman, suggesting that they were responding to a cultural stereotype rather than expressing their personal beliefs. This interpretation is compatible with Bowman and Auerbach's notion (1978) of the "well meaning liberal male" and fits with recent evidence suggesting that most subjects find it relatively easy to produce socially desirable responses on sex role attitude scales (Jean & Reynolds, 1984).

Another interpretation of the differences in the standard deviations of ratings by men and women is that the issue of women's roles is more salient for women than it is for men. This would appear to be particularly true for the female engineers in the present study, who were constantly asked to engineers in the present study, who were constantly asked to defend their choices, whereas male engineers were (presumably) much more rarely asked about their opinions on women's roles.

Regional Differences. Although the predicted differences in the attitudes of male engineers in London and Birmingham did not occur, there were important differences in the pattern of results in the two regions. In Birmingham female engineers showed significantly larger changes than male engineers on all measures. This result fits with the general interpretation that the female engineer is more likely to change as a result of her experience than her male counterpart. The fact that the difference between the sexes is significant on all measures in Birmingham fits with the strong masculine image of engineering in the Midlands. Most subjects worked in the automobile industry, which emphasises traditional masculine values and is likely to be seen as a particularly unsuitable environment for young women. This industry is in sharp contrast with the lighter electrical and electronics industry where most of the subjects in London worked.

This interpretation is bolstered by the finding that male subjects in Birmingham showed virtually no change on any of the MAFERR measures, suggesting that the experience of working as engineering trainees confirmed their views of their own sex roles and their perception of an ideal woman. However, they did not become more traditional in their attitudes.

An interesting and unexpected finding was in the changes in women's perception of Man's Ideal Woman in the two regions. As might have been anticipated, women in Birmingham initially saw men as having extremely traditional attitudes towards sex roles. This perception would fit with the expected regional differences in sex roles. As shown, in Figures 13.7 and 13.8, when they began training women in Birmingham perceived men's attitudes to be considerably farther away from their own than women in London. However, as training progressed both groups of women modified their views and at time 2, both groups had a similar view of men's perception of an ideal woman. It would appear that female engineers in Birmingham may have overestimated the conservatism of men's attitudes, whereas female engineers in London underestimated these attitudes.

In London male engineers tended to show a larger absolute change in their perception of their own sex roles than female engineers. This difference, which is in the opposite direction from predicted, is significant at the .11 level, using a two-tailed test. The change is also significantly larger than the change shown by male engineers in Birmingham ($t = 3.66$, 37 df, $p = .001$, two-tailed test), which may suggest that the experience of the London male engineers changed their conception of sex roles, although subjects did not respond to this experience in a uniform way.

<u>Changes Over Time.</u> The changes shown by female engineers were relatively small but were in the direction predicted, suggesting some support for the notion that the experience

of working as one of a few women in a male-dominated industry will lead to increased profeminist attitudes. As predicted, the overall attitudes of male engineers showed little change. There was little evidence that male engineers, as a group, modified their views of either their own roles or women's roles. This result is similar to Taylor's (1982) finding that male engineers who worked with female trainees did not change in their attitudes towards women's roles. However, it should be remembered that the present research did not provide an appropriate test of the contact hypothesis, since the amount of contact of the male engineers with female trainees is unknown.

The stability of men's attitudes observed suggests that attitudes towards sex roles are unlikely to change without specific impetus and personal involvement in the issues raised. This phenomenon is seen clearly in the male engineers' perception of an ideal woman, which appeared to represent a highly stereotyped view of women.

Footnotes

[1] Since Male Engineers and Female Engineers completed different forms of the MAFERR, it is not possible to make direct comparisons between their SELF and IDEAL scores. There are also difficulties in comparing net change and absolute change scores for these two measures. In the present study it was assumed that these change scores would be roughly comparable; however, this assumption can be challenged.

[2] In London differences between female engineers' self perception and male engineers' ideal woman yielded a t value of 1.65, 33 df at time 1 and increased to a t value of 3.23, 33 df at time 2. There was a similar pattern in Birmingham with the difference between the self described by women and the ideal described by men producing a t value of 12.57, 35 df at time 1 and a t value of 3.91, 35 df at time 2. With the exception of the initial difference in London, all differences are highly significant.)

[3] When the ideal described by women and the ideal woman described by men were compared using a t test between groups in London, the difference at time 1 was significant at the .09 for a two-tailed test (t = 1.73, 33 df); at time 2 the same comparison yielded a t of 2.78, which is significant at the .009 for a two-tailed test with 33 df. In Birmingham the identical between group comparisons were significant at the .06 level at time 1 (t = 1.92, 35 df) and at the .002 level at time 2 (t = 3.38, 35 df.)

[4] A similar phenomenon has been noted by Newton and Brocklesby (1982a) who found that several male supervisors of female engineering trainees differentiated between their trainees whom they saw very positively and 'women in general'. Although describing their own trainees in glowing terms, they continued to see most women as not suited to engineering.

[5] Another interpretation of the large standard deviation for women may be that they did not understand the instructions for the task.

SECTION THREE

CONCLUDING ISSUES

CHAPTER FOURTEEN

THEORETICAL SUMMARY AND PRACTICAL IMPLICATIONS OF THE RESEARCH

Introduction

These six experimental studies challenge the traditional image of the female engineer. They suggest that the problems for women in engineering have been exaggerated and that women who enter the business world may be subject to more discrimination than female engineers. Contrary to the cultural notion that 'engineering is bad for women', the field may offer them status and recognition which is denied them in traditionally feminine fields of employment. Female engineers do not appear to be extraordinary individuals; they share many similarities with women who enter traditionally feminine occupations. However, their concepts of gender appear to facilitate their entry into a field which is strongly dominated by men and masculine values.

The chapter consists of two parts: a theoretical summary and a discussion of the practical implications of the research. The first part of the chapter summarises the major findings from the experimental studies and relates them to some of the theoretical issues raised in previous chapters. Several gaps in current psychological theory and methodology are identified and suggestions for further research are offered.

The second part of the chapter looks at education and training and considers how engineering could be made more accessible and attractive to women. It argues for more flexibility in patterns of training and an increase in the proportion of women being trained as engineers at all levels. Although seeing individual psychological factors as important, it suggests that structural and institutional factors are crucial in accentuating or breaking down sex role stereotypes.

Theoretical Summary

Initial Differences between Groups

Figure 14.1 lists of the six experimental studies and the chapters in which they are described. Experimental Studies One, Two and Three demonstrated differences between subjects entering different occupations on a measure of sex role self concept, thus confirming the findings of previous research (e.g., Spence & Helmreich, 1978; Yanico & Hardin, 1981). Experimental Study Six documented differences in how female and male engineers viewed an 'ideal woman' and showed that female engineers believed that men had a more traditional view of an 'ideal woman' than the ideal actually portrayed by male engineers. This pattern of findings supported earlier research using the MAFERR (e.g., Steinmann & Fox, 1974). However, Experimental Studies Four and Five failed to show the expected differences between female groups in their sex role attitudes and ideals; only the Women in Business Studies were significantly different from other groups. There were no significant regional differences between comparable groups when they began their training.

Several lines of evidence suggest that the female engineers in the present research did see not their choice of job as being related to gender. This perspective enabled them to enter engineering and assisted them in coping with the doubts expressed over their suitability for the job. They appeared to have a tough-minded independent approach to their working lives and to see themselves as somewhat distant from their families (Newton & Brocklesby, 1982b). This description fits closely with Bachtold's (1976) description of the female scientist whose social aloofness and lack of sensitivity serve as highly adaptive qualities. It also supports other research suggesting that female engineers and other women entering non traditional occupations are less dependant on others' opinions and are comfortable in being regarded as 'different' (e.g., Breakwell, n.d.; Hennig & Jardim, 1976).

In contrast, women in traditionally feminine jobs and male engineers appeared to see gender as an essential feature of their jobs. As noted by Bem (1981) and more recently by Orlofsky et al. (1985), traditionally sex typed people tend to follow traditional role prescriptions. They are more likely to be sex typed and to categorise people and situations in stereotypical terms.

Further evidence confirming this pattern of findings comes from a pilot study using repertory grids by Newton and Brocklesby (1982b). They found that women employed as secretaries were significantly more likely than female engineers to use the construct male-female as an explanatory principle and to see males and females as having highly distinctive and separate qualities. [1]

Figure 14.1

Details of the Six Experimental Studies

STUDY	MEASURE	GROUPS
Study One (Chapter Six)	BSRI	London Female Engineers
		Birmingham Female Engineers
		London Female Friends
		Birmingham Female Friends
Study Two (Chapter Seven)	BSRI	London Female Engineers
		London Female Friends
		Women in Business Studies
		Women in Nursery Nursing
Study Three (Chapter Eight)	BSRI	London Female Engineers
		Birmingham Female Engineers
		London Male Engineers
		Birmingham Male Engineers
Study Four (Chapter Eleven)	MAFERR	London Female Engineers
		Birmingham Female Engineers
		London Female Friends
		Birmingham Female Friends

Figure 14.1 cont.

Study Five (Chapter Twelve)	MAFERR	London Female Engineers London Female Friends Women in Business Studies Women in Nursery Nursing
Study Six (Chapter Thirteen)	MAFERR	London Female Engineers Birmingham Female Engineers London Male Engineers Birmingham Male Engineers

<u>Changes over Time</u>

Changes were shown by the same two groups: Female Engineers and Women in Business Studies on both the BSRI and the MAFERR. Many of the changes shown by the Female Engineers and Women in Business Studies were similar, and it will be suggested below that these changes may be attibuted discrimination that they experienced at work. [2]

As previously noted, Female Engineers tended to be classified as androgynous when they began training. They saw themselves as resembling other female groups in feminine characteristics but as having significantly more masculine characteristics. They held somewhat more profeminist attitudes towards women's roles than women in other groups, but only the differences with the Women in Business Studies were statistically significant. Over the time observed, Female Engineers did not change in their assessments of their masculine characteristics, but they saw themselves as having more feminine characteristics than when they began training. These changes meant that they were less likely to be classified as androgynous and somewhat more likely to be classified as feminine sex typed. Female Engineers also became somewhat more profeminist in their sex role attitudes.

Like the Female Engineers, Women in Business Studies showed changes in sex role self concept and in sex role attitudes and ideals. However, the changes shown were greater in magnitude than those shown by Female Engineers. When they began training Women in Business Studies scored somewhat lower on self perceived masculinity than women in other traditional groups and significantly lower than Female Engineers. They were usually classified as feminine sex typed and were the most traditional of all female groups in their sex role attitudes. After two years of training they showed statistically significant increases in both masculinity and femininity and were somewhat more likely to be classified as androgynous than when they began training. Their sex role attitudes became significantly more profeminist, although they retained their relative position in having the most traditional attitudes in comparison with other female groups.

Theoretical Explanations

Two basic paradigms for change in gender concepts have been proposed: 'occupational socialisation' and the 'agitation' hypothesis. The present research offered little support for the occupational socialisation hypothesis. This theory predicted that women and men in engineering would become more masculine in their sex role self concepts and that Nursery Nurses would become more feminine. Male Engineers and Nursery Nurses were also expected to hold more traditional sex role attitudes and ideals than when they began training. The only trends which offered support for this general line of reasoning were the divergence in sex role self concepts and sex role attitudes shown by Female Engineers and Male Engineers in Birmingham.

The 'agitation' hypothesis, advanced in Chapter Five and re-framed in Chapters Nine and Ten, suggested that female engineers would show greater changes in their gender concepts than subjects in any other group. This prediction was based on the author's perception of the working conditions faced by female engineering trainees. She assumed that women in this group would experience more discrimination than subjects in any other group and that they would frequently be in a position of defending their career choice. Both processes were seen as making gender a highly salient issue for women in this group and leading them to re-evalute their self perceived femininity and masculinity and their sex role attitudes and ideals. However, a more careful consideration of recent theory and the results of the present research suggests several flaws in this basic analysis. The theoretical account suggested below offers an explanation for the results obtained and provides some clear directions for future research.

An Alternative Explanation. It was originally predicted that the Women in Business Studies would show little change in their gender concepts. However, a more detailed analysis of their position suggests that they may have perceived more discrimination than the Female Engineers and have been more psychologically predisposed to re-evaluate their notions of gender.

Both Female Engineers and Women in Business Studies were in situations where they could easily compare their own training with that of their male counterparts. The Women in Business Studies were taught in mixed groups for all subjects except secretarial studies, whereas Female Engineers were usually trained in parallel single sex groups with male colleagues on the same sites. During their time at college and in their work placements women in both groups were usually taught or supervised by men. They often felt that their training was not as good as that received by their male counterparts and that their future careers were not being taken as seriously.

Women in Business Studies were faced with clear evidence of discrimination when they finished their course. They usually entered secretarial positions, whereas males on the same course usually took jobs in sales or became management trainees. In contrast, female engineering trainees usually entered employment at the same level as their male counterparts. Interview data on the work experience of women in both groups suggests that they felt that their male supervisors under-rated their abilities and tended to see them in stereotypical terms. Women who had followed the Business Studies course were particularly likely to be disillusioned and were significantly less likely than the women in engineering to say that they would make the same career choice again (Newton & Brocklesby, 1982a). [3]

Following the line of argument suggested by gender schema theory (e.g., Bem, 1981; 1983; 1985), Women in Business Studies can be seen as more likely to modify their gender concepts when faced with discrimination at work. Like other women entering traditional occupations, they saw their work as closely linked with their gender identity. They were more sensitive to social situations and saw gender as a more important aspect of their identity. Conversely Female

Engineers appeared well-defended against change. The same perspective which enabled them to enter engineering and view it as gender-neutral may be seen as preserving their basic sense of gender identity. [4]

The only finding from the present research which does not fit with this interpretation is the statistically significant increase in self-perceived femininity shown by Female Engineers. A similar result has also been reported in a complementary study by Newton and Brocklesby (1982b) in which female engineers described themselves as wishing to become more feminine. One possible interpretation of this result is that the increase in femininity refers to social situations and not to how Female Engineers see themselves at work. Recent studies by Lemkau (1983) and Signorella (1984) lend weight to this interpretation and suggest that individuals may vary in the extent to which their self concept is consistent in a variety of situations.

Lemkau (1983) looked at women in traditional and non traditional occupations using three different sets of instructions for the BSRI. When she compared subjects' descriptions of themselves at work with their descriptions of themselves in social situations she found that subjects in non traditional jobs saw the two situations as much more discrepant. They tended to see themselves as much more feminine in social situations than when at work.
Similar findings have been reported by Signorella (1984), who has emphasised the importance of assessing the degree to which individuals see gender as personally important.

According to Signorella (1984), individuals who see gender as personally important will be more consistent in their gender-related attitudes and behaviour. She found that women and men who were classified as 'less involved' in gender identity were similar to each other and had a higher preference for masculine research topics than 'traditional' women who tended to be classified as 'highly involved' in gender identity. Signorella (1984) also reported that very few non traditional individals were 'highly involved' in gender identity, thus providing support for the interpretation of the experimental studies of female engineers reported in this thesis. [6]

Further research is needed to test these theoretical formulations. However, there are a number of methodological considerations which should also be a feature of further research in this field. These issues are outlined briefly below.

Methodological Issues

The results of the experimental studies suggest that measures of sex role self concept and sex role attitudes are useful in differentiating between subjects entering various occupations late adolescence. However, both measures used in the present research suffer from problems in their conceptualisation and administration.

The BSRI. The BSRI provided a useful instrument in the present research and had the advantage of being in wide usage, so that results from the experimental studies could be compared with other research. However, the problems associated with scoring this measure and other similarly constructed measures persist and do not appear to be easily resolved (e.g., Handal & Salit, 1985). On a theoretical level there remain fundamental questions about what the BSRI and other androgyny instruments are measuring (Worell, 1978; Lenney, 1979a; 1979b; Wilson & Cook, 1984) and how sex role concept relates to other aspects of gender (e.g., Bem, 1985; Spence, 1985).

The present research does not resolve the question of the stability of the sex role self concept. The changes shown by the Women in Business Studies suggest that the sex role self concept may be modified and support the cross sectional studies of Abrahams et al. (1978) and Hyde and Phillis (1979) who found differences in androgyny classification associated with age and life roles. However, further research is needed to clarify the mechanisms by which the sex role self concepts is likely to change.

The MAFERR. There were several difficulties in using the MAFERR in the experimental studies. The items on the scale had a strong American bias and appeared to reflect concerns more prominent in the 1950's than in the present day. There were also difficulties in subjects' understanding the concept of an 'ideal woman' and in their being asked to complete the same scale with three different sets of instructions. Subjects' stereotypical responses to the 'ideal woman' and 'man's ideal woman' scales also raised questions about the utility of measuring sex role ideals, thus echoing similar questions about the measurement of the 'ideal self' in personality research (e.g., Wylie, 1979).

However, in spite of these serious reservations about the individual scales of the MAFERR, research using this instrument has shown the importance of assessing how each sex perceives the other sex's attitudes towards sex roles. There is a need to design more appropriate measures to assess how women and men view each other and to investigate the apparent discrepancies between their expressed attitudes and the perceptions of the opposite sex.

A promising approach to assessing how women perceive men lies in distinguishing between 'men in general' and 'significant men', as suggested by the research of Hawley (1971, 1972) and Tangri (1972). As described in Chapters One and Ten, Hawley found that women in non traditional occupations see 'significant men' quite differently from 'men in general', whereas women in traditional occupations do not make a similar distinction. However, this line of research needs to be extended. Perhaps some women make parallel distinctions between 'significant women' and 'women in general'. There is also a need to ask similar questions about how men view the attitudes of women and give more attention to how men define their own gender roles.

The experimental studies described in this thesis clearly indicate the importance of studying gender concepts in women and men entering a variety of traditional and non traditional occupations. They call into question the broad distinction between 'traditional' and 'non traditional' occupations and suggest that there is a need to identify similarities as well as differences between individuals in various occupations. This issue is further explored in the next section of the chapter, which discusses some of the practical implications of the research and recent measures to increase the number of women in engineering.

Practical Implications of the Research

Female engineers in the present research were participants in the EITB's Girl Scholarship Scheme. This was one of the first initiatives designed to increase the proportion of women in the engineering industry. The Scholarship Scheme clearly demonstrated that young women could be interested in careers in engineering and that they were successful as technicians. A recent follow-up study found that the majority of these women were currently working as engineers and that they continued to see it as a rewarding career (Peacock, 1986). However, the number of women engineers remains low, and the proportion of women employed as technicians and technologists has shown little change from the figures for 1976 when the EITB began a series of special programmes to increase the proportion of women in engineering.

In the past ten years there has been a serious decline in some sections of the engineering industry. Yet there has been a corresponding growth in electronics and the aspects of the industry associated with 'new technology'. The current government has placed a high priority on attracting more students for courses in science and technolgy, and employers complain of the shortage of graduates in engineering and computer science. However, in spite of extensive publicity and goverment incentives, many polytechnic and university departments are unable to recruit students with appropriate qualifications for their diploma and degree courses (THES, 1985). The situation is little different at technician level, with more pupils choosing to stay on at school to gain further qualifications.

It is in this context that there is continuing interest in recruiting more women as engineers. Since 1979 the EITB has sponsored a series of 'Insight' programmes, aimed at providing sixth form girls with information about careers in engineering. In 1984 the Engineering Council and Equal Opportunities Commission sponsored W.I.S.E. (Women into Science and Engineering), a year-long campaign designed to publicise opportunities for women in science and technology. Within the last five years there have been an increasing number of training and access courses for mature women students (25+) funded by the European Economic Community (EEC) and various local agencies. The majority of these courses offer academic preparation and practical experience in computing and electronics.

The remaining sections of the chapter review various measures for increasing the numbers of women in engineering at technician and at graduate level and discusses the most effective means for promoting change. The first section considers some of the difficulties of introducing changes in schools. The next section deals with positive changes in industry, whilst the final section evaluates the potential for and likelihood of change.

Why Not Schools

As observed by Blackstone (1985), one of the impressive achievements of the revival of feminism in the late 1960's was to place the question of girls' achievement on the agenda and to ask why girls failed to achieve their potential. This concern stimulated a flurry of research on gender and schooling and also produced a series of practical measures designed to encourage both sexes, but especially girls, to consider non traditional careers. Research in this area was supported by a large number of funding agencies including the Social Science Research Council, the Equal Opportunities Commission, the Schools Council and the Manpower Services Commission.

The findings from these research efforts are not easily summarised. However, many authors have suggested that the 'problem of the schools' is more serious and more entrenched than originally imagined. They contend that schools are run by men, that they emphasise masculine values and that they are designed primarily for the psychological characteristics of male pupils (e.g., Spender, 1980; 1982; Stanworth, 1983; Mahony, 1985). Teachers of both sexes have traditional attitudes towards sex roles, and only a bare majority of them believe in the principle of equal opportunity. Many fewer teachers endorse the notion of non traditional careers for either sex, and teachers of science and craft subjects are particularly likely to believe that differences between girls and boys are both natural and appropriate (Pratt, 1985).

Various institutional practices, such as the system for option choice, appear to interact with developmental characteristics of pupils, thus making change extremely difficult. Recent findings from the Girls into Science and Technology project (GIST) point up the difficulty of persuading pupils to select non traditional options. After an intensive three year programme, pupils held more positive attitudes towards women in science; however, there was little change in pupil's behaviour when choosing subjects for examination (Whyte, 1985). These results reinforce basic research in developmental psychology which shows that at the beginning of puberty both sexes are characterised by rigid gender concepts and are subject to strong social pressures for sex role conformity (Ullian, 1976).

Whilst education must still be seen as a priority, it is difficult to imagine that changes in school will either be rapid or easily accomplished. Therefore, unlike the author's previous recommendations (Newton, 1981a; Newton & Brocklesby, 1982a; Newton, 1984), the proposals suggested below are concerned with changes in institutions of higher education and in industry. It is not the author's belief that these organisations differ dramatically from schools in their institutional biases and basic attitudes towards the sexes. However, it will be argued here that changes in these organisations are likely to have a more direct impact on the representation of women in engineering than changes in schools.

Women's perception that engineering has a strong bias against women is accurate. To change this perception, girls and women need positive evidence that traditional attitudes are changing and that more women are finding engineering a satisfying career. The positive mesures outlined below offer a direct approach to increasing the numbers of women in engineering. The changes involve greater flexibility in entry requirements, a broader curriculum in training and education and the development of formal policies for equal opportunities. Some of the issues are of specific interest to women, but many of the suggestions would also benefit men. The proposals for change are discussed under three headings although many of the issues are inter-related.

<u>Positive Measures</u>

<u>Entry Qualifications</u>. The success of the female engineers in the present research sample calls into question the conventional criteria for selecting technicians. These women entered engineering with qualifications which did not meet the EITB's suggested standard of three or four O levels, including mathematics, physics and English. They were less likely than their male counterparts to have studied physics and technical subjects and even when they had studied these subjects, they often achieved relatively poor examinations results. However, in spite of these apparent handicaps they achieved better qualifications in engineering than a simlar cohort of male trainees (EITB, 1983b). These findings are not confined to this sample of female engineers but have recently been confirmed in a larger sample of women trained under a subsequent EITB initiative (Peacock, 1986).

The results of these studies suggest that examination results in mathematics and science may be less predictive for females than males. Furthermore, since many women do not study science subjects in school their academic potential is largely unknown. The initial evaluations of access courses for mature students suggest that highly motivated women can learn the mathematics and science necesary for engineering at technician level in a relatively short period of time (Tizard, 1984). The author's own experience in running an access course for mature women students also supports these observations. [7]

Based on these results there is a sound case for more flexible entry requirments for engineering. Such entry requirements would place less emphasis on criteria such as age and formal academic qualifications and relatively more emphasis on motivational factors and relevant experience.

Patterns of Training and Education. In a similar way, it may be argued that broadening the content training in engineering would attract a different pool of entrants to engineering. By definition, these people would not fit the typical mould of the dedicated male engineer who has had a childhood interest in 'how things work'. Entrants might include women and men with backgrounds in the arts, humanities and social sciences. These people would bring a different perspective to engineering. They would be likely to have better communication and social skills-- skills which are seen as necessary but which are often lacking in engineers who undergo current patterns of selection and training (HMSO, 1980; Beuret & Webb, 1983).

Similar suggestions come from Alex McKay, Secretary of the Institution of Mechanical Engineers. McKay (1983) contends that 'humanising the technological aspects of engineering' would improve the image of the profession and recommends relaxing the entry requirements for engineering courses to allow a wider range of students to enter. The basic notion of broadening engineering training and education also fits with the major recommendations of the Finniston Report (HMSO, 1980) and research funded by the DES and CNAA on the goals of engineering education (Beuret & Webb, 1983). (However, it is unlikely that either of these working parties would endorse the notion of more flexible entry requiremernts.)

Equal Opportunities Policies. Both prospective and practicing female engineers see discrimination as a serious problem in their working lives (Bryant, 1984; Davidson, 1984; Weinreich-Haste & Newton, 1983). Although the Sex Discrimination Act and Equal Pay Act outlaw some forms of discrimination, the scope of the legislation is limited and enforcement is difficult (Atkins & Hoggett, 1984). In the United States most organisations are required by law to keep records of the numbers of female and male employees and the ethnic group of employees at all levels of the organisation (Atkins & Hoggett, 1984). They are further required to demonstrate a 'positive action' policy which encourages women and members of ethnic minorities to apply for higher positions within the organisation. As a result of these legal requirements, many companies reward managers who recognise and promote talented women. Such programmes can only be successful when they are carefully implemented, but they can provide managers with a positive incentive to give women more training and responsibility than they might otherwise receive.

Although positive discrimination is not legal under the Sex Discrimination Act, many of the measures suggested above could be carried out in Britain. For example, several local authorities and colleges have conducted equal opportunity audits which provide evidence of the positions that women and members of ethnic minorities hold within the organisation. This data can provide the basis for policies to identify capable employees and ensure that they receive appropriate training and promotion opportunities. In carrying out equal opportunity audits, employers are encouraged to review their personnel policies and to provide their employees (and potential employees) with written information on the procedures and criteria for selection and promotion and details of various benefits and entitlements, including maternity and parental leave. Examples of model policies and suggested procedures are available from the Equal Opportunities Commission (1978), from the Institute of Personnel Management (1978) and from the Runnymede Trust (Pearn, 1980).

An example of good practice is provided by British Petroleum (BP), who invited a social psychologist to assist in carrying out an equal opportunities audit and make recommendations for a positive action programme for women in the company. As a result of this exercise, BP has instituted a series of positive measures for selecting and retaining female engineers and managers. These measures include a formal equal opportunities statement and policy; the redesigning of their graduate recruitment literature to include information about professional careers for women; training seminars concerning equal opportunities issues; designation of a staff member in the Personnel Department to have particular responsibility for equal opportunity policy; regular statistical reports on numbers and levels of women and ethnic minority employees and a booklet explaining equal opportunity policy and giving guidance for staff carrying out selection interviews or making selection decisions (Davidson, 1984).

Potential for Change

The Scholarship Scheme described in this thesis is only one of several programmes which have demonstrated that women can become engineers. Women in the present research enjoyed their work and most of them would make the same career choice again (Newton & Brocklesby, 1982a). However, they found their position stressful and they often felt under the extra 'performance pressures' which are experienced by 'token women' in a male-dominated industry (Kanter, 1977b; Newton & Brocklesby, 1982a; Davidson, 1985).

Unfortunately many male engineers remain reluctant to accept women and are suspicious of special programmes which will treat women differently from men (Davidson, 1984). Robin's (1969) contention that the 'problem' for women in engineering was the incompatibility between females and males in the field continues to be valid. As argued in Chapter Two, the typical male engineer is conservative in attitudes and values and is slow to accept change. This conservatism is reflected in his highly traditional view of women's roles. He sees engineering as a masculine world and is likely to regard the introduction of women as a personal threat.

Although accurate, this analysis ignores the structural and institutional barriers to women's achievement that operate in all sectors of society. It may be argued that engineering is not qualitatively worse for women than other fields of employment; it is merely unusual in the extent to which its prejudice against women is so openly expressed. Paradoxically this factor may be an advantage, since blatant discrimination is often more easily confronted than more subtle and covert practices which operate against women.

The present research has been concerned with individual differences in how women and men in different occupations view gender and how these concepts are modified. However, the greatest need for change in views of gender lies at an organisational and structural level, not at an individual level. For real change to occur, women must occupy a much higher proportion of responsible and respected positions throughout society. It is unlikely that the situation for women in engineering will be improved until women are recruited in much larger numbers, so that women engineers are no longer unusual. These changes are essential for breaking down sex role stereotypes in the workplace and for encouraging more women to consider engineering as a career.

Women are often blamed for their lack of ambition and their failure to achieve. But perhaps they are showing good judgment in questioning the male dominated values and ethos of engineering.

Footnotes

[1] In this comparison the grids of three secretaries were compared with three female engineers. On the grids of two secretaries a straight line could be drawn dividing male and female elements in the grid. The grid of the third secretary nearly conformed to the same pattern except that the element denoting a 'feminist woman' was on the male side of the grid. In contrast, none of the grids of female engineers showed a clear organisation of male and female elements.

[2] Although these changes may be attributed to other factors in their lives, the lack of change shown by women in other groups argues against this interpretation.

Tesch (1984) has shown that sex role self concept is linked with intimacy status; in her study females involved in long term intimate relationships were more likely to be feminine sex typed, whereas those in pre-intimate or psuedo-intimate relationships were usually classified as androgynous. However, there is no evidence from the present research to suggest that Female Engineers and Women in Business Studies were less likely to be involved in long term intimate relationships than Female Friends or Nursery Nurses. Ideally future research should consider intimacy status as a potential variable.

[3] Course tutors for the Business Studies course believed that the secretarial option was a 'good insurance policy' for women. However, the curriculum was changed in 1979, so that this option was no longer available to students on this course.

[4] Bem (1985) implies that the gender schema is relatively stable. The speculations about susceptibility to change are solely those of the author.

[5] The importance of this dimension has also been noted by Rebecc Hefner and Oleshansky (1976) and Garnets and Pleck (1979).

[6] Research by Newton and Brocklesby (1982b) supports Lemkau's (1983) and Signorella's (1984) findings. In the grid study discussed above, they asked female engineers and female secretaries to describe themselves at home, at work and in social situations with friends. They found that secretaries saw themselves as relatively similar in all three situations, whereas female engineers saw themselves as having distinctly different characteristics in each of the situations.

[7] The author is Course Leader for the Technology Foundation Course for Women at Huddersfield Polytechnic. This is a one year access course for women with few if any previous educational qualifications in mathematics and science. Approximately half of the women attending the course in 1985-86 have reached A level standard in selected topics in mathematics and physics and have been offered places on diploma and degree courses in science and engineering.

APPENDICES

APPENDICES FOR CHAPTER THREE:

THE MEASURES USED IN THE RESEARCH

(Appendices 3.1 - 3.2)

APPENDIX 3.1

THE BEM SEX ROLE INVENTORY

Name JULIA POTTER
(Please print)

Company or Training Site ______

Place: Birmingham / Croydon / Kingston.

On the following page, you will be shown a large number of personality characteristics. We would like you to use those characteristics in order to describe yourself. That is, we would like you to indicate, on a scale from 1 to 7, how true of you these various characteristics are. Please do not leave any characteristic unmarked.

Example: sly

Mark a 1 if it is NEVER OR ALMOST NEVER TRUE that you are sly.

Mark a 2 if it is USUALLY NOT TRUE that you are sly.

Mark a 3 if it is SOMETIMES BUT INFREQUENTLY TRUE that you are sly.

Mark a 4 if it is OCCASIONALLY TRUE that you are sly.

Mark a 5 if it is OFTEN TRUE that you are sly.

Mark a 6 if it is USUALLY TRUE that you are sly.

Mark a 7 if it is ALWAYS OR ALMOST ALWAYS TRUE that you are sly.

Thus, if you feel it is sometimes but infrequently true that you are "sly", never or almost never true that you are "malicious", always or almost always true that you are "irresponsible", and often true that you are "carefree", then you would rate these characteristics as follows:

Sly	3	Irresponsible	7
Malicious	1	Carefree	5

BSRI

Brim Control 1978 1st 164 370

1	2	3	4	5	6	7
NEVER OR ALMOST NEVER TRUE	USUALLY NOT TRUE	SOMETIMES BUT INFREQUENTLY TRUE	OCCASIONALLY TRUE	OFTEN TRUE	USUALLY TRUE	ALWAYS OR ALMOST ALWAYS TRUE

	Self reliant	5
	Yielding	4
	Helpful	5
	Defends own beliefs	5
	Cheerful	4
	Moody	3
	Independent	3
	Shy	4
	Conscientious	6
	Athletic	2
	Affectionate	4
	Theatrical	6
	Assertive	4
	Flatterable	3
	Happy	4
	Strong personality	4
	Loyal	6
	Unpredictable	4
	Forceful	3
20	Feminine	4

	Reliable	6
	Analytical	4
	Sympathetic	6
	Jealous	4
	Has leadership abilities	3
	Sensitive to the needs of others	5
	Truthful	5
	Willing to take risks	2
	Understanding	5
30	Secretive	4
	Makes decisions easily	2
	Compassionate	4
	Sincere	5 6
	Self-sufficient	3
	Eager to soothe hurt feelings	5
	Conceited	3
	Dominant	1
	Soft-spoken	4
	Likable	4
40	Masculine	1

	Warm	5
	Solemn	4 5
	Willing to take a stand	4
	Tender	4
	Friendly	6
	Aggressive	2
	Gullible	3
	Inefficient	4
	Acts as a leader	2
50	Childlike	3
	Adaptable	4
	Individualistic	4
	Does not use harsh language	6
	Unsystematic	5
	Competitive	4
	Loves children	6
	Tactful	4
	Ambitious	4
	Gentle	5
60	Conventional	4

APPENDIX 3.2

MAFERR INVENTORY OF FEMININE VALUES

CONFIDENTIAL

FORM A (SELF) NAME ...M. KOKER..........................

We would like to know how you feel about yourself and what you think about women's roles at work and in the family. There are no right or wrong answers : we are simply interested in what you think.

Please indicate your opinion on each item by writing a number from 1 to 5 in the space to the left of the item, using the following scale :

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

Response	No.	Item
2	1	An ambitious and responsible husband does not want his wife to work.
4	2	I usually pay no attention to other people's feelings.
5	3	A woman who works cannot possibly be as good a mother as the one who stays home.
2	4	I would like to do something that everybody knows is important.
2	5	I try to do what I think people want me to do.
4	6	A woman has a conflict in what she has to do as a woman and what she wishes to do for herself.
5	7	A woman should get married even if the man does not measure up to all her hopes.
4	8	I sometimes feel that I must do everything myself, that I can accept nothing from others.
2	9	The needs of a family come before a woman's personal ambitions.
4	10	I am not sure that the joys of motherhood make up for the sacrifices.
4	11	I like listening to people better than talking.
2	12	I argue with people who try to give me orders.
2	13	Marriage and children should come first in a woman's life.
3	14	When I am with a group of people, I usually become the leader.
2	15	I worry about what people think of me.
2	16	I express my ideas strongly.
2	17	Single women need personal success, but all a married woman needs is her husband's success.
2	18	I would not get married if I had to give up what I really believe in order to get along with another person.
4	19	It is up to the woman to make a marriage work.
2	20	A working mother can get along as well with her children as can a mother who stays at home.
1	21	The greatest help a wife can give her husband is to encourage his progress.
2	22	It is unfair that women have to give up more than men in order to have a good marriage.
4	23	I can put myself in the background and work hard for a person I admire.
1	24	A wife's opinion should be as important as the husband's opinion.
4	25	My main interest is to raise normal, well-behaved children.
2	26	How I develop as a person is more important to me than what others think of me.
4	27	If we disagree, I would give in to my husband more often than I would expect him to give in to me.
2	28	The greatest satisfactions in life come from what you do yourself.
2	29	I would like to marry a man to whom I could really look up.
2	30	A woman should have interests outside the home.
1	31	I am sure that what a woman gains from marriage makes up for sacrifices.
4	32	Modern mothers should bring up their boys and girls to believe in equal rights and freedoms for both sexes.
4	33	A woman's place is in the home.
5	34	I would rather be famous, admired and popular throughout the nation than have the constant affection of just one man.

MAFERR

CONFIDENTIAL

FORM B (IDEAL WOMAN) NAME ..M. Koker..................

We would like you to think of your ideal woman and imagine how she would answer these questions.

As in the previous questionnaire, please respond by writing a number from 1 to 5 in the space to the left of the question, using the following scale :

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

REMEMBER TO THINK OF YOUR IDEAL WOMAN AND TO ANSWER EACH QUESTION AS YOU BELIEVE SHE WOULD

5 1 I worry about what people think of me.
1 2 A wife's opinion should be as important as the husband's opinion.
2 3 A woman's place is in the home.
4 4 I am not sure that the joys of motherhood make up for the sacrifices.
1 5 The greatest help a wife can give her husband is to encourage his progress.
2 6 A woman should have interests outside the home.
2 7 My main interest is to raise normal, well-behaved children.
4 8 I argue with people who try to give me orders.
4 9 Single women need personal success, but all a married woman needs is her husband's success.
4 10 It is unfair that women have to give up more than men in order to have a good marriage.
4 11 I can put myself in the background and work hard for a person I admire.
2 12 I would like to do something that everybody knows is important.
4 13 It is up to the woman to make a marriage work.
4 14 A woman has a conflict in what she has to do as a woman and what she wishes to do for herself.
4 15 I try to do what I think people want me to do.
5 16 I sometimes feel that I must do everything myself, that I can accept nothing from others.
5 17 A woman should get married even if the man does not measure up to all her hopes.
2 18 I express my ideas strongly.
1 19 The needs of a family come before a woman's personal ambitions.
2 20 When I am with a group of people, I usually become the leader.
2 21 I like listening to people better than talking.
2 22 Modern mothers should bring up their boys and girls to believe in equal rights and freedoms for both sexes.
2 23 If we disagree, I would give in to my husband more often than I would expect him to give in to me.
2 24 The greatest satisfactions in life come from what you do yourself.
2 25 Marriage and children should come first in a woman's life.
5 26 I usually pay no attention to other people's feelings.
2 27 I would like to marry a man to whom I could really look up.
2 28 A working mother can get along as well with her children as can a mother who stays at home.
1 29 I am sure that what a woman gains from a marriage makes up for sacrifices.
2 30 I would rather be famous, admired and popular throughout the nation than have the constant affection of just one man.
5 31 A woman who works cannot possibly be as good a mother as the one who stays home.
2 32 How I develop as a person is more important to me than what others think of me.
2 33 An ambitious and responsible husband does not want his wife to work.
2 34 I would not get married if I had to give up what I really believe in to get along with another person.

Did you have a specific woman in mind when you answered these questions?

Yes .... if 'Yes' how is she related to you? ....

No ..X..... ....

MAFERR

CONFIDENTIAL

FORM C (MAN'S IDEAL WOMAN) FOR FEMALE SUBJECTS

NAME ..M. KOKER.................

We would like you to consider the questions again, but this time imagine a woman that men might like and want to marry. Please complete the form as you think she would fill it in.

Please respond to each statement by writing a number from 1 to 5 in the space to the left of the question, using the following scale :

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

REMEMBER TO THINK OF WHAT MEN THINK ABOUT WOMEN'S ROLES AND ANSWER EACH QUESTION AS YOU IMAGINE A WOMAN WHOM MEN LIKED WOULD ANSWER IT.

4 1. I express my ideas strongly.
2 2. I try to do what I think people want me to do.
4 3. I sometimes feel that I must do everything myself, that I can accept nothing from others.
2 4. I can put myself in the background and work hard for a person I admire.
2 5. The greatest satisfactions in life come from what you do yourself.
2 6. Single women need personal success, but all a married woman needs is her husband's success.
4 7. It is unfair that women have to give up more than men in order to have a good marriage.
1 8. The greatest help a wife can give her husband is to encourage his progress.
2 9. How I develop as a person is more important to me than what others think of me.
2 10 My main interest is to raise normal, well-behaved children.
4 11 I am not sure that the joys of motherhood make up for the sacrifices.
2 12 If we disagree, I would give in to my husband more often than I would expect him to give in to me.
2 13 A woman should have interests outside the home.
4 14 A woman who works cannot possibly be as good a mother as the one who stays home.
4 15 When I am with a group of people, I usually become the leader.
1 16 I would like to marry a man to whom I could really look up.
4 17 Modern mothers should bring up their boys and girls to believe in equal rights and freedoms for both sexes.
2 18 A woman's place is in the home.
2 19 A working mother can get along as well with her children as can a mother who stays at home.
4 20 It is up to the woman to make a marriage work.
4 21 I would rather be famous, admired and popular throughout the nation than have the constant affection of just one man.
2 22 An ambitious and responsible husband does not want his wife to work.
4 23 I usually pay no attention to other people's feelings.
2 24 I am sure that what a woman gains from a marriage makes up for sacrifices.
4 25 I argue with people who try to give me orders.
2 26 The needs of a family come before a woman's personal ambitions.
2 27 I would not get married if I had to give up what I really believe in to get along with another person.
2 28 I like listening to people better than talking.
2 29 I would like to do something that everybody knows is important.
4 30 A woman should get married even if the man does not measure up to all her hopes.
4 31 A woman has a conflict in what she has to do as a woman and what she wishes to do for herself.
2 32 Marriage and children should come first in a woman's life.
2 33 A wife's opinion should be as important as the husband's...

FORM H Bmm. Delta ♂ 1977 1st NAME ..JAN PARKES..........................374...

MAFERR INVENTORY OF MASCULINE VALUES

We would like to know how you feel about yourself and what you think about men's roles at work and in the family. There are no right or wrong answers : we are simply interested in what you think.

SELF)

Please indicate your opinion on each item by writing a number from 1 to 5 in the space to the left of the item, using the following scale :

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

8/1112

2 1. I worry about what people think of me.
4 2. An ambitious and responsible husband does not like his wife to work.
2 3. A father's place is in the home when he is not at work.
4 4. I am not sure that the joys of fatherhood make up for sacrifices.
2 5. To be successful, a man needs his wife's encouragement.
2 6. To be fully satisfied, a man needs interests besides his job and family.
2 7. My main interest is to raise normal, well-behaved children.
2 8. I argue with people who try to give me orders.
2 9. Married men should not be personally ambitious if it interferes with their families.
3 10. A man should not give up his personal goals and ideas in order to have a good marriage.
3 11. I can put myself in the background and work hard for a person I admire.
2 12. I would like to do something everybody knows is important.
3 13. A man needs the responsibilities of marriage to develop fully.
3 14. When a man has a conflict between what he wants to do for himself and what he has to do as a husband, his ambitions should come first.
3 15. I try to do what I think people want me to do.
3 16. I sometimes feel that I must do everything myself, that I can accept nothing from others.
4 17. A man should get married even if the woman does not measure up to all his hopes.
4 18. I express my ideas strongly.
3 19. The needs of a family come before a man's personal ambitions.
4 20. When I am with a group of people, I usually become the leader.
3 21. I like listening to people better than talking.
4 22. A husband's opinion should be more important than his wife's opinion.
4 23. If we disagree, I should give in to my wife more often than I would expect her to give in to me.
2 24. The greatest satisfactions in life come from what you do yourself.
3 25. Marriage and children should come first in a man's life.
4 26. I usually pay no attention to other people's feelings.
4 27. If a woman is as smart as her husband, the marriage will not work.
2 28. A father with active interests outside of his job can be as close to his children as a stay-at-home father.
3 29. I am sure that what a man gains from marriage makes up for sacrifices.
4 30. I would rather be famous, admired, and popular throughout the nation than have the constant affection of just one woman.
2 31. A father who spends his free time away from home cannot possibly be as good a father as the one who is home a great deal.
2 32. How I develop as a person is more important to me than what others think of me.
2 33. Modern fathers should bring up their boys and girls to believe in absolute equal rights and freedoms for both sexes.
3 34. I would not get married if I had to give up what I really believe in to get along with another person.

FORM I Bmn. Delta ♂ NAME 1977 IAN PARKES 1st 375

MAFERR

We would like you to think of your ideal man and imagine how he would answer these questions.

(IDEAL MAN)

As in the previous questionnaire, please respond by writing a number from 1 to 5 in the space to the left of the question, using the following scale :

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

REMEMBER TO THINK OF YOUR IDEAL MAN AND TO ANSWER EACH QUESTION AS YOU BELIEVE HE WOULD

50 2 112

2 1. Modern fathers should bring up their boys and girls to believe in absolute equal rights and freedoms for both sexes.
4 2. I usually pay no attention to other people's feelings.
1 3. A father who spends his free time away from home cannot possibly be as good a father as the one who is home a great deal.
2 4. I would like to do something everybody knows is important.
2 5. I try to do what I think people want me to do.
4 6. When a man has a conflict between what he wants to do for himself and what he has to do as a husband, his ambitions should come first.
4 7. A man should get married even if the woman does not measure up to all his hopes.
2 8. I sometimes feel that I must do everything myself, that I can accept nothing from others.
2 9. The needs of a family come before a man's personal ambitions.
4 10. I am not sure that the joys of fatherhood make up for sacrifices.
3 11. I like listening to people better than talking.
2 12. I argue with people who try to give me orders.
2 13. Marriage and children should come first in a man's life.
4 14. When I am with a group of people, I usually become the leader.
5 15. I worry about what people think of me.
2 16. I express my ideas strongly.
3 17. Married men should not be personally ambitious if it interferes with their families.
2 18. I would not get married if I had to give up what I really believe in to get along with another person.
2 19. A man needs the responsibilities of marriage to develop fully.
2 20. A father with active interests outside of his job can be as close to his children as a stay-at-home father.
2 21. To be successful, a man needs his wife's encouragement.
4 22. A man should not give up his personal goals and ideas in order to have a good marriage.
3 23. I can put myself in the background and work hard for a person I admire.
___ 24. A husband's opinion should be more important than his wife's opinion.
2 25. My main interest is to raise normal, well-behaved children.
1 26. How I develop as a person is more important to me than what others think of me.
4 27. If we disagree, I should give in to my wife more often than I would expect her to give in to me.
2 28. The greatest satisfactions in life come from what you do yourself.
4 29. If a woman is as smart as her husband, the marriage will not work.
~~3~~ 4 30. To be fully satisfied, a man needs interests besides his job and family.
2 31. I am sure that what a man gains from marriage makes up for sacrifices.
4 32. An ambitious and responsible husband does not like his wife to work.
2 33. A father's place is in the home when he is not at work.
4 34. I would rather be famous, admired, and popular throughout the nation than have the constant affection of just one woman.

Did you have a specific man in mind when you answered these questions?

Yes ..✓.... if 'Yes' how is he related to you? ...Miles away.......

No ....

FORM IW MAFERR NAME ..IAN PARKES....... 376

We would like you to consider the questions again, but this time imagine a woman you would like and might want to marry. Please complete the form as you think she would fill it in.

(MAN'S IDEAL WOMAN FOR MALE SUBJECTS)

Please respond to each statement by writing a number from 1 to 5 in the space to the left of the question, using the following scale:

STRONGLY AGREE	1	AGREE	2
NO OPINION/DON'T KNOW	3	DISAGREE	4
STRONGLY DISAGREE	5		

REMEMBER TO THINK OF A WOMAN WHOM YOU WOULD LIKE AND ANSWER EACH QUESTION AS YOU BELIEVE SHE WOULD

658/3112

4 1. A woman worries about what people think of her
2 2. A wife's opinion should be as important as the husband's opinion.
4 3. A woman's place is in the home.
4 4. A woman is not sure that the joys of motherhood make up for the sacrifices.
2 5. The greatest help a wife can give her husband is to encourage his progress.
4 6. A woman should have interests outside the home.
3 7. A woman's main interest is to raise normal, well-behaved children.
4 8. A woman should argue with people who try to give her orders.
4 9. Single women need personal success, but all a married woman needs is her husband's success.
4 10. It is unfair that women have to give up more than men in order to have a good marriage.
4 11. A woman should be able to put herself in the background and work hard for a person she admires.
2 12. A woman would like to do something that everybody knows is important.
4 13. It is up to the woman to make a marriage work.
3 14. A woman has a conflict in what she has to do as a woman and what she wishes to do for herself.
4 15. A woman should try to do what people want her to do.
4 16. A woman sometimes feels that she must do everything herself, that she can accept nothing from others.
4 17. A woman should get married even if the man does not measure up to all her hopes
2 18. A woman should express her ideas strongly.
2 19. The needs of a family come before a woman's personal ambitions.
4 20. When she's with a group of people, a woman usually becomes the leader.
3 21. A woman likes listening to people better than talking.
2 22. Modern mothers should bring up their boys and girls to believe in absolute equal rights and freedoms for both sexes.
4 23. If they disagree, the woman should give in to her husband more often than she should expect him to give in to her.
2 24. The greatest satisfactions in life come from what you do yourself.
2 25. Marriage and children should come first in a woman's life.
4 26. A woman usually pays no attention to other people's feelings.
4 27. A woman would like to marry a man to whom she could really look up.
3 28. A working mother can get along as well with her children as can a mother who stays at home.
2 29 A woman is sure that what she gains from marriage makes up for sacrifices.
4 30. A woman would rather be famous, admired and popular throughout the nation than have the constant affection of just one man.
4 31. A woman who works cannot possibly be as good a mother as the one who stays home.
2 32. The way a woman develops as a person should be more important to her than what others think of her.
3 33. An ambitious and responsible husband does not want his wife to work.
3 34. A woman should not get married if she has to give up what she really believes in to get along with another person.

Did you have a specific woman in mind when you answered these questions?

Yes ..✓..... if 'Yes', how is she related to you? ...A woman who I would like....

No ....

APPENDICES FOR CHAPTER SIX

STUDY ONE: A COMPARISON OF FEMALE ENGINEERS AND FEMALE FRIENDS ON SEX ROLE SELF CONCEPT

(Appendices 6.1 - 6.7)

APPENDICES FOR CHAPTER SIX: STUDY ONE

A Comparison of Female Engineers and Female Friends on Sex Role Self Concept

Appendix 6.1

INITIAL LEVELS OF MASCULINITY ON THE BSRI: Means and Standard Deviations for Masculinity Scores on the BSRI for Time 1 for Female Engineers and Female Friends in London and Birmingham

Group	N	Score	s.d.
London Female Engineers	17	91.41	12.55
Birm Female Engineers	20	94.40	13.00
All Female Engineers	37	93.03	12.71
London Female Friends	14	83.36	15.48
Birm Female Friends	43	87.95	16.99
All Female Friends	57	86.83	16.61

T Tests in Relation to Hypothesis 6.1:

MASCULINITY AT TIME 1: A Comparison between Female Engineers and Female Friends In London and Birmingham

Group 1	Group 2	Variable	t	df	signif.+
London F. Eng	London Frd	Masculin.	-1.60	29	.06
Birm F. Eng	Birm Frd	Masculin.	-1.50	61	.07
All Eng	All Frd	Masculin.	-1.93	92	.03

\+ one-tailed test

Appendix 6.1 cont.

INITIAL LEVELS OF FEMININITY ON THE BSRI: Means and Standard Deviations for Femininity Scores on the BSRI for Time 1 for Female Engineers and Female Friends in London and Birmingham

Group	N	Score	s.d.
London Female Engineers	17	92.94	15.08
Birm Female Engineers	20	87.45	11.50
All Female Engineers	37	89.97	13.36
London Female Friends	14	96.29	10.03
Birm Female Friends	43	92.79	14.71
All Female Friends	57	93.65	13.70

Additional Analysis in Relation to Hypothesis 6.1:

FEMININITY AT TIME 1: A Comparison between Female Engineers and Female Friends In London and Birmingham

Group 1	Group 2	Variable	t	df	signif.*
London F. Eng	London Frd	Feminin.	0.71	29	NS
Birm F. Eng	Birm Frd	Feminin.	1.43	61	.16
All F. Eng	All Frd	Feminin.	1.28	92	.20

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* Two-tailed test

Appendix 6.2

ANDROGYNY AND SEX TYPING IN FEMALE ENGINEERS AND THEIR FEMALE FRIENDS: Four Fold Classification According to Femininity and Masculinity Scores on the Bem Sex Role Inventory (BSRI) at Time 1+

	Total	Andro.		Masculine		Feminine		Undiff.	
	N	N	%	N	%	N	%	N	%
Lon Eng	17	9	(53)	3	(18)	3	(18)	2	(12)
Birm Eng	20	7	(35)	7	(35)	3	(15)	3	(15)
All Eng	37	16	(43)	10	(27)	6	(16)	5	(14)
Lon Frnd	14	6	(43)	1	(7)	7	(50)	-	
Birm Frnd	43	7	(16)	13	(30)	21	(49)	2	(5)
All Frnd	57	13	(23)	14	(25)	28	(49)	2	(4)

+ Owing to rounding errors, percentages do not always add up to 100%.

Chi Squared Tests in Relation to Hypothesis 6.2:

A Comparison between Female Engineers and their Friends: (Androgyny-Masculine vs. Feminine-Undifferentiated)

(1) London Engineers vs. London Friends

	Andro./ Masc.	Femin./ Undiff
LON ENG	12	5
LON FRD	7	7

Chi squared = 0.641, 1 df NS

Appendix 6.2 cont.

(2) Birmingham Engineers vs. Birmingham Friends

	Andro./ Masc.	Femin./ Undiff.
BIRM ENG	14	6
BIRM FRD	20	23

Chi squared = 2.16, 1 df NS

(3) Regions Combined: Engineers vs. Friends

	Andro./ Masc.	Femin./ Undiff.
ENGINEERS	26	11
FRIENDS	27	30

Chi squared = 3.90, 1 df, p = .05

Chi Squared Tests in Relation to Hypothesis 6.2 (cont.)

A Comparison between Female Engineers and their Friends:
(Feminine Sex Typed vs. Other Categories)

(1) London Engineers vs. London Friends

	Femin. Sex Typ	Other Categ.
LON ENG	3	14
LON FRD	7	7

Fisher's Exact = .052

Appendix 6.2 cont.

(2) Birmingham Engineers vs. Birmingham Friends

	Femin. Sex Typ	Other Categ.
BIRM ENG	3	17
BIRM FRD	21	22

Chi squared = 5.27, 1 df, p = .02

(3) Regions Combined: Engineers vs. Friends

	Femin. Sex Typ	Other Categ.
ENGINEERS	6	31
FRIENDS	28	29

Chi squared = 9.15, 1 df, p = .0002

Appendix 6.3

A Comparison between Female Subjects in London and Birmingham for Sex Typing: Balanced (Androgynous + Undifferentiated) vs. Sex Typed (Masculine + Feminine Sex typed)

(1) Female Engineers: London vs. Birmingham

	Balancd	Sex Typed
LON ENG	11	6
BIRM ENG	10	10

Chi squared = 0.32, 1 df NS

(2) Female Friends: London vs. Birmingham

	Balancd	Sex Typed
LON FRD	6	8
BIRM FRD	9	34

Fisher's Exact = .08

(3) Groups Combined: London vs. Birmingham

	Balancd	Sex Typed
LONDON	17	14
BIRMINGHAM	19	44

Chi squared = 4.36, 1 df, p = .04

Appendix 6.4

A Comparison of the Changes in Sex Role Self Concept Shown by Female Engineers and Female Friends in London and Birmingham

(See Tables 6.4 and 6.5 in Chapter 6 for the ANOVAs on Masculinity Change Scores and Femininity Change Scores.)

(1) Net Changes in Masculinity:

MEAN MASCULINITY SCORES AT TIME 1 AND TIME 2: A Comparison of Female Engineers and Female Friends in London and Birmingham on the BSRI

Group	N	Time 1	Time 2
London Eng	17	91.41	92.47
Birm Eng	20	94.40	91.70
London Friends	14	83.36	84.29
Birm Friends	43	87.95	89.07

MASCULINITY NET CHANGE SCORES: Means and Standard Deviations

Group	N	Mean Score	s.d.
London Eng	17	1.06	11.02
Birm Eng	20	-2.70	11.13
London Frd	14	0.93	7.05
Birm Frd	43	1.12	11.24

(2) Net Changes in Femininity:

MEAN FEMININITY SCORES AT TIME 1 AND TIME 2: A Comparison of Female Engineers and Female Friends in London and Birmingham on the BSRI

Group	N	Time 1	Time 2
London Eng	17	92.94	95.77
Birm Eng	20	87.45	91.75
London Friends	14	96.29	97.86
Birm Friends	43	92.79	95.30

Appendix 6.4 cont.

FEMININITY NET CHANGE SCORES: Means and Standard Deviations

Group	N	Mean Score	s.d.
London Eng	17	2.82	8.59
Birm Eng	20	4.30	8.05
London Frd	14	1.57	6.94
Birm Frd	43	2.51	11.53

(3) Absolute Changes in Masculinity and Femininity:

ABSOLUTE CHANGE SCORES: A Comparison of Female Engineers and Female Friends in London and Birmingham for Absolute Change Scores on the Masculinity and Femininity Scales of the BSRI

Group	Chnge in Masc.	s.d.	Chnge in Fem.	s.d.
Lon Fem. Eng (N = 17)	9.29	5.55	6.82	5.72
Lon Fem. Frnd (N = 14)	5.36	4.45	5.43	4.36
Birm Fem. Eng (N = 20)	9.50	6.05	7.60	4.84
Birm Fem. Frnd (N = 43)	8.42	7.41	9.40	7.01

Appendix 6.4 cont.

T Tests in Relation to Hypothesis 6.4:

ABSOLUTE CHANGE SCORES FOR MASCULINITY AND FEMININITY: A Comparison between Female Engineers and Female Friends In London and Birmingham

Group 1	Group 2	Variable	t	df	signif.*
London F. Eng	London Frd	Masc. Chnge	-2.14	29	.04
London F. Eng	London Frd	Fem. Chnge	-0.75	29	NS
Birm F. Eng	Birm Frnd	Masc. Chnge	-0.57	61	NS
Birm F. Eng	Birm Frd	Fem. Chnge	1.04	61	NS
All F. Eng	All Frd	Masc. Chnge	-1.27	23	NS
All F. Eng	All Frd	Fem. Chnge+			

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* Significance levels are for a two-tailed test

+ This analysis could not be carried out because the patterns of changes were not parallel in the two regions.

Appendix 6.5

A Comparison of Female Engineers and Female Friends for Changes in Levels of Masculinity and Femininity

(1) Masculinity Scores at Time 2:

MASCULINITY AT TIME 2: Mean Scores and Standard Deviations for Female Engineers and Female Friends in London and Birmingham

Group	N	Score	s.d.
London Engineers	17	92.47	12.12
Birm Engineers	20	91.70	11.09
All F. Engineeers	37	92.05	11.41
London Friends	14	84.29	13.82
Birm Friends	43	89.07	17.26
All F. Friends	57	87.90	16.49

T Tests in Relation to Hypothesis 6.5:

CHANGES IN MASCULINITY: Paired t tests within Groups of Female Engineers and Female Friends between Masculinity Scores at Time 1 and Time 2+

Group	Mean Masc Time 1	Mean Masc Time 2	t	df	signif.
Lon Eng	91.41	92.47	-.396	16	NS
Birm Eng	94.40	91.70	1.085	19	NS
All Eng	93.03	92.05	not valid		
Lon Frd	83.36	84.29	-.493	13	NS
Birm Frd	87.95	89.07	-.651	42	NS
All Frd	86.83	87.90	-.784	56	NS

+ Significance levels are for a two-tailed test

Appendix 6.5 cont.

(2) Femininity Scores at Time 2:

FEMININITY AT TIME 2: Mean Scores and Standard Deviations for Female Engineers and Female Friends in London and Birmingham

Group	N	Score	s.d.
London Engineers	17	95.77	14.90
Birm Engineers	20	91.75	12.03
All Engineers	37	93.60	13.39
London Friends	14	97.86	9.08
Birm Friends	43	95.30	9.33
All Friends	57	95/93	9.26

CHANGES IN FEMININITY: Paired t tests within Groups of Female Engineers and Female Friends between Femininity Scores at Time 1 and Time 2

Group	Mean Fem. Time 1	Mean Fem. Time 2	t	df	signif.+
Lon Eng	92.94	95.77	-1.355	16	.19
Birm Eng	87.45	91.75	-2.390	19	.03
All Eng	89.97	93.60	-2.681	36	.01
Lon Frd	96.29	97.86	-0.848	13	NS
Birm Frd	89.07	95.30	-1.428	42	.16
All Frd	93.65	95.93	-1.634	56	.11

\+ All significance levesls are for a two-tailed test

Appendix 6.6

Additional Analyses: A Comparison of Female Engineers and Female Friends for Sex Typing: Balanced (Androgynous + Undifferentiated) vs. Sex Typed (Masculine + Feminine Sex Typed) at Time 1

(1) London Female Engineers vs. London Female Friends

	Balancd	Sex Typed
LON ENG	11	6
LON FRND	6	8

Chi squared = 0.729, 1 df NS

(2) Birmingham Female Engineers vs. Birmingham Female Friends

	Balancd	Sex Typed
BIRM ENG	10	10
BIRM FRND	9	34

Chi squared = 4.18, 1 df, p = .04

(3) All Female Engineers vs. All Female Friends

	Balancd	Sex Typed
ALL ENG	21	16
ALL FRND	15	42

Chi squared = 7.56, 1 df, p = .006

Appendix 6.7

Additional Analysis: A Comparison between Initial and Final Androgyny Classifications for Female Engineers and Female Friends in London and Birmingham

Androgyny vs. Other Catergories at Time 1 and Time 2

(1) London Female Engineers: Time 1 vs. Time 2

	Andro.	Other Categ.
TIME 1	9	8
TIME 2	5	12

Chi squared = 1.093, 1 df NS

(2) Birmingham Female Engineers: Time 1 vs. Time 2

	Andro.	Other Categ.
TIME 1	7	13
TIME 2	3	17

Chi squared = 1.20, 1 df NS

(3) London Female Friends: Time 1 vs. Time 2

	Andro.	Other Categ.
TIME 1	6	8
TIME 2	1	13

Fisher's exact = .03

Apppendix 6.7 cont.

(4) Birmingham Female Friends: Time 1 vs. Time 2

	Andro.	Other Categ.
TIME 1	7	36
TIME 2	11	32

Chi squared = 0.632, 1 df NS

Feminine Sex Typing vs. Other Categories at Time 1 and Time 2

(1) London Female Engineers: Time 1 vs. Time 2

	Femin. Sex Typ	Other Categ.
TIME 1	3	14
TIME 2	7	10

Chi squared = 1.275, 1 df NS

(2) Birmingham Female Engineers: Time 1 vs. Time 2

	Femin. Sex Typ	Other Categ.
TIME 1	3	17
TIME 2	9	11

Chi squared = 2.976, 1 df NS

Appendix 6.7 cont.

(3) London Female Friends: Time 1 vs. Time 2

	Femin. Sex Typ	Other Categ.
TIME 1	7	7
TIME 2	10	4

Chi squared = 0.599, 1 df NS

(4) Birmingham Female Friends: Time 1 vs. Time 2

	Femin. Sex Typ	Other Categ.
TIME 1	21	22
TIME 2	23	20

Chi squared = 0.047, 1 df NS

APPENDICES FOR CHAPTER SEVEN

STUDY TWO: A PARTIAL COMPARISON OF WOMEN IN BUSINESS STUDIES AND NURSERY NURSING WITH FEMALE ENGINEERS AND FEMALE FRIENDS ON SEX ROLE SELF CONCEPT

(Appendices 7.1 - 7.7)

APPENDICES FOR CHAPTER SEVEN: STUDY TWO

A Partial Comparison of Women in Business Studies and Women in Nursery Nursing with London Female Engineers and London Female Friends on Sex Role Self Concept

Appendix 7.1

INITIAL LEVELS OF MASCULINITY: Means and Standard Deviations for Masculinity Scores on the BSRI at Time 1 for Kingston Business Studies, Kingston Nursery Nurses, London Female Engineers and London Female Friends

Group	N	Mean	s.d.
Kingston Business Studies	13	77.08	15.97
Kingston Nursery Nurses	12	84.08	15.70
London Female Friends	14	83.36	15.48
London Female Engineers	17	91.41	12.55

T Tests in Relation to Hypothesis 7.1:

MASCULINITY AT TIME 1: A Comparison between London Female Engineers and London Female Friends, Kingston Business Studies, Kingston Nursery Nurses

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon. F. Frnd	Masculin.	-1.60	29	.06
Lon. F. Eng	King. B.S.	Masculin.	-2.76	28	.005
Lon. F. Eng	King. N.N.	Masculin.	-1.40	27	.09

---

* Significance levels are for a one-tailed test.

Appendix 7.2

INITIAL LEVELS OF FEMININITY: Comparison of Mean Scores and Standard Deviations for Women in Business Studies and Women in Nursery Nursing, London Female Engineers and London Female Friends on the Femininity Scale of the BSRI at Time 1+

Group	N	Mean	s.d.
Kingston Business Studies	13	95.77	8.35
Kingston Nursery Nurses	12	106.25	9.02
London Female Friends	14	96.29	10.03
London Female Engineers	17	92.94	15.08

+ Differences between Nursery Nurses and Business Studies groups are statistically significant at the .003 level; differences between Nursery Nurses and Female Engineers are significant at the .006 level, and differences between Nursery Nurses and Female Friends are significant at the .007 level. (All significance levels are for one-tailed tests.)

T tests in Relation to Hypothesis 7.2

INITIAL LEVELS OF FEMININITY: A Comparison of Women in Nursery Nursing with London Female Engineers, London Female Friends and Women in Business Studies

Group 1	Group 2	Variable	t	df	signif.*
King NN	Lon F. Eng.	Feminin.	-2.72	27	.006
King NN	Lon F. Frd.	Feminin.	-2.65	24	.007
King NN	King BS	Feminin.	-3.02	28	.003

---

* Significance levels are for a one-tailed test.

Appendix 7.3

ANDROGYNY CLASSIFICATION ON THE BSRI: Four Fold Classification of Kingston Business Studies and Kingston Nursery Nurses, London Female Friends and London Female Engineers on the BSRI at Time 1 + *

		ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	N	N	%	N	%	N	%	N	%
King. Bus. St.	13	3	(23)	-		9	(69)	1	(7)
King. N. Nurse	12	2	(17)	1	(8)	8	(67)	1	(8)
Lon. Friends	14	6	(43)	1	(7)	7	(50)	-	
Lon. F. Eng.	17	9	(53)	3	(18)	3	(18)	2	(12)

+ Group medians for all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Three for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

Chi Squared Tests in Relation to Hypothesis 7.3

A Comparison between Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses, London Female Friends) and Female Engineers on Feminine Sex Typing

	fem. sex typed	all other categories
BUS STUD	9	4
F ENG	3	14

Chi squared = 6.16, 1 df, p =.013

Appendix 7.3 cont.

	fem. sex typed	all other categories
N NURSE	8	4
F ENG	3	14

Fisher's exact = .009

	fem. sex typed	all other categories
F FRND	7	7
F ENG	3	14

Fisher's exact = .052

A Comparison between Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses, London Female Friends) and Female Engineers on Proportions Classified as Androgynous or Masculine Sex Typed vs. Proportions Classified as Feminine Sex Typed and Undifferentiated

	andr./masc. sextyped	fem. sex typ./undiff
BUS STUD	3	10
F ENG	12	5

Chi squared = 4.89, p <.03

Appendix 7.3 cont.

	andr./masc. sextyped	fem. sex typ./undiff
N NURSE	3	9
F ENG	12	5

Fisher's exact = .052

	andr./masc. sextyped	fem. sex typ./undiff
F FRND	7	7
F ENG	12	5

Chi squared = 0.641, 1 df NS

Appendix 7.4

Table 7.4

ABSOLUTE CHANGES IN MASCULINITY AND FEMININITY: Change Scores in on the BSRI for Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers+

Group	Chnge in Masculin.	s.d.	Chnge in Feminin.	s.d.
King. Bus. St. (N = 13)	9.39	7.41	9.15	5.91
King. N. Nurse (N = 12)	9.50	7.56	7.50	6.71
Lon. Friends (N = 14)	5.36	4.45	5.43	4.36
Lon. F. Eng (N = 17)	9.29	5.55	6.82	5.73

T Tests in Relation to Hypothesis 7.4

ABSOLUTE CHANGES IN MASCULINTY: A Comparison between London Female Engineers and Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses and London Female Friends)

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	King B Stud	Masculin.	0.038	28	NS
Lon F. Eng	King N Nurse	Masculin.	0.085	27	NS
Lon F. Eng	Lon F. Frnd	Masculin.	-2.14	29	.02

---

* Significance levels are for a one-tailed test.

Appendix 7.4 cont.

ABSOLUTE CHANGES IN FEMININITY: A Comparison between London Female Engineers and Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses and London Female Friends)

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	King B Stud	Feminin.	1.089	28	NS
Lon F. Eng	King N Nurse	Feminin.	0.292	27	NS
Lon F. Eng	Lon F. Frnd	Feminin.	-0.655	23	NS

---
* Significance levels are for a one-tailed test.

MEAN NET CHANGES IN MASCULINITY AND FEMININITY: Change Scores in on the BSRI for Kingston Business Studies and Kingston Nursery Nurses, London Female Friends and London Female Engineers+

Group	Chnge in Masculin.	s.d.	Chnge in Feminin.	s.d.
King. Bus. St. (N = 13)	8.15	8.85	7.00	8.52
King. N. Nurse (N = 12)	-1.00	12.43	-1.33	10.22
Lon. Friends (N = 14)	0.93	7.05	1.57	6.94
Lon. F. Eng (N = 17)	1.06	11.02	2.82	8.59

+ Change scores are calculated by subtracting the Time 1 value from the Time 2 value, so that a positive score represents an increase and a negative score represents a decrease in the quality being measured.

Appendix 7.4 cont.

NET CHANGES IN MASCULINTY: A Comparison between London Female Engineers and Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses and London Female Friends)

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	King B Stud	Masculin.	1.898	28	.07+
Lon F. Eng	King N Nurse	Masculin.	0.085	27	NS
Lon F. Eng	Lon F. Frnd	Masculin.	-2.14	29	.02

---
* Significance levels are for a two-tailed test.

+ Greater change was shown by the Kingston Business Studies group; this finding goes against the hypothesis.

NET CHANGES IN FEMININITY: A Comparison between London Female Engineers and Women in Traditionally Feminine Fields (Kingston Business Studies, Kingston Nursery Nurses and London Female Friends)

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	King B Stud	Feminin.	1.324	28	.20+
Lon F. Eng	King N Nurse	Feminin.	-1.187	27	NS
Lon F. Eng	Lon F. Frnd	Feminin.	-0.44	29	NS

---
* Significance levels are for a two-tailed test.

+ Greater change was shown by the Kingston Business Studies group; this finding goes against the hypothesis.

Appendix 7.4 cont.

WITHIN GROUP CHANGES IN MASCULINITY: Paired T Tests between Masculinity Scores on the BSRI at Time 1 and Time 2 for Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers

Group	Var. 1	Var. 2	t	df	signif.*
King B Stud.	Masc.(T1)	Masc.(T2)	-3.32	12	.006+
King N Nurse	"	"	0.279	11	NS
Lon F. Frnd	"	"	-0.493	13	NS
Lon F. Eng	"	"	-0.396	16	NS

---

* Significance levels are for a two-tailed test.

+ This finding goes against the hypothesis.

WITHIN GROUP CHANGES IN FEMININIY: Paired T Tests between Masculinity Scores on the BSRI at Time 1 and Time 2 for Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers

Group	Var. 1	Var. 2	t	df	signif.*
King B Stud.	Femin.(T1)	Femin.(T2)	-2.96	12	.02+
King N Nurse	"	"	0.452	11	NS
Lon F. Frnd	"	"	-0.848	13	NS
Lon F. Eng	"	"	-1.355	16	.19

---

* Significance levels are for a two-tailed test.

+ This finding goes against the hypothesis.

Appendix 7.5

Additional Analyses Comparing Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

MASCULINITY AT TIME 1: T Tests Comparing Initial Levels of Masculinity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Masculin.	1.105	23	NS
Lon F Frnd	King B S	Masculin.	-1.038	25	NS
King N N	Lon F Frnd	Masculin.	-0.118	24	NS

---
* Significance levels are for a two-tailed test.

FEMININITY AT TIME 1: T Tests Comparing Initial Levels of Femininity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Feminin.	3.018	23	.003
Lon F Frnd	King B S	Feminin.	-0.145	25	NS
King N N	Lon F Frnd	Feminin.	-2.648	24	.007

---
* Significance levels are for a one-tailed test for comparisons involving Kingston Nursery Nurses.

NET CHANGES IN MASCULINITY: T Tests Comparing Net Changes in Masculinity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Masculin.	-2.134	23	.04
Lon F Frnd	King B S	Masculin.	2.355	25	.03
King N N	Lon F Frnd	Masculin.	0.496	24	NS

---
* Significance levels are for a two-tailed test.

Appendix 7.5 cont.

NET CHANGES IN FEMININITY: T Tests Comparing Net Changes in Femininity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Feminin.	-2.221	23	.04
Lon F Frnd	King B S	Feminin.	1.821	25	.08
King N N	Lon F Frnd	Feminin.	0.859	24	NS

---
* Significance levels are for a two-tailed test.

ABSOLUTE CHANGES IN MASCULINITY: T Tests Comparing Absolute Changes in Masculinity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Masculin.	0.038	23	NS
Lon F Frnd	King B S	Masculin.	1.727	25	.10
King N N	Lon F Frnd	Masculin.	-1.733	24	.10

---
* Significance levels are for a two-tailed test.

ABSOLUTE CHANGES IN FEMININITY: T Tests Comparing Absolute Changes in Femininity on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Feminin.	0.655	23	NS
Lon F Frnd	King B S	Feminin.	1.872	25	.07
King N N	Lon F Frnd	Feminin.	0.947	24	NS

---
* Significance levels are for a two-tailed test.

Appendix 7.5 cont.

MASCULINITY AT TIME 2: T Tests Comparing Levels of Masculinity on the BSRI at Time 2 for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Masculin.	-0.399	23	NS
Lon F Frnd	King B S	Masculin.	-1.038	25	NS
King N N	Lon F Frnd	Masculin.	-0.118	24	NS

---

* Significance levels are for a two-tailed test.

FEMININITY AT TIME 2: T Tests Comparing Levels of Femininity at Time 2 on the BSRI for Kingston Business Studies, Kingston Nursery Nurses and London Female Friends

Group 1	Group 2	Variable	t	df	signif.*
King B S	King N N	Feminin.	0.697	23	NS
Lon F Frnd	King B S	Feminin.	1.529	25	.14
King N N	Lon F Frnd	Feminin.	-2.029	24	.03

---

* Significance levels are for a one-tailed test for the comparisons involving the Kingston Nursery Nurses; the comparison between London Female Friends and Kingston Business Studies is for a two-tailed test.

Appendix 7.5 cont.

ANDROGYNY CLASSIFICATION ON THE BSRI AT TIME 2: Four Fold Classification of Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers on the BSRI at Time 2 + *

		ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	N	N	%	N	%	N	%	N	%
King. B. St.	13	6	(46)	-		7	(54)	-	
King. N. Nurs.	12	2	(17)	-		9	(75)	1	(8)
Lon. F. Frnd.	14	1	(7)	2	(14)	10	(71)	1	(7)
Lon. F. Eng.	17	5	(29)	3	(18)	7	(41)	2	(12)

+ Group medians for all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Four for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%

ANDROGYNOUS AT TIME 1 AND TIME 2: A Comparison of the Proportion of Subjects in the Kingston Business Studies group Classified as Androgynous at Time 1 and Time 2

Kingston Business Studies: Time 1 vs. Time 2

	androg.	all other categories
TIME 1	3	10
TIME 2	6	7

Fisher's exact = .16 NS

Appendix 7.5 cont.

ANDROGYNOUS AT TIME 1: Comparisons between London Female Friends and Kingston Business Studies and Kingston Nursery Nurses for Proportions of Subjects Classified as Androgynous at Time 1

(1) London Female Friends vs. Kingston Busines Studies at Time 1

	androg.	all other categories
L F FRD	6	8
K BUS S	3	10

Fisher's exact = .18

(2) London Female Friends vs. Kingston Nursery Nurses at Time 1

	androg.	all other categories
L F FRD	6	8
K NURS N	2	10

Fisher's exact = .13

Appendix 7.6

Masculinity Scores of Subjects in the Kingston Business Studies Group

Subject No.	Masculinity Score at Time 1
1401	79
1402	91
1403	70
1404	64
1405	86
1406	47
1407	69
1408	107
1409	92
1410	58
1411	84
1412	72
1413	83

Appendix 7.7

LEVELS OF MASCULINITY AT TIME 2: Comparison of Mean Scores of London Female Engineers, London Friends, Kingston Business Studies and Kingston Nursery Nurses on the Masculinity Scale of the BSRI at Time 2

Group	N	Mean	s.d.
Kingston Business Studies	13	85.23	16.60
Kingston Nursery Nurses	12	83.08	8.95
London Female Friends	14	84.29	13.82
London Female Engineers	17	92.47	12.12

LEVELS OF FEMININITY AT TIME 2: Comparison of Mean Scores of Kingston Business Studies, Kingston Nursery Nurses, London Female Friends and London Female Engineers on the Femininity Scale of the BSRI at Time 2

Group	N	Mean	s.d.
Kingston Business Studies	13	102.77	7.46
Kingston Nursery Nurses	12	104.92	7.95
London Female Friends	14	91.75	12.03
London Female Engineers	17	95.77	14.90

APPENDICES FOR CHAPTER EIGHT

STUDY THREE: A COMPARISON OF MALE AND FEMALE ENGINEERS ON SEX ROLE SELF CONCEPT

(Appendices 8.1 - 8.8)

APPENDICES FOR CHAPTER EIGHT: STUDY THREE

A Comparison of Male and Female Engineers on Sex Role Self Concept

Appendix 8.1

INITIAL LEVELS OF FEMININITY: Comparison of Mean Scores of Male Engineers and Female Engineers on the Femininity Scale of the BSRI at Time 1+

GROUP	N	Mean	s.d.
London Male Engineers	8	89.00	7.21
London Female Engineers	17	92.94	15.08
Birmingham Male Engineers	23	85.09	9.09
Birmingham Female Engineers	20	87.45	11.50
All Female Engineers	37	89.97	13.36
All Male Engineers	31	86.10	8.70

+ As shown below the differences between male and female engineers are not significant within region. When the regions are combined, the difference between male and female engineers approaches significance (p = .09, See t tests below in relation to hypothesis 8.1).

T Tests in Relation to Hypothesis 8.1:

DIFFERENCES IN INITIAL LEVELS OF FEMININITY: A Comparison of Female and Male Engineers on the Femininity Scale of the BSRI at Time 1

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon M. Eng	Feminin.	-0.697	23	NS
Birm F. Eng	Birm M. Eng	Feminin.	-0.752	41	NS
All F. Eng	All M. Eng	Feminin.	-1.38	66	.09

---

* Significance levels are for a one-tailed test.

Appendix 8.1 cont.

REGIONAL DIFFERENCES IN INITIAL LEVELS OF FEMININITY: A Comparison of Female and Male Engineers in London with their Counterparts in Birmingham on the Femininity Scale of the BSRI at Time 1

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Birm F. Eng	Feminin.	-1.26	23	NS
Lon M. Eng	Birm M. Eng	Feminin.	-1.10	41	NS
All Lon Eng	All Birm Eng	Feminin.	-1.93	66	.06

----
* Significance levels are for a two-tailed test.

Additional Tables and Analyses in Relation to Hypothesis 8.1

INITIAL LEVELS OF MASCULINITY:Comparison of Mean Scores of Male Engineers and Female Engineers on the Masculinity Scale of the BSRI at Time 1+

GROUP	N	Mean	s.d.
London Male Engineers	8	97.63	19.26
London Female Engineers	17	91.41	12.55
Birmingham Male Engineers	23	97.70	11.28
Birmingham Female Engineers	20	94.40	13.00
All Male Engineers	31	97.68	13.41
All Female Engineers	37	93.03	12.71

+ None of the differences between groups is significant. (See t tests below.)

INITIAL LEVELS OF MASCULINITY: T tests Comparing Female and Male Engineers on the Masculinity Scale of the BSRI at Time 1

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon M. Eng	Masculin.	0.972	23	NS
Birm F. Eng	Birm M. Eng	Masculin.	0.890	41	NS
All F. Eng	All M. Eng	Masculin.	1.470	66	NS

Appendix 8.2

INITIAL ANDROGYNY CLASSIFICATION ON THE BSRI: Four Fold Classification of Male and Female Engineers on the BSRI at Time 1 + *

		ANDRO.		MASC.		FEMININ.		UNDIFF.	
GROUP	N	N	%	N	%	N	%	N	%
Lon. M. Eng.	8	3	(38)	4	(50)	1	(13)	--	
Lon. F. Eng.	17	9	(53)	3	(10)	3	(10)	2	(12)
Birm.M. Eng.	23	2	(9)	18	(78)	--		3	(13)
Birm.F. Eng.	20	7	(35)	7	(35)	3	(15)	3	(15)

+ Weighted group medians for all males and all females at time 1 were used to assign subjects to the androgynous or undifferentiated categories. (See Chapter Three for further information on scoring of the BSRI.)

* Owing to rounding errors percentages do not always add up to 100%.

Chi Squared Tests in Relation to Hypothesis 8.2

A Comparison of Male and Female Engineers on Masculine Sex Typing

(1) London Male Engineers vs. London Female Engineers

	masc. sex typed	all other categories
m. eng.	4	4
f. eng.	3	14

Fisher's exact = .10, 1 df

Appendix 8.2 cont.

(2) Birmingham Male Engineers vs. Birmingham Female Engineers

	masc. sex typed	all other categories
m. eng.	18	5
f. eng.	7	13

Chi squared = 6.55, 1 df

p = .01

(3) Regions Combined

	masc. sex typed	all other categories
m. eng.	22	9
f. eng.	10	27

Chi squared = 11.37, 1 df

p = .00075

Additional Chi Squared Analyses

A Comparison between Male and Female Engineers:
(Androgynous vs Other Categories)

(1) London Male Engineers vs. London Female Engineers

	androgynous	all other categories
m. eng.	3	5
f. eng.	9	8

Chi squared = 0.85, 1 df

NS

(2) Birmingham Male Engineers vs. Birmingham Female Engineers

	androgynous	all other categories
m. eng.	2	21
f. eng.	7	13

Chi squared = 3.024, 1 df

p = .08

(3) Regions Combined

	androgynous	all other categories
m. eng.	5	26
f. eng.	16	21

Chi squared = 4.61, 1 df

p = .03

Appendix 8.3

Chi Squared Analyses in Relation to Hypothesis 8.3

A Comparison between Engineers in London and Birmingham on Sex Typing: (Masculine or Feminine Sex Typing vs. 'Balanced'-- Androgynous or Undifferentiated)

(1) Male Engineers in London and Birmingham

	sex typed	balanced
London	5	3
Birm.	18	5

Fisher's exact = .24, 1 df

(2) Female Engineers in London and Birmingham

	sex typed	balanced
London	6	11
Birm.	10	10

Chi squared = 0.321, 1 df

NS

(3) All Engineers (Sexes Combined)

	sex typed	balanced
London	11	14
Birm.	28	15

Chi squared = 2.083, 1 df

P = .15

Appendix 8.4

T Tests in Relation to Hypothesis 8.4

DIFFERENCES IN ABSOLUTE CHANGE IN MASCULINITY: Comparison of Female and Male Engineers on Asolute Change on the Masculinity Scale of the BSRI

Group 1	Group 2	Variable	t	df	signif.
Lon F. Eng	Lon M. Eng	Masculin.	-0.984	23	NS
Birm F. Eng	Birm M. Eng	Masculin.	-0.513	41	NS
All F. Eng	All M. Eng	Masculin.	-0.885	66	NS

DIFFERENCES IN ABSOLUTE CHANGE IN FEMININITY: Comparison of Female and Male Engineers on Asolute Change on the Femininity Scale of the BSRI

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon M. Eng	Feminin.	1.094	23	NS
Birm F. Eng	Birm M. Eng	Feminin.	-1.790	41	.08
All F. Eng	All M. Eng	Feminin.	invalid+		

---

* Significance levels are for a two-tailed test.

\+ This statistic could not be computed because changes within each region were in opposite directions.

Appendix 8.4 cont.

ANALYSIS OF VARIANCE ON MASCULINITY CHANGE SCORES: A Two Way Analysis of Variance for Change in Masculinity on the BSRI for Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif.
GROUP (Male-Female)	1	93.9	93.9	0.83	NS
PLACE (Lon-Birm)	1	0.4	0.4	0.00	NS
GROUP X PLACE	1	361.3	361.3	3.17	.08
Residual	64	7282.6	113.8		
Total	67	7738.2			

ANALYSIS OF VARIANCE ON FEMININITY CHANGE SCORES: A Two Way Analysis of Variance for Change in Femininity on the BSRI for Male and Female Engineers in London and Birmingham

Source	df	SS	MS	F	signif.
GROUP (Male-Female)	1	91.67	91.67	0.98	NS
PLACE (Lon-Birm)	1	151.64	151.64	1.62	NS
GROUP X PLACE	1	66.87	66.87	0.71	NS
Residual	64	6002.55	93.79		
Total	67	6312.72			

Appendix 8.4 cont.

MEAN NET CHANGE IN MASCULINITY AND FEMININITY: Change Scores on the BSRI for Male and Female Engineers+

Group	Mean Change in Masculin.	s.d.	Mean Change in Feminin.	s.d.
Lon. M. Eng (N = 8)	-3.25	8.40	-3.00	11.17
Lon. F. Eng (N = 17)	1.06	11.02	2.82	8.59
Birm. M. Eng (N = 23)	3.00	10.64	2.78	11.12
Birm. F. Eng (N = 20)	-2.70	11.13	4.30	8.05

+ Change scores are calculated by subtracting the Time 1 value from the Time 2 value, so that a positive score represents an increase and a negative score represents a decrease in the quality being measured.

WITHIN GROUP CHANGES IN MASCULINITY: Paired T Tests between Masculinity Scores on the BSRI at Time 1 and Time 2 for Male and Female Engineers

Group	Var. 1	Var. 2	t	df	signif.*
Lon F. Eng.	Masc.(T1)	Masc.(T2)	-0.396	16	NS
Birm F. Eng.	"	"	1.085	19	NS
All F. Eng.	"	"	not valid+		
Lon M. Eng	"	"	1.095	7	NS
Birm M. Eng	"	"	-1.352	22	.19
All M. Eng.	"	"	not valid+		

---
* Significance levels are for a two-tailed test.

+ Statistic cannot be computed because changes within each region were in the opposite direction.

Appendix 8.4 cont.

WITHIN GROUP CHANGES IN FEMININITY: Paired T Tests between Femininity Scores on the BSRI at Time 1 and Time 2 for Male and Female Engineers

Group	Var. 1	Var. 2	t	df	signif.*
Lon F. Eng.	Femin. (T1)	Femin.(T2)	-1.355	16	.19
Birm F. Eng.	"	"	-2.390	19	.03
All F. Eng.	"	"	-2.681	36	.01
Lon M. Eng	"	"	-0.759	7	NS
Birm M. Eng	"	"	-1.201	22	.19
All M. Eng.	"	"	-0.639	30	NS

---
* Significance levels are for a two-tailed test.

Appendix 8.5

Additional Analyeses

Regional Effects

Comparisons between Regions for Masculine Sex Typing

(1) Female Engineers in London and Birmingham

	masc. sex typed	all other categories
London	3	14
Birm.	7	13

Fishers exact = .15, 1 df

(2) Male Engineers in London and Birmingham

	masc. sex typed	all other categories
London	4	4
Birm.	18	5

Fishers exact = .12, 1 df

(3) All Engineers in London and Birmingham

	masc. sex typed	all other categories
London	7	18
Birm.	25	18

Chi squared = 4.62, 1 df

$p = .03$

Appendix 8.6

Differences in Androgyny Classification between Time 1 and Time 2

(1) A Comparison between Time 1 and Time 2 for Female Engineers in London and Birmingham (Regions Combined)

	ANDROG.	MASC.	FEM.	UNDIFF.
TIME 1	16	10	6	5
TIME 2	7	10	16	4

Chi squared = 8.18+, 3 df, p = .04

\+ This value is unreliable because of the low expected values in some of the cells.

(2) A Comparison between Time 1 and Time 2 for Male Engineers in London and Birmingham (Regions Combined)

	ANDROG.	MASC.	FEM.	UNDIFF.
TIME 1	5	22	1	3
TIME 2	5	19	1	6

Chi squared could not be computed because of the distribution of the scores. However, it is apparent that the pattern for Time 1 and Time 2 are extremely similar.

(3) Proportions of Subjects Classified as Balanced (Androgynous or Undifferentiated) at Time 1 and Time 2: London Female Engineers

	balanced	sex typed
TIME 1	11	6
TIME 2	7	10

Chi squared = 1.06, 1 df

NS

Appendix 8.6 cont.

(4) Proportions of Subjects Classified as Balanced at Time 1 and Time 2: Birmingham Female Engineers

	balanced	sex typed
TIME 1	10	10
TIME 2	4	16

Chi squared = 2.74, 1 df

NS

(5) Proportions of Subjects Classified as Balanced at Time 1 and Time 2: Female Engineers (Regions Combined)

	balanced	sex typed
TIME 1	21	16
TIME 2	11	26

Chi squared = 4.46, 1 df

P = .03

(6) Proportions of Subjects Classified as Androgynous at Time 1 and Time 2: London Female Engineers

	androgynous	all other categories
TIME 1	9	8
TIME 2	4	13

Chi squared = 1.99, 1 df

NS

Appendix 8.6 cont.

(7) Proportions of Subjects Classified as Androgynous at Time 1 and Time 2: Birmingham Female Engineers

	androgynous	all other categories
TIME 1	7	13
TIME 2	3	17

Chi squared = 1.20, 1 df

NS

(8) Proportions of Subjects Classified as Androgynous at Time 1 and Time 2: Female Engineers (Regions Combined)

	androgynous	all other categories
TIME 1	16	21
TIME 2	7	30

Chi squared = 4.04, 1 df

p = .04

(9) Proportions of Subjects Classified as Feminine Sex Typed at Time 1 and Time 2: London Female Engineers

	feminine sex typed	all other categories
TIME 1	3	14
TIME 2	7	10

Chi squared = 1.28, 1 df

NS

Appendix 8.6 cont.

(10) Proportions of Subjects Classified as Feminine Sex Typed at Time 1 and Time 2: Birmingham Female Engineers

	feminine sex typed	all other categories
TIME 1	3	17
TIME 2	9	11

Chi squared = 2.98, 1 df

p = .08

(11) Proportions of Subjects Classified as Feminine Sex Typed at Time 1 and Time 2: Female Engineers (Regions Combined)

	feminine sex typed	all other categories
TIME 1	6	31
TIME 2	16	21

Chi squared = 5.24, 1 df

p = .02

Appendix 8.7

Differences between Groups in Levels of Masculinity and Femininity at Time 2

MASCULINITY AT TIME 2: A Comparison of Mean Scores of Male Engineers and Female Engineers on the Masculinity Scale of the BSRI at Time 2

Group	N	Mean	s.d.
London Male Engineers	8	94.38	13.61
London Female Engineers	17	92.47	12.12
Birmingham Male Engineers	23	100.70	12.20
Birmingham Female Engineers	20	91.70	11.09

DIFFERENCES IN MASCULINITY: Comparison on Female and Male Engineers on the Masculinity Scale of the BSRI at Time 2

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon M. Eng	Masculin.	0.35	23	NS
Birm F. Eng	Birm M. Eng	Masculin.	2.51	41	.02
All F. Eng	All M. Eng	Masculin.	2.40	66	.02

---
* All significance levels are for two-tailed tests.

FEMININITY AT TIME 2: Comparison of Mean Scores of Male Engineers and Female Engineers on the Femininity Scale of the BSRI at Time 2

Group	N	Mean	s.d.
London Male Engineers	8	86.00	15.23
London Female Engineers	17	95.77	14.90
Birmingham Male Engineers	23	87.87	9.42
Birmingham Female Engineers	20	91.75	12.03

Appendix 8.7 cont.

DIFFERENCES IN FEMININITY: Comparison of Female and Male Engineers on the Femininity Scale of the BSRI at Time 2

Group 1	Group 2	Variable	t	df	signif.*
Lon F. Eng	Lon M. Eng	Feminin.	-1.52	23	NS
Birm F. Eng	Birm M. Eng	Feminin.	-1.19	41	NS
All F. Eng	All M. Eng	Feminin.	2.07	66	.04

---

* All significance levels are for two-tailed tests

Appendix 8.8

F TESTS FOR COMPARING VARIANCES: Female Engineers vs. Male Engineers

Group 1	Group 2	Variable	F	df	signif.
Lon F. Eng	Lon M. Eng	Masc at T1	0.42	7,16	NS
Birm F. Eng	Birm M. Eng	Masc at T1	1.33	19,22	NS
All F. Eng	All M. Eng	Masc at T1	0.90	30,36	NS
Lon F. Eng	Lon M. Eng	Fem at T1	4.37	7,16	.007
Birm F.Eng	Birm M. Eng	Fem at T1	1.60	19,22	NS
All F. Eng	All M. Eng	Fem at T1	2.36	30,36	NS

APPENDIX FOR CHAPTER TEN:

A BRIEF SUMMARY OF RESEARCH ON SEX ROLE IDEALS

USING STEREOTYPE MEASURES

APPENDIX TEN:
A BRIEF SUMMARY OF RESEARCH ON SEX ROLE IDEALS USING STEREOTYPING MEASURES

Introduction

The research on sex role ideals discussed below has used measures of stereotyping, such as adjective check lists or the Bem Sex Role Inventory. Because this research has been carried out over a long period of time and has frequently employed different measures, comparisons between studies are difficult. In this appendix some of the main research findings are summarised and then the pattern of results is compared with that from research using the MAFERR. Possible reasons for the differences in findings are explored briefly.

Research Findings

When subjects have been asked to compare an ideal figure of the same sex with a 'typical' figure of the same sex, most researchers have found that the ideal is described in less stereotypical terms. This pattern of findings has been reported for both women and men (e.g., Deutsch & Gilbert, 1976; McKee & Sheriffs, 1959). However, in a more recent study using the Bem Sex Role Inventory (BSRI), Gilbert, Deutsch & Strahan (1978) found that this pattern held for women, who described a less sex typed or more androgynous ideal woman than their 'typical' woman, but not for men. Men saw a 'typical' and ideal man as being similarly masculine sex-typed.

Gilbert et al.'s (1978) findings are partially supported by Scher (1984) who also used the BSRI. When Scher (1984) compared subjects' ratings of their own characteristics with that of an ideal figure of the same sex, she found that females described an androgynous model for themselves and their ideal female. However, males described themselves as androgynous but their ideal as traditionally sex typed.

Some researchers have found that subjects describe an ideal of the opposite sex in more stereotyped terms than they describe an ideal of the same sex (Urberg 1979; Urberg & Labouvie-Vief, 1976). Gilbert et al. (1978) found support for this finding for women but not for men. In this study, Gilbert and her colleagues found that women described an ideal woman as relatively androgynous, whereas they saw an ideal man as being masculine sex-typed. However, men described both an ideal man and an ideal woman as traditionally sex-typed.

Gilbert et al.'s findings for men have been replicated by Scher (1984) who also found that men described ideals of both sexes as traditionally sex-typed. However, Scher (1984) reported that women in her sample described ideals of both sexes as androgynous, thus offering partial support for a much earlier study by McKee and Sheriffs (1959) who found that women had an androgynous ideal man, but men had a traditionally sex-typed woman as an ideal.

Given the problems of comparability between studies and the considerable time period over which they have been conducted, there are few consistent findings. It does appear that men usually describe their ideal man as masculine sex typed and their ideal woman as feminine sex typed. The results for women are less clear although women appear to be more likely to favour androgynous ideals of either sex than men.

Comparison of Results from Stereotyping Studies with Research Using the MAFERR

Studies using the MAFERR have supported the general finding from stereotyping studies that women describe their own ideal as having both feminine and masculine characteristics in being balanced between self achieving and traditional values. They have also found that women tend to describe their ideal man in stereotyped terms, expecting him to have strongly self achieving values (Steinmann & Fox, 1974). However, men's descriptions of an ideal woman on the MAFERR are quite at variance with studies employing other measures. On the MAFERR men describe an ideal woman as having both self achieving and traditional attitudes, although she is usually described as somewhat less self achieving than the ideal described by women themselves (Steinmann & Fox, 1974; Voss, 1980). This latter finding fits well with the general result that men have more traditional attitudes towards women's roles than women; however, it contradicts the finding from stereotyping studies that men describe an ideal woman who has traditional characteristics.

Although more research is needed, the differences between findings in research using the MAFERR and research using stereotyping measures suggest that the two types of measure are tapping different aspects of subjects' sex role ideals.

The stereotyping measures appear to have close links with sex role self concept or sex role orientation, whereas the attitude measures are more concerned with specific rights and responsibilities (See Wylie, 1979 or Douvan, 1979 for a discussion of the problems of defining terms in this area of research.) Spence (1985) has argued that one should expect a relatively modest relationship between sex role self concept and sex role attitudes, whereas Bem (1985) has suggested a much closer correspondence between these two aspects of sex role concepts.

APPENDICES FOR CHAPTER ELEVEN

STUDY FOUR: A COMPARISON OF FEMALE ENGINEERS AND

AND FEMALE FRIENDS ON SEX ROLE ATTITUDES AND IDEALS

(Appendices 11.1 - 11.6)

APPENDICES FOR CHAPTER ELEVEN: STUDY FOUR

A Comparison of Female Engineers and Female Friends on Sex Role Attitudes and Ideals

Appendix 11.1

SELF AT TIME 1: Comparison between London Engineers, London Friends, Birmingham Engineers and Birmingham Friends on the MAFERR+

Group	N	Mean	Stnd. Dev.
London F. Eng	16	90.19	12.99
London F. Frnd	20	89.10	10.46
Birm F. Eng	17	88.82	10.24
Birm F. Frnd	33	91.49	10.92

\+ This measure has been scored so that higher scores represent relatively traditional attitudes towards women's roles and lower scores represent relatively profeminist attitudes towards women's roles.

T Tests in Relation to Hypothesis 11.1:

SELF AT TIME1: A Comparison between Female Engineers and Female Friends in London and Birmingham

Group 1	Group 2	t	df	significance
Lon Eng	Lon Frnd	-0.278	34	NS
Birm Eng	Birm Frnd	0.834	48	NS

Appendix 11.1 cont.

IDEAL AT TIME 1: Comparison between London Female Engineers, London Female Friends, Birmingham Female Engineers and Birmingham Female Friends on the MAFERR+

Group	N	Mean	Stnd. Dev.
London F. Eng	16	89.06	15.57
London F. Frnd	20	88.55	16.55
Birm F. Eng	17	90.65	10.59
Birm F. Frnd	33	87.33	13.61

\+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

T Tests in Relation to Hypothesis 11.1:

IDEAL AT TIME1: A Comparison between Female Engineers and Female Friends in London and Birmingham

Group 1	Group 2	t	df	significance
Lon Eng	Lon Frnd	-0.095	34	NS
Birm Eng	Birm Frnd	-0.875	48	NS

Appendix 11.2

MAN'S IDEAL WOMAN AT TIME 1: Comparison between Female Engineers and Female Friends in London and Birmingham on the MAFERR+

Group	N	Mean	Stnd. Dev.
London F. Eng	16	106.00	24.27
London F. Frnd	20	115.00	15.54
Birm F. Eng	17	118.65	22.03
Birm F. Frnd	33	120.97	16.15

+ Higher scores represent more traditional attitudes; lower scores represent more profeminist attitudes.

T Tests in Relation to Hypothesis 11.2:

IDEAL WOMAN AND MAN'S IDEAL WOMAN AT TIME1: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t Tests+

Group	Mean Ideal1	Mean Man's Ideal	t	df	significance++
London F. Eng	89.06	106.00	-2.69	16	.01
Birm F. Eng	90.65	118.65	-5.23	16	.0001
London F. Frnd	88.55	115.00	-8.73	32	.0001
Birm F. Frnd	91.49	120.97	-7.71	32	.0001

+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a one-tailed test.

Additional Analyses in Relation to Hypothesis 11.2

SELF AND MAN'S IDEAL WOMAN AT TIME 1: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean Selfl	M an Man's Ideal	t	df	significance++
London F. Eng	90.19	106.00	-2.67	16	.02
Birm F. Eng	88.82	118.65	-4.92	16	.002
London F. Frnds	89.10	115.00	-7.50	19	.0001
Birm F. Frnds	91.49	120.97	-7.714	32	.0001

+ Higher scores indicate more traditional attitudes; lower scores indicate more profemi ist attitudes.

++ Significance levels are for a two-tailed test.

Appendix 11.3

T Tests in Relation to Hypothesis 11.3:

COMPARISONS BETWEEN REGIONS: London Female Engineers compared with Birmingham Female Engineers, London Female Friends compared with Birmingham Female Friends and London Subjects compared with Birmingham Subjects

Group 1	Group 2	Variable	t	df	signif.++
Lon F.Eng	Birm F.Eng	Selfl	-0.336	31	NS
Lon F.Frnd	Birm F.Frnd	Selfl	0.783	51	NS
Lon F.Eng	Birm F.Eng	Ideall	0.344	31	NS
Lon F.Frnd	Birm F.Frnd	Ideall	-0.291	51	NS
Lon F.Eng	Birm F.Eng	M. Ideall	1.57	31	.08
Lon F.Frnd	Birm F.Frnd	M. Ideall	1.30	51	.10
Lon F. Ss	Birm F. Ss	M. Ideall	2.21	84	.025

+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

+ Significance levels are for a one-tailed test.

Appendix 11.4

NET CHANGE SCORES: Means and Standard Deviations on the Self, Ideal Woman and Man's Ideal Woman Scales of the MAFERR for London Female Engineers, Birmingham Female Engineers, London Female Friends and Birmingham Female Friends+

Group	S.Chnge	s.d.	I.Chnge	s.d.	M.I.Chnge	s.d.
Lon F.Eng (N=16)	-3.25	8.42	-3.31	11.25	5.69	28.82
Lon F.Frnd (N=20)	2.25	8.35	-1.40	15.25	-5.00	12.83
Birm F.Eng (N=17)	-2.30	10.51	-4.59	15.67	-7.00	19.24
Birm F.Frnd (N=33)	0.46	10.16	-1.21	9.98	-4.12	21.02

+ All change scores have been computed by subtracting the score at time 2 from the score at time 1.

T tests in Relation to Hypothesis 11.4: A Comparison of Changes in Sex Role Attitudes and Ideals shown by Female Engineers and Female Friends in London and Birmingham

(a) NET CHANGES ON SELF: A Comparison between Female Engineers and Female Friends on Self Change (Self2-Self1) on the MAFERR

Group 1	Group 2	Variable	t	df	signif.+
Lon F.Eng	Lon F.Frnd	S. Change	1.96	34	.05
Birm F.Eng	Birm F.Frnd	S. Change	0.896	48	NS
All F.Eng	All F.Frnd	S. Change	1.86	84	.05

+ Significance levels are for a one-tailed test.

Appendix 11.4 cont.

(b) NET CHANGES ON IDEAL: A Comparison between Female Engineers and Female Friends on Ideal Change (Ideal2-Ideal1) on the MAFERR

Group 1	Group 2	Variable	t	df	signif.+
Lon F.Eng	Lon F.Frnd	I. Change	0.42	34	NS
Birm F.Eng	Birm F.Frnd	I. Change	0.93	48	NS
All F.Eng	All F.Frnd	I. Change	0.96	84	NS

+ Significance levels are for a one-tailed test.

(c) NET CHANGES ON MAN'S IDEAL WOMEN: A Comparison between Female Engineers and Female Friends on Man's Ideal Woman Change (M. Ideal Woman 2-M. Ideal Woman Ideal 1) on the MAFERR

Group 1	Group 2	Variable	t	df	signif.
Lon F.Eng	Lon F.Frnd	M.I. Change	-0.86	34	NS
Birm F.Eng	Birm F.Frnd	M.I. Change	0.01	48	NS
All F.Eng	All F.Frnd	M. I. Change	0.96	84	NS

Appendix 11.5

(a) Within Group Comparisons for Self at Time 1 and Time 2

SELF AT TIME 1 AND TIME 2: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean Self1	Mean Self2	t	df	significance++
London F. Eng	90.19	86.94	1.54	15	.07
Birm F. Eng	88.82	86.53	0.90	16	NS
All F. Eng	89.49	86.73	1.68	32	.06
London F. Frnds	89.10	91.35	-1.21	19	NS
Birm F. Frnds	91.49	91.94	-0.26	32	NS
All F. Frnds	90.59	91.72	-0.87	52	NS

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels for Female Engineers are for a one-tailed test; siginificance levels for Female Friends are for a two-tailed test.

Appendix 11.5 cont.

(b) Within Group Comparisons for Ideal at Time 1 and Time 2

IDEAL AT TIME 1 AND TIME 2: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean Ideal1	Mean Ideal2	t	df	significance++
London F. Eng	89.06	85.75	1.54	15	.08
Birm F. Eng	90.65	86.06	1.21	16	NS
All F. Eng	89.88	85.91	1.69	33	.06
London F.Frnds	88.55	87.15	0.41	19	NS
Birm F.Frnds	87.33	86.12	0.70	32	NS
All F. Frnds	87.92	86.51	0.77	52	NS

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels for Female Engineers are for a one-tailed test; siginificance levels for Female Friends are for a two-tailed test.

Appendix 11.5 cont.

(c) Within Group Comparisons for Man's Ideal Woman at Time 1 and Time 2

MAN'S IDEAL WOMAN AT TIME 1 AND TIME 2: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean M. Ideal1	Mean M. Ideal2	t	df	significance++
London F. Eng	106.00	111 69	-0.79	15	NS
Birm F. Eng	118.65	111.65	1.50	16	NS
London F.Frnds	115.00	114.50	0.17	19	NS
Birm F.Frnds	120.97	116.85	1.13	32	NS

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a one-tailed test.

Appendix 11.6

Additional Analyses: Self-Ideal Discrepancy

(a) Within Group Comparisons for Self and Ideal at Time 1

SELF AND IDEAL AT TIME 1: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean Self1	Mean Ideal1	t	df	significance++
London F. Eng	90.19	89.06	0.41	15	NS
Birm F. Eng	88.82	90.65	-0.89	16	NS
All F. Eng+++	89.49	89.88	--		
London F. Frnds	89.10	88.55	0.19	19	NS
Birm F. Frnds	91.49	87.33	2.58	32	.02
All F. Frnds	90.59	87.92	1.87	52	.07

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a two-tailed test.

+++ Groups not combined because trends in opposite direction.

Appendix 11.6 cont.

(b) Within Group Comparisons for Self and Ideal at Time 2

SELF AND IDEAL AT TIME 2: Within Group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests+

Group	Mean Self2	Mean Ideal2	t	df	significance++
London F. Eng	86.94	85.75	0.44	15	NS
Birm F. Eng	86.53	86.06	-0.89	16	NS
All F. Eng	86.73	85.91	0.49	32	NS
London F. Frnds	91.35	87.15	1.43	19	.17
Birm F. Frnds	91.94	86.12	2.91	32	.005
All F. Frnds	91.72	86.51	3.15	52	.003

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a one-tailed test.

Appendix 11.6 cont.

(c) Within Group Comparisons of Self and Man's Ideal Woman at Time 1

SELF AND MAN'S IDEAL WOMAN AT TIME 1: Within group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests

Group	Mean Self	Mean M. Ideall	t	df	significance++
London F. Eng	90.19	106.00	-2.67	16	.01
Birm F. Eng	88.82	118.65	-4.92	16	.001
London F.Frnds	89.10	115.00	-7.50	19	.0001
Birm F.Frnds	91.49	116.85	-7.93	32	.0001

\+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a one-tailed test.

Appendix 11.6 cont.

(d) Within Group Comparisons of Self and Man's Ideal Woman at Time 2

SELF AND MAN'S IDEAL WOMAN AT TIME 2: Within group Comparisons for Female Engineers and Female Friends in London and Birmingham using Paired t tests

Group	Mean Self2	Mean M. Ideal2	t	df	significance++
London F. Eng	86.94	111.69	-4.22	15	.0006
Birm F. Eng	86.53	111.65	-4.76	16	.0002
London F.Frnds	91.35	111.65	-5.45	19	.0003
Birm F.Frnds	91.94	116.85	-8.16	32	.0001

+ Higher scores indicate more traditional attitudes; lower scores indicate more profeminist attitudes.

++ Significance levels are for a one-tailed test.

(e) Differences between Female Engineers and Female Friends on Self-Ideal Discrepancy at Time 1

Group 1	Group 2	Variable	t	df	signif.+
Lon F.Eng	Lon F.Frnd	S.I. Discrep.	0.14	34	NS
Birm F.Eng	Birm F.Frnd	S.I. Discrep.	-2.23	48	.03
All F.Eng	All F.Frnd	S.I. Discrep.	-1.38	84	.17

--
\+ Significance levels are for a two-tailed test

(f) Differences between Female Engineers and Female Friends on Self-Ideal Discrepancy at Time 2

Group 1	Group 2	Variable	t	df	signif.+
Lon F.Eng	Lon F.Frnd	S.I. Discrep.	-0.74	34	NS
Birm F.Eng	Birm F.Frnd	S.I. Discrep.	-1.68	48	.10
All F.Eng	All F.Frnd	S.I. Discrep.	-1.77	84	.08

--
\+ Significance levels are for a two-tailed test

APPENDICES FOR CHAPTER TWELVE

STUDY FIVE: A PARTIAL COMPARISON OF WOMEN IN BUSINESS STUDIES AND NURSERY NURSING WITH FEMALE ENGINEERS AND FEMALE FRIENDS ON SEX ROLE ATTITUDES AND IDEALS

(Appendices 12.1 - 12.7)

APPENDICES FOR CHAPTER TWELVE: STUDY FIVE

A Partial Comparison of Women in Business Studies and Nursery Nursing with London Female Friends and London Female Engineers on Sex Role Attitudes and Ideals

Appendix 12.1

SELF, IDEAL AND MAN'S IDEAL WOMAN AT TIME 1: Comparison of Mean Scores on the Self, Ideal and Man's Ideal Woman Scales of the MAFERR for Kingston Nursery Nurses, Kingston Business Studies and London Female Friends+

GROUP	SELF	s.d.	IDEAL	s.d.	M.IDEAL	s.d.
King. N. Nurs. (N = 15)	93.07	11.76	92.00	12.08	114.33	12.79
King. Bus. St. (N = 14)	98.59	9.92	86.57	11.43	114.00	13.76
Lon. F. Frds (N = 20)	89.10	10.46	88.55	16.55	115.00	15.64
Lon. F. Eng (N = 16)	90.19	12.99	89.06	15.97	106.00	24.27

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

T Tests in Relation to Hypothesis 12.1

SELF AT TIME 1: A Comparison between London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing at Time 1

Group 1	Group 2	Variable	t	df	signif.*
Bus. Stud.	Lon F. Eng	SELF	-1.96	28	.03
N. Nurse	Lon F. Eng	SELF	-0.65	29	NS
L. F. Frnd	Lon F. Eng	SELF	0.28	34	NS

---

* Significance levels are for a one-tailed test.

Appendix 12.1 cont.

IDEAL AT TIME 1: A Comparison between London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing at Time 1

Group 1	Group 2	Variable	t	df	signif.*
Bus. Stud.	Lon F. Eng	IDEAL	0.49	28	NS
N. Nurse	Lon F. Eng	IDEAL	-0.58	29	NS
L. F. Frnd	Lon F. Eng	IDEAL	0.95	34	NS

---

* Significance levels are for a one-tailed test.

Appendix 12.2

T Tests in Relation to Hypothesis 12.1

SELF AT TIME 1: A Comparison between Women in Nursery Nursing, Women in Business Studies and London Female Friends at Time 1

Group 1	Group 2	Variable	t	df	signif.
N. Nurse	Bus. Stud.	SELF	1.36+	27	.19
N. Nurse	L. F. Frnd	SELF	-1.05	33	NS

\+ This difference between groups was in the opposite direction from that which was predicted. The significance level given is for a two-tailed test.

IDEAL AT TIME 1: A Comparison between Women in Nursery Nursing, Women in Business Studies and London Female Friends at Time 1

Group 1	Group 2	Variable	t	df	signif.
N. Nurse	Bus. Stud.	IDEAL	1.24	27	NS
N. Nurse	L. F. Frnd	IDEAL	-0.14	33	NS

MAN'S IDEAL WOMAN AT TIME 1: A Comparison between Women in Nursery Nursing, Women in Business Studies and London Female Friends at Time 1

Group 1	Group 2	Variable	t	df	signif.
N. Nurse	Bus. Stud.	M. IDEAL	0.07	27	NS
N. Nurse	L. F. Frnd	M. IDEAL	0.68	33	NS

Appendix 12.3

T tests in Relation to Hypothesis 12.3

AN IDEAL WOMAN AND MAN'S IDEAL WOMAN AT TIME1: Within Group Comparisons for Women in Business Studies, Women in Nursery Nursing, London Female Friends and London Female Engineers using Paired t tests

Group	Mean Ideall	Mean M. Ideall	t	df	signif.*
Bus. Stud.	86.57	114.00	-7.43	13	.0001
N. Nurse	92.00	114.33	-5.17	14	.0002
Lon F. Frd.	88.55	115.00	-6.99	19	.0001
Lon F. Eng.	89.06	106.00	-2.69	15	.02

---

* Significance levels are for a two-tailed test.

Appendix 12.4

SELF, IDEAL AND MAN'S IDEAL WOMAN AT TIME 2: Comparison of Mean Scores on the Self, Ideal and Man's Ideal Woman Scales of the MAFERR for Kingston Nursery Nurses, Kingston Business Studies and London Female Friends+

GROUP	SELF	s.d.	IDEAL	s.d.	M.IDEAL	s.d.
King. N. Nurs. (N = 15)	91.07	8.15	90.13	9.83	113.33	16.12
King. Bus. St. (N = 14)	94.21	9.33	86.57	12.01	115.29	10.31
Lon. F. Frds (N = 20)	91.35	11.11	87.15	15.20	114.50	17.42
Lon. F. Eng (N = 16)	86.94	12.14	85.75	16.78	111.69	22.17

+ Higher scores represent more traditional attitudes towards women's roles; lower scores represent more profeminist attitudes.

NET CHANGES IN SELF, AN IDEAL WOMAN AND MAN'S IDEAL WOMAN:Comparison of Mean Scores on the Self, Ideal and Man's Ideal Woman Scales of the MAFERR for Kingston Nursery Nurses, Kingston Business Studies and London Female Friends+

GROUP	SELF CHNGE	s.d.	I.CHNGE	s.d.	M.I.CHNGE	s.d.
King. N. Nurs. (N = 15)	-2.00	7.45	-1.87	14.22	-1.00	13.23
King. Bus. St. (N = 14)	-4.38	5.00	0.00	8.89	1.29	12.95
Lon. F. Frds (N = 20)	2.25	8.35	-1.40	15.25	-0.50	12.83
Lon. F. Eng (N = 16)	-3.25	8.42	-3.31	11.25	5.69	28.82

+ Net change scores were computed by subtracting scores at time 1 from scores at time 2. A positive net change score represents a change towards more traditional attitudes, whereas a negative score represents a change in the profeminist direction.

Appendix 12.4 cont.

T Tests in Relation to Hypothesis 12.4

SELF CHANGE: A Comparison between London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing on Net Change in Self between Time 1 and Time 2

Group 1	Group 2	Variable	t	df	signif.*
Bus. Stud.	Lon F. Eng	SELF CHNGE	0.43	28	NS
N. Nurse	Lon F. Eng	SELF CHNGE	-0.44	29	NS
L. F. Frnd	Lon F. Eng	SELF CHNGE	-1.96	34	.06

---
* Significance levels are for a one-tailed test.

IDEAL CHANGE: A Comparison between London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing on Net Change in Ideal between Time 1 and Time 2

Group 1	Group 2	Variable	t	df	signif.*
Bus. Stud.	Lon F. Eng	I. CHNGE	-0.89	28	NS
N. Nurse	Lon F. Eng	I. CHNGE	-0.32	29	NS
L. F. Frnd	Lon F. Eng	I. CHNGE	-0.42	34	NS

---
* Significance levels are for a one-tailed test.

MAN'S IDEAL CHANGE: A Comparison between London Female Engineers, London Female Friends, Women in Business Studies and Women in Nursery Nursing on Net Change in Man's Ideal Woman between Time 1 and Time 2

Group 1	Group 2	Variable	t	df	signif.*
Bus. Stud.	Lon F. Eng	M.I. CHNGE	0.53	28	NS
N. Nurse	Lon F. Eng	M.I. CHNGE	0.82	29	NS
L. F. Frnd	Lon F. Eng	M.I. CHNGE	0.86	34	NS

---
* Significance levels are for a one-tailed test.

Appendix 12.5

T Tests in Relation to Hypothesis 12.5

SELF AT TIME1 AND TIME 2: Within Group Comparisons for Women in Business Studies and London Female Friends

Group	Mean Self1	Mean Self2	t	df	signif.*
Bus. Stud.	98.57	94.21	3.26	13	.007
L. F. Frnd.	89.10	91.35	-1.21	19	NS
N. Nurse	93.07	91.07	1.04	14	NS

---
* Significance levels are for a two-tailed test.

IDEAL AT TIME 1 AND TIME 2: Within Group Comparisons for Women in Business Studies and London Female Friends

Group	Mean Ideal1	Mean Ideal2	t	df	signif.*
Bus. Stud.	86.57	86.57	0.00	13	NS
L. F. Frnd.	88.55	87.15	0.41	19	NS
N. Nurse	92.00	90.13	0.51	14	NS

---
* Significance levels are for a two-tailed test.

Appendix 12.6

T Tests in Relation to Hypothesis 12.6

SELF AT TIME1 AND TIME 2: Within Group Comparison for Women in Nursery Nursing

Group	Mean Self1	Mean Self2	t	df	signif.*
N. Nurse	93.07	91.07	1.04	14	NS

---
* Significance levels are for a two-tailed test.

IDEAL AT TIME1 AND TIME 2: Within Group Comparison for Women in Nursery Nursing

Group	Mean Ideal1	Mean Ideal2	t	df	signif.*
N. Nurse	92.00	90.13	0.51	14	NS

---
* Significance levels are for a two-tailed test.

Appendix 12.7

Self Ideal Discrepancy: Within Group Comparisons of Self and Ideal at Time 1

SELF AND IDEAL AT TIME 1: Within Group Comparisons for Women in Business Studies, Women in Nursery Nursing, London Female Engineers and London Female Friends using Paired t tests

Group	Mean Self1	Mean Ideal1	t	df	signif.*
Bus. Stud.	98.57	86.57	5.93	13	.0001
N. Nurse	93.07	92.00	0.32	14	NS
Lon F. Frd.	89.10	88.55	0.19	19	NS
Lon F. Eng.	90.19	89.06	0.41	15	NS

---
* Significance levels are for a two-tailed test.

Self Ideal Discrepancy: Within Group Comparisons of Self and Ideal at Time 2

SELF AND IDEAL AT TIME 2: Within Group Comparisons for Women in Business Studies, Women in Nursery Nursing, London Female Engineers and London Female Friends using Paired t tests

Group	Mean Self2	Mean Ideal2	t	df	signif.*
Bus. Stud.	94.21	86.57	3.29	13	.006
N. Nurse	91.07	90.13	0.45	14	NS
Lon F. Frd.	91.35	87.15	1.43	19	.16
Lon F. Eng.	86.94	85.75	0.44	15	NS

---
* Significance levels are for a two-tailed test.

APPENDICES FOR CHAPTER THIRTEEN

STUDY SIX: A COMPARISON OF MALE AND FEMALE ENGINEERS ON SEX ROLE ATTITUDES AND IDEALS

(Appendices 13.1 - 13.5)

APPENDICES FOR CHAPTER THIRTEEN

A Comparison of Male Engineers and Female Engineers in London and Birmingham on Sex Role Attitudes and Sex Role Ideals

Appendix 13.1

SELF, IDEAL AND MAN'S IDEAL WOMAN AT TIME 1: Comparison of Mean Scores for Male Engineers and Female Engineers in London and Birmingham+

Group	SELF1*	s.d.	IDEAL1*	s.d.	MIW1	s.d.
Lon M. Eng (N = 19)	97.90	11.63	98.63	9.26	96.32	8.83
Birm M. Eng (N = 20)	102.05	7.22	101.55	12.31	96.55	8.06
All M. Eng (N = 39)	100.03	9.72	100.13	11.86	96.44	8.33
Lon F. Eng (N = 16)	90.19	12.99	89.06	15.57	106.00	24.27
Birm F. Eng (N = 17)	88.82	10.24	90.65	10.59	118.65	22.03
All F. Eng (N = 33)	89.49	11.49	89.88	13.06	112.52	23.66

+ These measures have been scored so that higher scores represent relatively traditional attitudes towards the division of labour between women and men and lower scores represent a division of labour based on women and men performing similar tasks at home and in the workplace.

* For male engineers the SELF and IDEAL measures consist of questions about men's roles (Forms H & I), whereas the MIW measure consists of questions about the roles of an 'ideal woman' (Form IW). For female engineers all measures are based on questons about women's roles (Forms A, B & C). Therefore, the SELF and IDEAL measures are not directly comparable for male and female subjects.

Appendix 13.1 cont.

SELF, IDEAL AND MAN'S IDEAL WOMAN AT TIME 2: Comparison of Mean Scores for Male Engineers and Female Engineers in London and Birmingham+

Group	SELF2*	s.d.	IDEAL2*	s.d.	MIW2	s.d.
Lon M. Eng (N = 19)	99.84	13.42	99.11	12.75	97.37	6.60
Birm M. Eng (N = 20)	101.70	5.07	101.10	12.31	97.55	7.86
All M. Eng (N = 39)	100.80	9.95	100.13	12.40	97.46	7.18
Lon F. Eng (N = 16)	86.94	12.14	85.75	16.78	111.69	22.17
Birm F. Eng (N = 17)	86.53	9.31	86.06	12.63	111.65	16.25
All F. Eng (N = 33)	86.73	10.60	85.91	14.55	111.67	19.04

+ These measures have been scored so that higher scores represent relatively traditional attitudes towards the division of labour between women and men and lower scores represent a division of labour based on women and men performing similar tasks at home and in the workplace.

* For male engineers the SELF and IDEAL measures consist of questions about men's roles (Forms H & I), whereas the MIW measure consists of questions about the roles of an 'ideal woman' (Form IW). For female engineers all measures are based on questons about women's roles (Forms A, B & C). Therefore, the SELF and IDEAL measures are not directly comparable for male and female subjects.

Appendix 13.1 cont.

T tests in Relation to Hypothesis 13.1

IDEAL WOMAN AT TIME 1: A Comparison between Male and Female Engineers in London and Birmingham in their description of an 'Ideal Woman'+

Group 1	Group 2	Variable	t	df	signif.*
Lon M. Eng	Lon F. Eng	IDEAL WOMAN	1.73	33	.05
Birm M. Eng	Birm F. Eng	" "	1.95	35	.03
All F. Eng	All M. Eng	" "	2.58	70	.005

+ Male Engineers described the sex role attitudes of their Ideal Woman (Form IW), and Female Engineers described the sex role attitudes of their Ideal Woman (Form B).

* Significance levels are for a one-tailed test.

Appendix 13.2

T tests in Relation to Hypothesis 13.2

MAN'S IDEAL WOMAN AT TIME 1: A Comparison between Male and Female Engineers in London and Birmingham in their description of Man's Ideal Woman+

Group 1	Group 2	Variable	t	df	signif.*
Lon M. Eng	Lon F. Eng	M. IDEAL	-1.62	33	.06
Birm M. Eng	Birm F. Eng	" "	-4.18	35	.0001
All M. Eng	All F. Eng	" "	-3.97	70	.0002

+ Male Engineers described the sex role attitudes of their Ideal Woman (Form IW), whilst Female Engineers described the attitudes of Man's Ideal Woman (Form C).

* Significance levels are for a one-tailed test.

Appendix 13.3

T tests in Relation to Hypothesis 13.3

REGIONAL DIFFERENCES FOR MALE ENGINEERS: A Comparison between Male Engineers in London and Birmingham on the SELF, IDEAL and MAN'S IDEAL WOMAN measures of the MAFERR at Time 1+

Group 1	Group 2	Variable	t	df	signif.*
Lon M. Eng	Birm M. Eng.	SELF1+	1.35	37	.19
Lon M. Eng	Birm M. Eng.	IDEAL+	0.76	37	NS
Lon M. Eng	Birm M. Eng.	M. IDEAL	0.87	37	NS

+ The SELF and IDEAL measures refer to men's roles, whereas the MAN'S IDEAL WOMAN measure refers to women's roles.

* Significance levels are for two-tailed tests.

Appendix 13.4

(See text of Chapter Thirteen for information on the analyses of variance performed.)

ABSOLUTE CHANGE FOR MALE AND FEMALE ENGINEERS: A Comparison of the Absolute Values of Change on Self, Ideal and Man's Ideal Woman+ for Male Engineers and Female Engineers in London and Birmingham

Group	S.Chnge	s.d.	I.Chnge	s.d.	M.I.Chnge+	s.d.
London M. Eng (N = 19)	10.47	7.54	9.32	6.88	8.32	6.05
London F. Eng (N = 16)	6.75	5.79	9.31	6.76	16.69	4.08
Birm M. Eng (N = 20)	4.25	3.31	7.75	9.50	5.30	3.85
Birm F. Eng (N = 17)	8.18	6.70	12.82	9.65	15.24	13.24

+ Men completed the scale for their Ideal Woman, whereas women completed the scale for Man's Ideal Woman. A higher score indicates a more traditional attitude.

Appendix 13.4 cont.

T Tests in Relation to Hypothesis 13.4 & 13.5

ABSOLUTE CHANGE ON THE MAFERR: A Comparison between Male and Female Engineers in London and Birmingham on SELF, IDEAL and MAN'S IDEAL WOMAN measures+

Group 1	Group 2	Variable	t	df	signif.*
Lon M. Eng	Lon F. Eng	SELF	1.61	33	.12
Lon M. Eng	Lon F. Eng	IDEAL	2.25	33	.03
Lon M. Eng	Lon F. Eng	M. IDEAL	1.62	33	.11
Birm M. Eng	Birm F. Eng	SELF	-2.31	35	.03
Birm M. Eng	Birm F. Eng	IDEAL	-1.61	35	.12
Birm M. Eng	Birm F. Eng	M. IDEAL	-3.21	35	.003

+ Male Engineers described their own sex role attitudes and those of an Ideal Man on the SELF and IDEAL measures; they described the sex role attitudes of an Ideal Woman on the MAN'S IDEAL WOMAN measure. Female Engineers completed all three measures in terms of women's roles.

* Significance levels are for a two-tailed test.

WITHIN GROUP CHANGES ON SELF: Paired T Tests between SELF1 and SELF2, IDEAL1 and IDEAL2, MAN'S IDEAL WOMAN1 and MAN'S IDEAL WOMAN2 for Male Engineers and Female Engineers in London and Birmingham

Group	Mean SELF1	Mean SELF2	t	df	signif.*
Lon M. Eng	97.90	99.84	-0.65	18	NS
Birm M. Eng	102.05	101.70	0.28	19	NS
All M. Eng.	--	--	not valid		
Lon F. Eng.	90.19	86.94	1.54	15	.14
Birm F. Eng.	88.82	86.53	0.90	16	NS
All F. Eng.	89.49	86.73	1.68	32	.12

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* Significance levels are for a two-tailed test.

Appendix 13.4 cont.

WITHIN GROUP CHANGES ON IDEAL: Paired T Tests between IDEAL1 and IDEAL2 for Male Engineers and Female Engineers in London and Birmingham

Group	Mean IDEAL1	Mean IDEAL2	t	df	signif.*
Lon M. Eng	98.63	99.11	-1.75	18	.10
Birm M. Eng	101.55	101.10	0.16	19	NS
All M. Eng.	--	---	not valid		
Lon F. Eng.	90.19	85.75	1.18	18	NS
Birm F. Eng.	90.65	86.06	1.21	16	NS
All F. Eng.	89.88	85.91	1.69	38	.10

---
* Significance levels are for a two-tailed test.

WITHIN GROUP CHANGES ON MAN'S IDEAL WOMAN: Paired T Tests between MAN'S IDEAL WOMAN1 and MAN'S IDEAL WOMAN2 for Male Engineers and Female Engineers in London and Birmingham

Group	Mean M. IDEAL	Mean M. IDEAL	t	df	signif.*
Lon M. Eng	96.32	97.37	-0.44	18	NS
Birm M. Eng	96.55	97.55	0.16	19	NS
All M. Eng.	96.44	97.46	-0.75	38	NS
Lon F. Eng.	106.00	111.69	0.79	15	NS
Birm F. Eng.	118.65	111.65	1.50	16	NS
All F. Eng.	---	---	not valid		

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* Significance levels are for a two-tailed test.

Appendix 13.5

F TESTS FOR COMPARING VARIANCES: A Comparison of Female and Male Engineers on Man's Ideal Woman (MIW) at Time 1

Group 1	Group 2	Variable	F	df	signif.
Lon F. Eng	Lon M. Eng	MIW	7.55	15,18	.0001
Birm F. Eng	Birm M. Eng	MIW	7.47	16,19	.0001
All F. Eng	All M. Eng	MIW	8.07	32,38	.0001

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SUPPLEMENTARY MATERIAL

INTRODUCTION TO THE SUPPLEMENTARY MATERIAL

The Supplementary Material in this section begins with a Final Report to the Engineering Industry Training Board and the Equal Opportunities Commission/Social Science Research Council's Joint Panel on Women and Underachievement. This research was carried out jointly by the author and her research assistant, Janette Brocklesby. Ms. Brocklesby's contract finished at the completion of the data collection, and she subsequently emigrated to New Zealand. Although Ms. Brocklesby was responsible for carrying out the interviews described in this paper, the author analysed the data and wrote the Final Report.

The remaining two parts of this section include a paper on subjects in the present sample which was prepared for a conference on Girl Friendly Schooling at Manchester Polytechnic held in September, 1984 and a copy of a sample interview used in the research.

GETTING ON IN ENGINEERING:

BECOMING A WOMAN TECHNICIAN

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Report submitted to:

Engineering Industry Training Board

Equal Opportunities Commission/
Social Science Research Council
Panel on Women and Underachievement

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PREFACE

Women remain a rarity at technician level in engineering. In 1982 they accounted for only two per cent of the technician workforce. The research described in the present report grew out of the Engineeri Industry Training Board's (EITB) pioneering Girl Technician Scholarshi Scheme, which was begun in 1976 and was completed in 1980. (Footnote 1 Through the Scholarship Scheme the EITB explored several patterns of training and demonstrated to industry the value of training women as technicians.

Both the present research and a subsequent study (EITB, 1983) have shown that the majority of women who participated in the Scholarship Scheme continued their training as technicians. When the young women completed questionnaires in the present study, 79% were employed as technician apprentices. An additional 9% were employed in fields related to engineering and only 6% were employed in jobs unrelated to their training. In 1981 a follow-up study of young women from the first two intakes to the Scholarship Scheme showed that 61% of those responding to the survey were employed as technicians in engineering, whilst 14% were still being trained or were full-time students, and 12% were employed as technicians in fields other than engineering (EIT 1983). (Footnote 2).

The research described in this volume is one of a series of reports by the senior author on the experiences of girls in the Scholarship Scheme. (Footnote 3) Her research has been funded by the Engineering Industry Training Board, the Equal Opportunities Commission and Social

Science Research Council. (Footnote 4) Although the present report focuses on the experience of the girls during their third and fourth year of training as technicians, it draws heavily on the findings from her research on the first two years of the girls' training.

It is hoped that the series of reports on the Scholarship Scheme will provide encouragement to young women who are considering training as technicians and will demonstrate to those who advise and employ young women their suitability for training as technicians in engineering. (Footnote 5)

Footnote 1. The Scholarship Scheme was succeeded by the Premium Grant Scheme in 1979. Under this programme the EITB provided companies with an incentive to recruit young women as technician apprentices. At the end of the training year 1981-82 over 600 girls had been recruited under this scheme with approximately 90-120 firms taking part in the scheme each year.

Footnote 2. The response rate to the postal questionnaire used in the present study was 73%. This information was obtained during young women's third or fourth year of training. The EITB survey also used a postal questionnaire and achieved a response rate of 71%.

Footnote 3. Information on the career choice of girls in the Scholarship Scheme has been published in a chapter entitled, "Who says girls can't be engineers". In A Kelly (ed) The Missing Half, Manchester University Press and in a chapter with E T Keil "Into work: continuity and change". In R Deem (ed) Schooling for Women's Work, Routledge & Kegan Paul.

Footnote 4. The senior author's research has been founded by the Engineering Industry Training Board (1977-1981) and by the Equal Opportunities Commission and Social Science Research Council's Panel on Women and Underachievement (1979-1981). The work has also been supported by (1975-1980) a Social Science Research Council Programme Grant to Professor G M Stephenson.

Footnote 5. Further information about the Scholarship Scheme and on the employment of women as technicians in engineering is available in EITB Research Report No 9 'The Technician in engineering', Part 4 'Employment, education and training of women technicians'.

A PERSONAL NOTE

The choice of a research topic always has personal meaning. The authors of the present study both have an interest in engineering. Both are daughters of engineers, and both once considered technical careers. These concerns and their feminist views have guided the direction of the research.

In writing this report we have combined quantitative and qualitative data. We have found the material from individual interviews invaluable in understanding the questions we are exploring. In choosing quotations from the hundreds of pages of interview transcripts, we have obviously been forced to make selections and interpretations of the data. In doing so, we have attempted to represent some of the recurrent themes in the experience of the young women in the study. Our aim has been to illustrate the process of becoming an engineer or a secretary.

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CHAPTER 1 BACKGROUND OF THE RESEARCH

In response to the need for well qualified young people as technicians in engineering, the Engineering Industry Training Board (EITB) launched the Girl Technician Scholarship Scheme in 1976. This was an experimental programme which sponsored the first two years of young women's training as technicians. The Scheme was designed to demonstrate that women can work effectively as technicians and to encourage industry to recruit more women at this level. Through providing examples of successful young women technicians, the EITB hoped to modify the image of engineering, so that girls, their teachers, careers advisors and families would see it as offering a promising career.

Women represent almost one quarter of the employees within the engineering industry. However, ninety three per cent of women are employed in three relatively low-skilled categories. In more highly skilled jobs women remain a rarity. They constitute less than one per cent of craft employees, only two per cent of technicians and two and one half per cent of scientists and technologists (EITB, 1982).

In its operation of the Scholarship Scheme the EITB was one of the first organisations to make use of provision of the Sex Discrimination Act (1975) which allows training bodies to carry out positive discrimination in areas in which there has been a serious imbalance in the ratio of the sexes.

The EITB Girl Technician Scholarship Scheme involved three groups of approximately 50 girls each who began training in 1976, 1977 and 1978. In the Scheme the EITB was responsible for the first two years of the girls' training. At the end of this time, it assisted girls in finding employment as apprentices in companies which would allow them to complete their training as technicians. The present research is based on questionnaires and interviews from a sample of these young women. It was designed to explore some of the problems faced by young women entering a male-dominated industry.

Technician Training

In the engineering industry the most common sources of recruitment for technicians are sixteen year old school leavers recruited for initial technician training or people already working in the industry in other types of jobs, notably skilled craft jobs. The recommended minimum school-leaving qualifications for entry to initial technician training are three or four 'O' levels including passes in English, Mathematics and Physics. However, some companies ask for higher qualifications and others have to accept lower qualifications, depending on the market forces in employment in the area.

The period of training for technicians is usually between three and one half and four and one half years. During this time most apprentices receive periods of day release to a college of further education where they study for formal qualifications. Many technicians continue to be given paid release in the year after their training is finished in order to complete a higher level qualification.

Until recently most technicians studied for qualifications from the City & Guilds of London Institute or for Ordinary and Higher National Certificates and Diplomas. At the present time the majority of technicians receive Certificates and Diplomas from the Technician Education Council (TEC).

During their first year technician apprentices are trained 'off the job'. They are most frequently trained in company or group training centres or in colleges of further education. The training is a broad-based one covering basic engineering skills complemented by further education on day or block release.

In the second year the majority of apprentices are trained in the companies which employ them. In the second and third years they spend periods of time ranging from a few weeks to several months in a variety of different departments in the company. This experience is designed to give trainees an overview of how the company works and some training and experience of the wide variety of work which technicians carry out. In the last six months of training trainees normally work in the department in which they are expected to take up their first post of responsibility.

Technicians carry out a wide variety of jobs. They work in areas such as work study, quality assurance, estimating, progress planning, design, draughting and production (ECIS, 1979). Their level is between that of a craft employee and a professional engineer, and they are often involved in communicating with people of both levels.

Because technicians carry out jobs in so many different areas in the industry and because the industry is in itself a highly varied one, it is extremely difficult to provide a definition of the technician's role which applies to all situations. However, it may be useful to distinguish the technician from the craft employee and the professional engineer. Craft employees usually carry out the highly skilled tasks involved in

the making of parts or components, whereas the professional engineer is responsible for overall design and ensuring that the final product meets with the original specifications. The technician frequently acts as a link between the two workers and sometimes functions as an assistant to the professional engineer. Some technicians are responsible for supervising or allocating work to craftswomen (craftsmen) or operators.

For example, a technician might produce detailed drawings from a design made by a professional engineer. After producing these drawings she/he might arrange for a craftswoman (craftsman) to construct components specified in the drawing. She/he might also be responsible for ordering any special materials that are needed for building the component. In the following passage, W.J., one of the young women engineers, explains her job and differentiates the role of the technician from that of the professional engineer. Although the examples of a design and control engineer are specific to her company, the basic distinction between the engineer and the technician is one that is recognised in most parts of the industry.

> When I say I'm not really an engineer it's because I'm a technician... which is someone who helps an engineer. An engineer is basically either a control engineer or a design engineer - someone who designs or controls equipment. A technician is someone who puts into practice their ideas. We're the ones who actually go 'round and collect the stuff and build it up and say, 'Is this what you want?' You work very closely with engineers, but it takes a lot of weight off them. You know if something's not come in; <u>you</u> chase it up. You use a bit of your own initiative. You say, 'How would you like this done?' and you go to the workshop and you sort it out for them...

Scholarship Scheme: Pattern of Training

The pattern of training followed by the girls met with the training recommendations for technicians and technician engineers of the Engineering Industry Training Board (FITB, 1969, EITB, 1971). The training programme followed by the girls is the same one which would be followed by boy school leavers who were entering apprenticeships as technicians. Details of the training are outlined in the series of Technician Guides prepared by the Training Board (EITB, 1976)(see Footnote 1).

During their first year, girls in the Scholarship Scheme received basic 'off the job' training with periods of day or block release for further education. In their second year girls were placed in companies where they received training in manufacturing practices and drawing office work. They also were given experience in one or more of the following areas: quality control, testing, production, planning, numerical control programming, inspection, and development. During this time they continued to attend colleges of further education on day or block release.

The Scholarship Scheme was based in two geographical areas: London and Birmingham. In London girls were trained in electrical engineering and in Birmingham they were trained in light mechanical engineering. However, the first year of training was quite similar with both groups receiving a broad general grounding in engineering. The EITB was interested in exploring different models of training young women within its general pattern of training for technicians, so that there were variations in the organisation of the training in the two regions.

In London there were two sites used in first year training. Some girls were trained at an EITB Training Centre and attended a college of further

education for periods of day or block release. Other girls in the London region completed an integrated first year at a different college of further education. Girls at the EITB Training Centre completed a TEC level I course in their further education, whereas those who attended a college full-time completed a TEC course which covered both Levels 1 and 2. During their second year of training all girls in London were placed in companies for industrial experience and continued to attend college during periods of day or block release. Most girls spent their second year in one company placement, although a few girls who were unhappy with their initial placements were transferred to another company.

In contrast, girls in Birmingham began their training in companies' first year training centres and attended a college of further education for study on day or block release, completing either a City & Guilds Mechanical Engineering Technicians Certificate Part I or a TEC level 1 course. When in their second year, girls in Birmingham had three or four industrial placements, which gave them experience in a variety of engineering companies. Most girls in both regions received the TEC Certificate or Diploma towards the end of their second year of training.

The three models for training used in the Scholarship Scheme are ones commonly used in the training of boys. However, most of the girls were obliged to make a transition from EITB sponsorship to company employment at the end of the second year, whereas the majority of boys are not faced with this discontinuity. In some cases, girls found employment in companies where they had been placed during their second year, so that the transition was a relatively smooth one.

During their first year the girls were trained as a group separately from boys although boys were being trained in the same centres or colleges. In their second year most girls were placed in pairs or in groups of three or four in companies although a few girls were on their own during this time.

The girls who participated in the present research completed questionnaires and were interviewed during their third or fourth year of training after they had left EITB sponsorship and were employed by engineering companies. Although none of the young women had completed her apprenticeship at the time of the research, the majority had been told of the area in which they were to be employed. They tended to be concentrated in five areas: test, quality control, production, the laboratory and the drawing office. This finding fits with recent evidence (EITB, 1982) suggesting that women working as technicians are more likely than men to work in lower level jobs.

The Control Group: Secretaries

For comparison with the engineers, a control group of young women who had followed a two year academic course involving secretarial studies was chosen. This group offered several advantages. Its members had attended a two year college course and had entered employment at approximately the same time that the engineers had left EITB sponsorship and had begun employment. The members of the control group had academic qualifications similar to the engineers. However, the majority of young women in the control group were employed as secretaries or personal assistants. They tended to work directly for a male boss, thus occupying a traditional female role. For purposes of convenience, control group

members will be referred to as 'secretaries' although many held more responsible positions.

In London control group members attended the same two colleges that the engineers attended during their periods of further education. Most of the young women followed an OND course in Business Studies which included training in secretarial skills. A few girls in this group participated in a course for bilingual secretaries.

In Birmingham girls in the control group attended a college of further education which provided two year courses for private secretaries and medical secretaries. It had been hoped to find a group of girls on an OND course similar to that followed by the girls in London. However, it was not possible to locate an OND course which included secretarial skills. The two courses selected were seen as being similar to the London courses in drawing young women of equivalent academic qualifications and in tending to place their graduates in positions involving considerable responsibility. (For further information on the various courses followed, see Appendix 1.1)

The Research Sample

The research sample consisted of 85 young women who had completed two years of training as technicians in engineering and 110 young women who had undergone two years of training for jobs involving secretarial skills. Owing to the difficulty of matching subjects for region, college course, type of job and year of participation in the study, it was decided to include a larger number of secretaries than engineers in the sample. (See Appendix 1.2 for a summary of the numbers of subjects in the various conditions in the research.)

At the time of participating in the research 67 (79%) of the engineers were employed as technician apprentices, whereas 8 (9%) of young women were in engineering-related fields and 5 (6%) had left engineering. An additional five young woemn were attending university courses in engineering or in a closely related field.

With the secretaries, 45 (41%) were employed as secretaries or personal assistants and 33 (30%) were employed as medical secretaries. In addition, four women were employed as trainees or clerks involved in accounting or handling money, and two young women were trainees in the travel industry. Two of the respondents were working as clerical officers in government departments and two were attending university. However, 18 young women (16%) were employed on a temporary basis or as clerks or shorthand/typists. Four women from the sample were no longer involved in jobs which were related to their training courses. (Further information on the jobs held by both the engineers and secretaries is presented in Appendices 1.3 and 1.4.)

Research Measures

Questionnaires were sent to subjects who began their training in 1976 in the winter of 1979-1980. The young women engineers in this group were in the middle of their fourth year of training and most of the secretaries had been employed for approximately a year and a half since completing their college course. Although much useful information was obtained from this group, this sample of 25 engineers and 35 secretaries was seen as forming a pilot study. Many of the questions on this first version of the questionnaire were open-ended, the responses from them were analysed for content, so that questions could be refined and structured in subsequent questionnaires. Comments from the respondents also suggested several additional questions that were included in the questionnaires sent to young women who began training in 1977 and 1978.

The subjects in the 1977 sample were sent questionnaires in the summer of 1980. At this time the engineers were completing the third year of their apprenticeship and the secretaries had been employed for approximately one year. Thirty two engineers and forty six secretaries completed this questionnaire.

The subjects who began training in 1978 were sent questionnaires in the summer of 1981. Like the 1977 sample, these subjects were finishing the third year of their apprenticeships or the first year on the job at the time they completed the questionnaires. This version of the questionnaire included several more detailed questions about career choice and plans for child care which were not present in the previous questionnaires. An overall response rate of 67% was achieved with the sample with 73% of the engineers and 64% of the secretaries completing and returning the questionnaires. (See Appendix 1.5 for further information on the response rates in the sample.)

To gain further information and insights on some of the processes involved in entering the two careers, 18 engineers and 19 secretaries were interviewed about their career choices, jobs and future plans for their careers. The young women who were interviewed were selected from both regions and from the 1977 and 1978 samples. Owing to problems of travel and of the availability of interviewers it was not possible to interview the same number of young women in each region in the two years. However, the young women who participated in the interviews were selected to represent a wide range of jobs and varying levels of satisfaction with their work.

The interviews were open-ended and were approximately 45 minutes to an hour in length. All interviews were tape recorded. One of the authors and three additional interviewers - all of whom had had previous training in in-depth interviewing - carried out the interviews, following a general outline of topics suggested by the authors. (Further information on the respondents interviewed and an outline of the topics considered in the interviews is provided in Appendices 1.6 and 1.7.)

Eight young women (four engineers and four secretaries) completed repertory grids, designed to illustrate their personal constructs and relationships. The grids were designed to provide additional information on the influence and support provided by family and friends for young women making relatively traditional and unusual career choices. Whilst there are problems in generalising from such a small number of subjects, this study provides several hypotheses that might be fruitful for further investigation. (See Footnote 2)

The Jobs

Although the jobs held by the young women in the research are varied, it may be useful to describe the positions and duties of several young women in the sample. On the questionnaire responderts were asked to detail a day's duties. The following four descriptions have been selected as representing typical jobs held by engineers and secretaries. Three of the four respondents were in their first jobs, whilst one had worked as a shipping clerk before taking up her present and more responsible secretarial post.

I.A. is a trainee electronics technician working in a large electrical firm in Greater London. She has worked in this company during her second year industrial placement under the Scholarship Scheme and had been employed by the company for approximately ten months when she completed the questionnaire. She will finish her apprenticeship in another fourteen months. She hopes to be employed eventually in the product development or research department.

During her apprenticeship I.A. has worked in five departments. She has already worked in quality assurance, test gear maintenance, the product control laboratory and the preparation department. She is currently working in the video systems lab.

> On a typical day a member of my department will ask me to do an odd job such as making small modifications to a part in a computer that is being developed. I am given the circuit diagram to work from so that I only have to obtain the correct components from stores and solder them into the correct position. I then test the circuit, usually using an oscilloscope. If I do not know what results to expect, I can get someone to explain the circuit, how it works, its function and the wave forms to expect at various points on the panel.
>
> I am also given projects to do from time to time. These projects are either complete panels for use inside the computer being developed or additional pieces of equipment for use in conjunction with the computer. I am not yet capable of designing my own circuits, so I am given the circuit diagram with the component values written on it. I have to decide how best to fit the components onto the panel (or equipment) and draw the layout diagram. I solder the components into place and in the case of a piece of separate equipment, I have to design the box, e.g., decide where to cut holes for plugs and sockets, etc. If necessary, I send the box to the mechanical design department to have the holes cut or flange plates made for me.
>
> I test the circuit as before and finally enter all my findings and circuit diagrams in a log book for future reference.

C.L. works as a trainee draughtswoman in a structural engineering company in the West Midlands. She was completing the third year of her apprenticeship when she filled in a questionnaire and expects to work as a draughtswoman when she finishes her apprenticeship. During her time in this company she has worked in six departments or areas: costing and estimating, the shop floor, inspection, quality control, setting out and the drawing office. She describes her present duties below:

> The company I work for produce drawings for structural sites, e.g., furnaces, water waste treatment plants, flaring systems, etc. Therefore, on a typical day I draw the various sections that go together to form the finished product. If working on furnaces (fired heaters is their other name) there are convection sections, radiant sections, tubes for transport of the fluids, burners, the casing, etc. that are all parts that go to the assembly of the furnace. What I usually have to draw are the coils, which involve drawing tubes and doing the parts lists stating how many there are, what materials they should be made out of and exactly how long they should be, plus any fittings that have to go on the tubes like flanges, reducers, etc.
>
> I expect to be doing the same sort of job only slightly more complicated (when I finish training). At the moment the drawings I am given to do are fairly easy and not a lot of thought has to be put into them to get them completed...I expect to be given Foundation Loading Drawings to do when I am fully qualified.

P.H. works as a personal assistant to an accountant for a large popular magazine. When she completed the questionnaire she had held this post for approximately four months. Prior to holding this job she worked as a shipping clerk for nine months. In her present job she works for the "Shops" Department. Although she is primarily responsible to the accountant in the department, she also runs the personnel section of the Shops Department. She lists her duties under the two headings:

Personnel

1. Answering queries from employees.
2. Keeping lists of their holidays, salaries, etc. and updating them when necessary.
3. Any disciplinary problems.
4. Representative of any shop staff at meetings concerning the whole firm.

Accounting

1. Collecting the weekly sales figures from each centre, tabling them and comparing them with last year.
2. Expense accounts.
3. Monthly accounts for each centre.
4. Credit sales analysis.

She explains that she spends most of her time coping with what she describes as "everyday problems" which occur in shops. For example, she is often involved in compensating and providing extra petty cash or stock. She also spends time dealing with "customer relations" and what she describes as "keeping the staff happy." Two days per week are taken up producing weekly sales figures and the last week of each month is devoted to producing monthly figures and preparing them for the computer.

M.B. works as a medical secretary in a large hospital in Birmingham. She gained this job immediately after leaving college and was initially quite amazed at the amount of responsibility she was given. She usually works on her own and is relied upon to organise her work. She enjoys working with her present boss and hopes to continue in her present job or in a similar post. Her description of her job follows:

> On a typical day I would deal with telephone enquiries: these are mainly to do with appointments to clinics, enquiries about blood tests and results which would mean transferring the call to the laboratory. I (also) type results and send them to the appropriate wards or GPs. Notes for the patients have to be sorted with results from tests filled in. Notes for clinics have

> to be got ready; this involves a good deal of telephoning (and) tracing notes that have been booked out to other clinics. Letters have to be dictated about these patients. I receive these from three doctors. These letters are then typed, signed and sent out. (I am also involved in...) running errands ...making tea, photocopying and taking notes up to the ward for patients being admitted.

> The majority of my time is spent dealing with telephone enquiries. These act as continual interruptions throughout the day. My other major task is the preparation for clinics. This involves typing and photocopying a list of patients attending the clinic, sending them to the people involved with running the clinic, getting the notes out and making sure all results are filed.

In the following chapters material from questionnaires and interviews will be used to illustrate how the respondents chose their careers, how they felt about their jobs and how they saw their lives in the future. Whenever possible differences in responses to questionnaire items have been analysed for the effects of place as well as for differences between engineers and secretaries. (The statistical technique used in the majority of the analyses is discussed in Appendix 1.8.)

Footnote 1:
The Technician Guides are designed to cover the topics recommended by the EITB for general training: manufacturing practice, design appreciation, communication, control techniques and commercial matters. The Guides were introduced in their present form in 1976. However, the content of the Guides is frequently updated, so that several of the Guides have been published more recently. Further information about the Technician Guides and a list of individual titles in the series is available from the Engineering Industry Training Board, 54 Clarendon Road, Watford WD1 1LB.

Footnote 2:
The results of the grid study are presented in a separate paper available from the authors.

CHAPTER 2 CHOOSING AN UNCONVENTIONAL CAREER

How do girls come to choose an unconventional career? Who encourages them to consider an unusual choice? Who discourages them or tells them that the job really isn't appropriate for a girl?

Previous research on the girls participating in the Scholarship Scheme (Newton, 1981) has suggested the importance of the school and the Careers Advisory Service in deciding to enter engineering. Although not all girls reported receiving encouragement from these sources, it was through the school and the Careers Service that many of the girls found out about engineering and the Scholarship Scheme. In contrast, girls and boys following traditional careers were significantly more likely to see their parents and family friends as important in providing information and influencing their career choice.

This finding should not be taken to mean that parents and friends usually discouraged girls from doing engineering. In many cases they were extremely helpful and supportive; however, parents did not usually think of suggesting engineering as a career to their daughters. In the present research respondents were asked about the roles of teachers, family and friends in their career choices. They were also asked to indicate whether they would make the same choice again and to describe the advice they would offer to schoolgirls who were considering a similar decision.

Influences on Career Choice

In the 1976 and 1977 samples, respondents were asked who had most influenced their career choice. Although the majority of respondents felt that the decision had been primarily theirs, 43% of the young women (see Footnote 1) suggested other people who were influential in their career choice. When the responses of the engineers and secretaries are compared, several important differences emerge. For engineers, the most frequently mentioned source of influence is the careers teacher or careers officer; for secretaries, the most frequently mentioned source is their parents (see Table 2.1). These differences between the groups are statistically significant, so that engineers are more likely than secretaries to see teachers and careers officers as influential in their career choice. Conversely, secretaries are more likely than engineers to see their parents as influential. In addition, engineers in London are significantly more likely than engineers in Birmingham or secretaries in either region to mention teachers or careers officers as having influenced them. (see Appendix 2.1)

Table 2.1 Influences on Career Choice (1976 and 1977 samples combined)*

	Engineers	Secretaries
†Parents**	8	17
Other Family	7	5
Family Friends	-	2
Peers	-	2
School***	11	4
TOTAL NUMBER SUBJECTS	26	30

* The two samples are combined in this summary table. However, the years were analysed separately and then combined using the Mantel Haenszel technique. (See Appendix 2.1 for further information on the analysis.)

† The category 'parents' includes the responses: 'parents', 'mother', and 'father'.

** Differences between the engineers and secretaries in the influence of parents are significant at the .05 level with a Mantel Haenszel composite chi square of 4.53.

*** Differences between the engineers and secretaries in the influence of school are significant at the .05 level with a Mantel Haenszel composite chi square of 6.31.

When the patterns of family influence are compared, the sex of the family member is related to the sex-typing of the job; fathers and brothers (but rarely mothers and sisters) are seen as influential in a decision to do engineering. Similarly, mothers are more likely than fathers to be mentioned in a decision to take up a secretarial career. It is interesting to note that secretaries were more likely than engineers to see both parents as influential.

Table 2.2 Influence of Female and Male Family Members on Career Choice (1976 and 1977 samples combined)†

	Engineers	Secretaries
Female family members*	2	8
Male family members	11	2
Both female and male family members or sex unspecified**	2	12
TOTAL NUMBER SUBJECTS	15	22

† The two samples are combined in this table. However, the two years were analysed separately and then combined using the Mantel Haenszel technique.

* Differences between engineers and secretaries mention of male and female family members are significant at the .01 level with a Mantel Haenszel composite chi square of 8.29. (See Appendix 2.2).

** Some subjects mentioned more than one family member; others used broad or relatively undifferentiated terms, e.g., parents, family, etc

It was decided to examine the pattern of family and school influence more closely in the 1978 sample. Respondents were asked to indicate how family members and teachers had been involved in their career choice. They could indicate which people had influenced, encouraged or discouraged them. They could also note if anyone had commented on whether their career was 'appropriate for a girl', and they could indicate who gave them information about their career.

Although there were relatively few differences in the patterns of influence and encouragement reported by engineers and secretaries, there were striking differences in the amount and the patterns of discouragement. In the group of 27 engineers, 21 felt that one or more people were discouraging; whereas in the group of 28 secretaries, only eight saw one or more people as discouraging.

Engineers tended to view female family and friends as discouraging. For example, five engineers but no secretaries perceived their mothers as discouraging; similarly, six engineers but no secretaries saw their female friends as discouraging. The only exception to this pattern was with sisters; four secretaries but only one engineer saw their sisters as discouraging. The role of sister is a curious one. Comments from interviews suggest that sisters are ambivalent about the engineers' achievement; they regard the engineers with both admiration and envy.

Table 2.3 Sources of Discouragement (1978 Sample Regions combined)*

	Engineers (N=27)	Secretaries (N=28)
Mother	5	-
Father	3	2
Sister	1	4
Brother	2	1
Female Friends	6	-
Male Friends	1	-
Careers Teacher	8	1
Subject Teacher	2	1
NUMBER OF DISCOURAGING COMMENTS**	28	9
TOTAL NUMBER OF COMMENTS	210	161
PROPORTION OF DISCOURAGING COMMENTS	13%	6%

* The results were analysed by region for the number of subjects in each of the groups mentioning one or more people who discouraged them. Differences between engineers and secretaries were significant in both regions. When the results of the two regions are combined, the Mantel Haenszel composite chi square is 13.67 which is significant at the .001 level. (See Appendix 2.3)

** Twenty-one out of the twenty-seven engineers mentioned one or more people who discouraged them. Eight out of the twenty-eight secretaries mentioned one or more people who discouraged them.

Careers teachers were also likely to be seen as a source of discouragement for engineers. Eight engineers but only one secretary perceived their careers teachers as discouraging. This finding is an important one, since careers teachers are a major source of influence and information for girls considering engineering.

Another source of difference amongst the respondents was in the people commenting on the appropriateness of the career for a girl. Such a comment may be either positive or negative, so that the comments reported by secretaries are presumed to reflect on the typicality of the choice, whereas the comments recorded by engineers are presumed to indicate the unusualness of such a choice. As in other analyses, the data was analysed for the effects of place as well as the effects of job. On this item there was a strong effect for place, with respondents in Birmingham (both engineers and secretaries) reporting the majority of comments about the sex appropriateness of their jobs.

There were also significant difference between the engineers and secretaries in comments made by female friends and careers teachers on the appropriateness of career choice. Nine engineers but only two secretaries recalled female friends commenting on this aspect of their career choice. Eight engineers but only one secretary remembered a careers teacher remarking on the suitability of her job for her sex. (See Appendix 2.4)

If the above findings are considered as a whole, a pattern emerges from the data. Engineers, especially those in London, report being influenced by teachers and careers officers, and yet teachers and careers officers frequently discourage them from an unconventional career. As a group, engineers report dramatically more discouragement than do secretaries.

Table 2.4 Comments on the Sex Appropriateness of Career
Comparison of Engineers and Secretaries from the two Regions; 1978 sample

	London†		Birmingham	
	Engineers (N=9)	Secretaries (N=7)	Engineers (N=18)	Secretaries (N=21)
Mother	-	1	7	4
Father	-	1	6	1
Sister	-	-	4	1
Brother	-	-	4	-
Female Friends*	3	-	6	2
Male Friends	2	-	6	4
Careers Teacher**	-	-	7	3
Subject Teacher	-	-	4	1
NUMBER OF COMMENTS ON APPROPRIATENESS***	5	2	44	16
TOTAL NUMBER OF COMMENTS	60	39	150	122
PROPORTION OF COMMENTS ON APPROPRIATENESS	8%	5%	29%	13%

† Differences between the two regions are significant, both for engineers and secretaries, yielding a Mantel Haenszel composite chi of 9.49. This is statistically significant at the .01 level. (See Appendix 2.4 for further information on the analysis).

* Differences between the numbers of engineers and secretaries receiving comments are statistically significant at the .05 level with a Mantel Haenszel chi square of 5.79. (See Appendix 2.4)

** Differences between the numbers of engineers and secretaries receiving comments are statistically significant at the .05 level with a Mantel Haenszel chi square of 6.49.

*** Subjects could make multiple responses.

Family influences appear to follow sex role stereotypical lines with fathers and brothers being seen as influential in a choice of engineering and mothers and sisters, as influential in the choice of a secretarial career. Mothers and female friends appear to exert pressure to conform to traditional sex roles by discouraging engineers or by commenting on the appropriateness of the job for a girl.

There are strong regional differences in the way that young women perceive their schools and families as influencing their career choice. Engineers in London are most likely to be influenced by careers teachers or officers, whereas these sources are not seen as influential by engineers in Birmingham nor by secretaries in either region. In addition, both families and careers teachers in Birmingham are likely to comment on the sex appropriateness of a chosen career. This effect holds for engineers and secretaries, suggesting a greater concern with sex role conformity in the Midlands than in London.

Career Characteristics

An important aspect of career choice lies in the perception of the characteristics of a particular career and the type of person who is likely to succeed in that career. All respondents were asked what advice they would offer to schoolgirls who were considering a career such as their own. Although responses to this question may not reflect the factors influencing the respondent's own choice several years previously, they do seem to provide a useful view of her decision in retrospect.

Both engineers and secretaries advise schoolgirls to get as much information as possible about potential college courses and jobs. However, engineers are significantly more likely than secretaries to emphasise the need to think seriously about what the course or job entails and to be extremely dedicated to one's career. They see interest and commitment as essential and are quick to warn others not to consider engineering because it's different or glamorous.

The comments below are typical of those made by engineers:

> Think very carefully about it. A job in engineering is not something to be taken lightly. It is not a glamorous job, nor is it clean, but it is interesting.
>
> Think about it carefully because it's hard work especially at college and if they are not really interested in the job... then it's not fair on people who are...
>
> Be sure; be very sure...

S.B. pointed out how engineering differed from more typically feminine careers, such as hairdressing or nursing in that one always needed to learn something new and keep abreast of changing developments in the field:

> Tell them (schoolgirls) it's not easy. It's not like hairdressing or nursing or something. It's not something you'd learn and finish learning, you know... like you can cut hair and you become a nurse and you know how to look after people. There's always something else to learn, always something coming onto the market that even expert engineers still have to read up and learn about. And I don't think you're ever going to stop it.

In offering advice, engineers and secretaries sometimes refer to useful personality characteristics for their careers. Not surprisingly the characteristics mentioned are different for the two groups. Engineers emphasise the importance of being independent and able to stand up and speak for oneself. They feel that one needs to have a strong personality and to be 'thick skinned'. Several girls mentioned that it was important not to be shy and that it helped to be able to mix with people. They also talked about the need for a sense of humour and the ability to laugh at one's mistakes.

E.M. put her advice to schoolgirls in the form of a checklist, specifying the necessary qualities of a successful engineer:

> Can you cope with college work and exams?
> Do you think you can mix with all types of male?
> Can you prove yourself a good efficient worker?
> Do you mind getting grease and dirt on your hands and face?
> Can you laugh at your own mistakes and not take everything to heart?
> Are you prepared to get on regardless of everybody else and not let them get you down?

Although secretaries mentioned some of the same issues as engineers, the flavour of their comments was different. They talked about confidence and efficiency. They also felt that it was important to show that they were intelligent. Like engineers, they felt it was a bonus to get on well with people. However, whilst engineers talked about getting along with different types of people, secretaries emphasised the need to be able to manage and organise people, particularly their bosses. They also mentioned the need for flexibility and for being helpful. Several of them pointed out the necessity of being willing to take orders and being prepared to do lowly jobs. Their comments appear to reflect their perceptions of their status. Many are given considerable responsibilities yet they receive little public recognition for what they do.

In describing her role at work, T.S. felt that the key to her job lay in her ability to handle her boss:

> I think really at the centre it's yourself; you have to know how to handle your boss. You're also dealing with other people so you've got to be organised and be at the controls.

Similarly D.S. emphasised the need to be both tough and pleasant. She advises schoolgirls not to consider secretarial work as glamorous:

> Don't think that it's glamorous. You don't get company cars, taken out to lunch and sit on the boss's knee. You've got to be dedicated, go out and give your all. It's a career not just a job. Be prepared to take the knocks. Don't have a nervous breakdown everytime something goes wrong. You've got to be tough and pleasant.

Like T.S., D.R. felt that the ability to handle people was crucial to her job:

> How to handle people, I think that's most important. If you can handle people you can turn any situation to your advantage... Often people will forget your weaknesses if they like you and (if you are) pleasant to work with...

In comparing the career descriptions of engineers and secretaries, many similarities emerge. The majority of respondents in both groups see their careers positively and use terms such as worthwhile, rewarding and interesting to describe them. Both careers are seen as varied and are seen by many as having a good future. However, several secretaries and no engineers saw their careers as limited or dead-end. Whilst this difference may be attributed to the fact that most of the engineers were still completing their apprenticeships and not settled in their permanent jobs, it seems more likely to reflect the lack of career structure in most secretarial jobs. This situation was felt acutely by several young women who were employed as medical secretaries, working for consultant physicians or surgeons. In their cases there was no possibility of promotion and the only likely change in their job would be to work for a different consultant.

Amongst the group of secretaries who were interviewed, over half spontaneously described their qualifications as 'something to fall back on' or as skills that would 'stand them in good stead'. The career was seen as providing flexibility and fitting in well with family life. None of the engineers interviewed saw her career in this way and some of them felt that a career break for children would prevent them from returning to engineering. This issue will be explored more fully in Chapter 4.

Importance of School Qualifications

In offering advice to schoolgirls, both engineers and secretaries emphasised the importance of good qualifications. However, secretaries usually referred to good skills, such as shorthand and typing or to professional qualifications, such as the Private Secretaries Diploma or an OND in Business Studies. Engineers were somewhat more likely to refer to school subjects and in doing so they usually specified the subject, whereas secretaries referred to the desirability of having more O or A levels.

There were seven engineers who mentioned specific school subjects on their questionnaires. Notably all were from Birmingham. Technical drawing and mathematics were suggested by three respondents; metalwork, English and physics were mentioned by two respondents, and woodwork and science (type unspecified) were listed by one respondent each.

It has been observed elsewhere (Newton, 1981) that girls frequently experience difficulty in gaining access to traditionally male subjects, particularly craft subjects. This lack of experience seemed important to some of the young women in engineering - even after having completed over three years of an apprenticeship. Some of the young women interviewed felt that they could never catch up with young men in engineering because of this deficit; however, two of those interviewed described how they had taken extra classes at night school after joining the EITB course and felt that they had done well because they now saw the relevance of studying them. Several girls believed that they would never be able to compete on equal terms with men because they lacked childhood experiences of 'messing about' with mechanical things.

S.B. was one of several girls who contended that men and women thought differently and that men were more logical. In the passage below, she notes how men approach a problem and how their previous experience and outside interests give them confidence and a style of reasoning that she lacks:

> ...Engineering seems to come naturally to them... They've been in it so many more years, and they seem to go to a problem and say, 'This is not happening, and this is not happening, so that is not happening there'.
>
> And I just don't think like that. I think all wrong and I can't seem to get my thoughts into a line, to think that that hasn't happened because something else hasn't happened.
>
> They seem to (think differently), like how a car works. They can go to a car and then...even if they didn't know how it worked - they weren't a mechanic on a car - they'd have an idea....

For some girls, the lack of traditionally 'male' knowledge seemed to be a serious handicap. This was a particular problem for girls working in the automotive industry in the Midlands, but it also occurred with girls working in some aspects of electronics. In both situations, girls felt that they began work at a disadvantage in comparison with their male

colleagues and that they had to struggle to gain a basic knowledge of the subject.

J.H., who works in a factory on components for large vehicles, believes that because of early experience most men are 'mechanically minded'. She thinks that it is possible for women to think this way, too, but that they are rarely given the opportunity to develop this type of thought. In her own case, she came in knowing very little and has had to spend a lot of time learning the 'basics' about how engines work:

> They (women) haven't had the basic grounding of what lads have learnt from... really young. They're taught about engines... or they find out for themselves about engines and cars and bikes... They get 'round them - take them apart. They've got that basic knowledge all the while. They seem to be mechanically minded. The odd females are too, but these can't be brought out, because they just don't do these things...
>
> I find that the biggest drawback... I knew nothing about engines at all. I've learnt, and I'm still learning now. It would have helped if I'd had that basic knowledge. You can manage without it, but it's so much more difficult. I could be learning other things instead of having to learn the basics.

In a similar way, A.S. has found that her ignorance of basic circuitry has made it difficult for her to compete with male apprentices. She felt under considerable pressure to learn quickly:

> Most of the blokes walk in knowing basic things about circuitry and they know basically what's going on. I did mine straight from scratch. I had to learn it and I had to learn quick, because all the other blokes were ahead of me already.

In the sample of engineers who were interviewed, almost half emphasised the importance of school qualifications and believed that they had not been adequately prepared for a course in engineering (see Footnote 4).

For some, the problem was one of outright opposition to taking subjects that were usually 'boys' options. Others were able to take some but not all of the craft subjects that they desired. It appeared as if some schools were unable or unwilling to arrange for girls to do more than one 'boys' subject. Although further documentation is needed, at the time that the respondents in the present research chose their options at the end of their third year (1973, 1974, 1975), it seemed extremely difficult for many girls to do the academic and craft subjects that prepared them for engineering and to get advice on a career in engineering.

The examples presented below illustrate some of the problems of choosing boys' options. They also suggest some of the practical issues that the girls confronted.

C.L. did technical drawing at school and felt that her teachers were quite pleased by her decision to do engineering. However, she was unable to do metalwork because the students were not allowed any choice of subjects until their fourth year, and entry to metalwork was restricted to those who had taken it in the third year. She felt that the only solution was to switch schools but the only other possible school in the area was 'all boys'.

J.B. explained that although she was able to do technical drawing it was more difficult for girls than boys to select this option. She observed, 'Because all the boys wanted to do it, we had to fight a bit'. She found that the technical drawing teacher was quite supportive of her interests. She described him as 'a fairly oldish man' who had worked with women in engineering during the war. However, like J.L., when she offered to return to school to talk about her career, she was told that they weren't interested.

Careers Advice

Careers advice may be formal or informal. In the present study, as in recent research by Bennett and Carter (1981), many girls found that their teachers and advisors did not take their interest in engineering seriously. It was also a problem that some advisors knew very little about engineering and were unable to offer girls any useful information.

Even when schools were basically helpful, several girls reported that there was some opposition to their decision to do engineering. In some schools, especially in former grammar schools, it appeared that the choice did not fit with the school's image. Pupils were expected to stay on at school and pursue an academic course; those who left after the fifth form were already somewhat stigmatised and a girl choosing engineering was considered an oddity and a particular example of the schools' having failed to instil its values. Other schools had systems for choosing options that made a girl's choice of some subjects difficult or, in a few cases, impossible. Several girls, in response to encouragement from the EITB, offered to go back to their former schools to give careers talks, but found that their schools were unwilling to let them come. The following examples describe some of the pressures exerted by schools and the covert discrimination that often occurred.

J.L. had done engineering as an option at school and was the only girl in the class. She was encouraged by a careers officer to consider a career in engineering. She had preivously thought about going into a drawing office and was delighted to discover that the EITB Scheme offered her a much wider scope. However, she felt that her school was not very pleased with her choice. She explained that it was a grammar school and that it '...wasn't the done thing for girls to go into engineering'. When she offered to go back to her school after her first year of training, she was told that there was little point her giving a careers talk, because no one would be interested.

In H.C. 's case, she felt that most of the school staff was against her doing engineering. They believed that banking, insurance, or going on to university were more appropriate choices. However, the metalwork teacher arranged a visit to the EITB training centre for her. In describing her schools' attitude, she attributed it to its grammar school ethos: 'It's a comprehensive, but run like a grammar. They didn't like you doing masculine jobs'.

P.S. made a similar observation of her school. She felt that her teachers virtually ignored her when they found out she was doing engineering:

> I didn't get any reaction from the teachers... They just didn't want to know... It was an all girls grammar school and they just wanted you to do A levels and degrees.

Many of the girls who did secretarial courses also reported that their schools were concerned with their academic reputations and urged them to stay on in the sixth form. However, a girl's decision to do engineering appeared to be an added embarrassment for some schools.

Career Choices Recognised

One of the ways of evaluating the investment placed in a career is to consider how the decision is viewed in retrospect and whether the person would make the same choice again. Respondents were asked the question, 'If you were beginning again, would you choose the same field of work?' Engineers

were significantly more likely than secretaries to say that they would make the same decision (see Table 2.5).

Table 2.5 Would You Choose the Same Field of Work Again?†
Comparison of Engineers and Secretaries+

	Engineers	Secretaries
Yes*	53	43
Maybe	25	34
No	3	20
TOTAL NUMBER OF SUBJECTS	81	97

† The question was worded as follows: If you were beginning again, would you choose the same field of work?

\+ Subjects from three samples have been combined in this summary table. However, the results were analysed by year and region, using the Mantel Haenszel technique. (See Appendix 2.5 for further information on the analysis).

* When the three potential responses to the question are analysed, differences between engineers and secretaries are statistically significant at the .001 level. The composite Mantel Haenszel chi square is 12.08.

Although the frequencies of many comments were too low to be analysed for statistical significance, it is worth noting comments that were made by members of only one group. For example, only engineers mentioned that they were happy and that they had become more confident. Only secretaries described their jobs as boring, and only engineers said that their jobs were not boring. In addition, only secretaries mentioned that they wanted more responsibility in their jobs.

Overview

The issue of access to subjects that are traditionally regarded as 'boys' subjects is an important one and involves not only technical or craft subjects, such as woodwork, metalwork and technical drawing but also academic subjects, such as physics and mathematics. When girls are discouraged from taking these subjects or denied access to them, they are not only blocked in following many scientific careers, they also fail to learn about them. Many of the girls interviewed said that they came to consider engineering because they had discovered that they were good at science. They frequently saw engineering as a way of applying their scientific interests in a practical way.

Experience in craft subjects not only provided girls with basic knowledge that was useful in engineering, it also gave several girls the idea that they might enjoy engineering. It also provided an opportunity of being in predominantly male environment. This experience often gave girls confidence that they could cope in this situation and that they could deal with the reactions of others to their doing something different or unusual.

In the passage below, J.B. describes the astonishment of the deputy head when she returned to school after her first year in engineering. Although it is hoped that his reaction is an unusual one, it seems far more likely that many girls are put off unconventional careers by reactions of doubt and disbelief:

> I knew he was going to say, 'What are you doing now?' So, I said, 'Well, I'm an apprentice engineer.' And he was quite stunned. Speechless in fact...taken aback. It was, sort of, 'How did you get into that? You had nothing to start with at all.'

CHAPTER 3 RELATIONSHIPS AT WORK

Beginning work as an apprentice, often as the first girl in that position, was a difficult time for most of the engineers. Added to the usual problems of starting a new job, they were faced with curiosity, disbelief, and sometimes open opposition from the men who were to work with them. They needed to prove that they could do the job, and they also needed to work out their position as women in a strongly male environment.

Kanter (1976; 1977) suggests that in situations where there is a skewed sex ratio, certain characteristic relationships occur between men and women. These relationships follow stereotypical lines and serve to emphasise and heighten sex role boundaries. When there is a serious imbalance in the ratio of the sexes, those who are in a minority, whom Kanter calls 'tokens', are often seen as representatives of their category. Tokens are treated as symbols and not as individuals by the 'dominants' - the members of the majority.

The position of the female engineers in this research fits Kanter's paradigm. The young woman apprentice was sometimes the only female engineer in her company and was usually the only woman in her department. In the few cases in which there was another woman in the same department, the two women were still largely outnumbered by men. Although some women preferred to work with another woman, the majority felt that it was better to be the only woman in the department. Being the only woman often led to being given a special place in the work group. Many young women felt that they were treated somewhat better than male apprentices and found that they were often given extra privileges. In some cases they were not expected to work as hard as young men and were spared from doing particularly dirty or unpleasant tasks. However, this different set of expectations often produced problems, since most young women basically wanted to be treated as equals.

Many women found the attitudes and behaviour of their male workmates confusing. Some men treated them as 'one of the lads', but others behaved in a paternalistic way towards them. Women who joined the men during tea and dinner breaks often found that they were only partially accepted as group members and that they were sometimes 'told' to behave in a more feminine way. Some women spent break times on their own or with other female workers and reported that these times offered them a respite from male conversation and a chance to relax.

Relationships between women at work were sometimes uncomfortable. Many women engineers felt that they were envied and resented by other female workers; there was often tension with older women who worked as operatives on the shop floor. The older women appeared to take exception to the young women's status and qualifications. Secretaries also presented problems for some women; whilst willing to type memos for male apprentices, they could be very awkward about doing the same work for a female.

However, it should be noted that the engineers' difficulty in relationships with other women was not one-sided. Many engineers felt that they had always found it easier to get on with men than with women. As their training progressed, some found that it became increasingly difficult to talk to other women because they were no longer interested in the same things.

In examining the types of relationships at work established by the female engineers, comparisons will be made with the working relationships of secretaries and personal assistants. The secretarial role is a traditionally feminine one and yet often involves a high degree of responsibilit[y]. In looking at the two positions, it is possible to identify similarities in the way the two groups of women saw themselves and the way they were perceived by the men who worked with them. For example, women in both groups experienced difficulty in being seen as intelligent and capable. They had to work hard to convince men that they could deal with responsible tasks. However, when some women had achieved a particular status, they tended to look down on other women and to see themselves as more serious and dedicated. In some instances, women supported chauvinistic practices and felt that discrimination against other women was justified.

Most of the material in this chapter is based on 'in depth' interviews with eighteen engineers and nineteen secretaries. Questionnaire data will be used occasionally to demonstrate group trends.

First Days at Work

The first days at work were often overwhelming for both engineers and secretaries. They frequently needed to learn their way around large factories and to begin to find out what the job entailed. However, for some engineers there was the added stress of being on their own for the first time in a large group of males. In the passage below P.B., who works in a large Midlands car factory describes 'going down the tracks' for the first time and having all the men stop work:

> (I was) scared. (It's) a massive place. All those blokes. The worst was going down the tracks. They stopped. About 500-600 blokes all stop, (and) start catcalling. It's unnerving.

J.H. also found her first days difficult. She describes her first experience of being on her own with a group of males:

> You've really got to fend for yourself. You didn't know a soul in the whole company. It was an absolutely massive place. You've got to learn to get to know people, to speak to people and communicate and learn jobs, new things and that.
>
> You learn to stand up for yourself and to say this that and the other. I think it's difficult if you've never just dealt with males on your own. You just walk in and they'll be sitting there, just totally male...

Another problem for the engineers was one of credibility. Many of their male colleagues had never met a female engineer and found it difficult to believe that a young woman could know anything about engineering. Almost all of the young women interviewed described a 'testing' procedure during their first few days at work. Members of the department besieged them with questions to see what they knew. One of the most frequent tests involved the naming of tools or the parts of machines. Several girls reported going home and 'swotting up' each evening, so that they wouldn't look foolish the next day.

Although a similar sort of initiation process occurs with male apprentices, all of the girls described this initial experience as extremely intense and said that they felt under pressure to prove themselves. They also found that when they moved to a new department during the initial training period, they were obliged to 'begin again' by demonstrating that they knew what they were doing to a new set of colleagues.

The initial 'testing' process is seen by establishing members in a work group as a way of finding out how much an apprentice knows, so that expensive equipment is not misused or damaged. It is also important to

establish that an apprentice is trustworthy and can be relied upon in potentially dangerous situations where quick thinking and co-operation are essential.

Without a group of male apprentices for direct comparison, it cannot be demonstrated that young women are more severely tested than young men would be in similar circumstances. However, it seems likely that an all male group - often without previous experience of female engineers - will respond to a young woman with more uncertainty than they will to a young man. Given the novelty of the situation, group members will probably require more evidence and take longer to decide that a female apprentice is competent and can be accepted as a member of the group.

An alternative interpretation of the data suggests that some young women may have misinterpreted the testing procedure and may not have realised the extent to which it also applied to young male apprentices. They may have assumed that they were under special pressure because they were female, whereas the pressure actually came from their being new and of unknown ability. They may have also found it difficult to separate group members' questioning of their competence from more personal questions about their femininity and about how they fit into the established group.

In contrast to the engineers, none of the secretaries reported a similar sort of technical grilling during her first few days at work. It was evidently assumed that since she had been hired she obviously knew how to type and take shorthand. One secretary did describe how she had gone to considerable lengths, '...to find out about the company and the people in it.' However, this had been her own initiative and she had done it to show that she was 'more than a secretary'.

In describing their first impressions of work, secretaries often mentioned being overwhelmed by the size of the company and being worried about learning new office routines. However, they seemed most concerned with the social aspects of work and fitting in with existing office staff. Many of them had expected a warm welcome and were quite upset to discover how distant others were and how hard they had to work at relationships. Although two young women mentioned 'getting on with their work' as a strategy for becoming accepted, most secretaries described their efforts of trying to appear pleasant and friendly to everyone. One woman explained the need to be nice to everybody:

> You have to smile at everybody and get on with everybody; otherwise you create a bad atmosphere straight away. I mean you have to fall over backwards to be nice to everybody - if you know you've got to work with the people - whether you like them or not.

During their early days at work, both secretaries and engineers were engaged in establishing their places and working out relationships with their supervisors and colleagues. McCall and Simmons (1966) see this process as one of 'negotiating a social identity'. Drawing on some of Goffman's (1963) notions about the presentation of self in everyday life, they suggest that if a person 'looks the part' and gives a credible performance, her claim to be who she says she is, is usually accepted and given the benefit of the doubt.

In the present research, being a woman was seen as contradictory evidence for being an engineer, and the engineers' claims were subjected to intense scrutiny. However, the secretaries were given the benefit of the doubt, and their status was not challenged.

Several of the young women engineers believed they had to work harder and turn in a higher standard of work than their male colleagues. As J.M. put it, 'You've got to be better than them to be as good'. F.B. voiced a similar sentiment, 'To prove you're equal you can't be the same, you've got to be better'.

A part of proving oneself is demonstrating that one is a serious and responsible worker. Some of the women engineers found that their male colleagues did not believe that they were really interested in engineering and planned to pursue it as a career. Their supervisors tended to assign them very easy work and did not expect much from them. This was a particular problem with older men, as noted in the passage below:

> Male older workers would frown if you tried to do something. They thought you were not capable of doing the work. They would not give you very difficult tasks.

However, the problem of not being taken seriously was not confined to engineers. Secretaries frequently complained that they were not given enough responsibility and that they were not seen as intelligent. M.T. describes her relationship with her boss and her early days at work:

> He gives me quite a lot of responsibility but not as much as I'd like. I'd prefer more... When I started there they used to be petty and explain things... I don't think they realised I had any intelligence... In fact they seemed surprised that a secretary has a bit of intelligence.

The initial work experiences of both engineers and secretaries seem to emphasise a theme noted earlier in Chapter 2. There is a reluctance on the part of many people to take young women's ambitions seriously and to recognise their capabilities. The girl whose career teacher laughed when she said she wanted to be an engineer is greeted with similar disbelief by her supervisors when she enters training. At both points she needs to be very determined to convince others that she really does want to be an engineer.

One of the Lads

Kanter (1976) suggests that those who are in a serious numerical minority and have the status of tokens can never be just another member of the group. Their status is always somewhat special and their title is usually double-barrelled, so that people speak of lady wrestlers, male secretaries and women engineers.

In the current research the women engineers were asked how they were treated by their workmates and why they thought they were treated in that way. Engineers in the 1976 and 1977 samples were asked whether they were seen as 'one of the lads' or if they were 'a special case'. It was hoped that these categories would provide a way of describing two basic attitudes towards the engineers.

Slightly over half of the engineers (59%) felt that they were usually treated as 'one of the lads' although four of the thirty two engineers who responded this way qualified their answer by noting some aspect in which they were treated differently. Seven engineers (13%) claimed that they were seen as 'a special case', and almost one quarter of the engineers (22%) felt that they were treated in both ways (see Table 3.1). The remaining three engineers gave idiosyncratic responses that did not fit into the other three categories.

Table 3.1 Treatment by Work-Mates (1976 and 1977 samples of Engineers)

	N	%
One of the lads	32	59
As a special case	7	13
Both	12	22
Other*	3	6

* These subjects gave idiosyncratic responses which did not fit the above categories

When asked to explain why they were treated as 'one of the lads', the majority of respondents felt that their own behaviour was instrumental in determining this attitude. As put tersely by several young women, the men behaved this way because 'that's the way I wanted it'. One of the strategies for encouraging equal treatment was to act in the same way as the lads did. A.S. used this tactic - both on the job and in social situations, although she wasn't quite certain about buying drinks at the pub:

> I'm treated like one of the lads by the blokes because I act like they do. I take anything that's coming to me. They somehow expect it. I even buy them drinks at the pub at lunch time. You can't get fairer than that. Even they were amazed.

In offering a further explanation of her relationships with men at work, A.S. noted that it was important to prove that she could do all the things men could. She even refused help in lifting, feeling that if she showed any sign of weakness it would be used against her:

> I've got to prove to them that I can do exactly the same as they can. The minute I can't do something that they can I've had it really. Any equipment they

> can lift I can lift. I proved that the other day. When they keep saying to me, 'Do you want any help? Do you want any help?' I won't accept it. I won't have it. The minute I show any sign of weakness they'll use it in any sort of bargaining...

Another related strategy for ensuring that one was treated as 'one of the lads' was to play down one's femininity and get on with the work. T.H. attributed her treatment to the way she dressed. She reasoned that she was seen in the same way '...because of the way I dress - jeans and sweatshirt, that's the way I expect to be treated'. J.L. observed that although there was '...a certain amount of flirtation on both sides, if you come in looking different you can't expect them to see you as equal'. In a similar vein, C.C. noted that she wasn't treated as a typical female because she didn't behave like one and because she wasn't embarrassed by typical male remarks:

> I'm not treated as a typical female because I don't behave like one. I'm not very feminine. I never wear skirts, always in jeans, never wear eye makeup, and I also don't get embarrassed at typical male remarks.

Although very few women mentioned that sexual harrassment was a problem, it seems likely that dressing in an inconspicuous and relatively masculine way may have discouraged unwelcome sexual attention from the men. In their study of women managers, Hennig and Jardim (1976) found that successful women did not emphasise their femininity but dressed in serviceable and almost asexual clothing during the early years of their career. It was only when they were well established - usually in their mid-thirties- that they were able to emphasise feminine characteristics in their behaviour and dress.

Some women felt that it was impossible to be 'one of the lads' because of their status as the only woman in the group. There was also a desire on the part of some to maintain a feminine style and to preserve some differences. J.B. felt that it was not possible to be 'one of the lads' but considered that her position was an intermediate one. She observed, 'I think women want to be women although the more tomboyish they are the less their differences will be noticed'.

Differences in Treatment

When asked how they were treated, some women pointed out that it depended on the person involved. To gain further information about differences in responses, engineers in the 1978 sample were asked to indicate how they were treated by a series of people: male workmates of the same age, older male workmates, female shop floor workers of the same age, secretaries, immediate supervisors and training or personnel officers. As can be seen in Table 3.2, female engineers found that male workmates and immediate supervisors were most likely to treat them as 'one of the lads'. Amongst female workers, secretaries were more likely than shop floor workers to treat female engineers as 'one of the lads'. However, older male workers were more likely than all other groups of workers to treat female engineer as 'a special case'. Training officers and personnel officers were midway between the two extremes.

Although the explanations for these differences must remain speculative, there are factors in the previous experience of workers and in the structure and status of the industry which encourage differential responses to a female apprentice. For example, the tendency of both immediate supervis

Table 3.2 Female Engineers' Treatment by Various Workmates 1978 Sample†

Group of workmates	As a special case	As one of the lads
Male workmates of the same age**	4	14
Older male workmates	14	5
Women on the shopfloor of the same age	9	5
Secretaries	4	11
Immediate supervisor***	4	14
Training/personnel officer	8	10

† There were nineteen subjects in the 1978 sample who answered at least one question on this topic. However, several subjects worked in small firms or in companies where some of the categories of workers did not apply.

** Differences between male workmates of the same age and older male workmates are significant at the .01 level. (See Appendix 3.2). Differences between male workmates of the same age and women on the shop floor are significant at the .05 level.

*** Differences between immediate supervisors and older male workmates are significant at the .01 level. (See Appendix 3.2). Differences between immediate supervisors and women shop floor workers are significant at the .05 level.

and male counterparts to treat the female engineers as 'one of the lads' lies in the dynamics of the work group. To maintain the respect of his subordinates, the supervisor must be seen to be behaving fairly. In most situations he will find it easiest to accomplish this objective by treating apprentices with similar qualifications and experience in the same way regardless of their sex. His approach will also encourage the male apprentices to see the female apprentices as similar to themselves.

Previous educational experiences are likely to shape the attitudes of male apprentices. Many of them will have attended co-educational schools and

some of them will have been trained with female apprentices. If a male apprentice views a young woman in the department as similar to himself, he will expect her to be treated in the same way. He is unlikely to approve of her being given extra privileges. As noted below, both female and male apprentices believe that female apprentices are given preferential treatment.

Although not asked directly about the attitudes of younger male apprentices, several women mentioned incidents in which younger apprentices were openly hostile. The young male apprentice often regards the female apprentice as a threat and sees her as encroaching on his current status and as endangering his chances for future employment.

In a similar way older men's responses arise from feelings of threat as well as from previous experience with women. Many of the older men had had little or no experience of working with women who would eventually hold a job as responsible as their own. Because they had attended single sex schools, many of their ideas of how to treat women were based almost solely on experience with their wives and daughters. The paternalistic style they adopted was a comfortable and familiar one, stemming from the belief that women were profoundly different from men.

Older men were in a position to feel seriously threatened by the female apprentices. Many older workers employed at technician level (EITB, 1982) left school at 15 with no academic qualifications. They entered engineering as craftsmen and were eventually 'promoted' to technician status. However, they lack the formal qualifications held by the girls. With the competition for jobs growing and 'early retirement' becoming an increasingly popular practice, apprentices must be seen as real danger. When the feelings of threat are coupled with prejudice towards women, it is hardly surprising that many older men will treat the young women apprentices as 'a special case' and that some of their 'respectful' gestures contain a measure of hostility.

Several women found that they had difficulty in coping with the chivalrous attitudes of the older men. In the passage below, J.L. describes the experience of moving to a larger workshop where most of the men were over 50. She found that their offers of help made her feel inadequate:

> There's about two men under 50, so they're very set in their ways... You have to be prepared to take a lot of sarcastic remarks. I'd been accepted (in her previous workshop) but moving I had to start again... 'And this is the lady engineer'. 'Can I do this for you?' 'Let me do that.' 'Let me set it up for you.' 'Don't do that, you'll break your nails.' That really got me down. It made me feel inadequate.

A Special Case

Being treated as 'a special case' was the logical consequence of their being female for some women. The differences between the sexes were so great that other factors were of minor importance. Some women insisted on being treated differently and expected the men to modify their behaviour when women were present. Other women were uncomfortable with deferential behaviour but were uncertain about how to respond to it. Several women were quite open about how they exploited their status and how they used their 'feminine charms' to manipulate the men's behaviour.

Being the only woman in an otherwise all-male group gave some women a special status. They felt that they were treated unusually kindly and

sometimes took on the role of group pet or mascot. J H. remarked that the men had a 'soft spot' for her because she was female and explained that they were proud to have her in their department so that they could 'stun' outsiders with her. Another woman described how she was always sent to another department to ask for supplies or to deal with problems because others felt it would be more difficult to turn down her request and that she would be more likely to be able to 'sort things out'.

Many women felt that the men tended to be protective and a few of them mentioned that they had exploited the situation by avoiding dangerous jobs or by asking for help on jobs they didn't want to do. In the following excerpt, L.T. explains her feeling that she was treated more leniently because she was female. It was worth noting that there appeared to be separate standards for male and female work and she received praise for work that would have been considered quite ordinary if it had been done by a bloke.

> If a fellow went in there and he couldn't do something I think they'd more or less look on it as, 'He's not very good.' But because I'm a girl I'm excused a bit... They think you're not supposed to be doing this sort of thing, but when you do something they're quite sort of surprised that you have done it. You end up getting good reports from everybody because you have just done the job and you're a girl.

When asked if there were differences between the way they were treated in comparison with their male colleagues, 79% reported that there were some differences. One of the most frequently mentioned differences was that they were given more help than the male apprentices.

The dynamics of helping were often complicated and in some cases appeared to change over time. Initially the young woman was reluctant to admit she didn't know how to do the work and had to be encouraged to ask for help. She soon discovered that asking for help was necessary because there were many things that she didn't understand and that she was unable to do her job without some explanation. However, in asking for help, she fell into the familiar stereotype of the 'helpless female' and there was often a danger that both she and the men in the group came to see her as less capable than male apprentices.

This difference in apparent ability is likely to be amplified by characteristic masculine and feminine styles. Many women noted that male apprentices tended to show off and exaggerate their capabilities. In some cases this strategy won them promotions or extra responsibilities. However, this was not a viable strategy for young women. As shown below, the consequences of failure were much greater for women than for men.

Kanter (1976) maintains that tokens' visibility subjects them to 'performance pressures' which are not experienced by dominants. The token is always conspicuous and her mistakes are remembered. Her position is a hgihly public one and she is always 'on show'. This situation is seen clearly in the position of A.S.

A.S. was one of several women who stated that she didn't want to draw attention to herself and her work. As she notes in the passage below, she concentrated on doing what she could do and waited for others to suggest that she was ready to attempt more difficult tasks:

> I think it's best not to open your mouth too much. You just keep along with what you can do and then the boss might push you a bit more and you find you can do something else.

In A.S. 's company technicians were expected to ask for a higher grading when they felt that they were capable of doing more complicated jobs. Her boss had been urging her to go for the higher grade but she felt uncertain about taking this step. Whilst her reluctance may have been attributed to a 'feminine' lack of confidence or ambition, it should also be seen as a realistic response to the pressures she would face. She needed to be certain that she could do the more difficult work before she could risk a very public test of her abilities.

Although swearing may in itself be a trivial issue, it often appeared to take on a symbolic significance as the women sought to work out their relationships in a department. It was an issue frequently mentioned by women in discussing how they were treated and also an issue mentioned by male apprentices in describing the effect of the presence of a female upon group interactions. Opinion was divided amongst the women as to whether men should stop swearing or at least 'tone down' their language. However, most women felt that there were differences in the type of language that was appropriate for men and women. On a measure of women's roles, three quarters of the engineers from the 1977 sample endorsed the statement, 'Swearing and obscenity are more repulsive in the speech of a woman than a man'.

Kanter (1976) suggests that when members of the dominant group are threatened by the presence of a token, they make use of distinctive aspects of a dominant group culture to heighten group boundaries and to emphasise dominant-token differences. They remind tokens of their status as outsiders by prefacing their acts with apologies, so that men continue to swear but apologise for doing so with 'ladies present'. They also expect tokens to tolerate their cultural expressions, but they do not allow tokens to have the same privileges, thus setting up a double standard. For example, tokens are expected to tolerate swearing and listen to dirty jokes but are not allowed to swear or to tell 'off colour' jokes themselves.

The young women engineers reported many incidents of men taunting them with bad language. One woman described her male colleagues bombarding her with obscenities to see if they could make her blush. She found the situation amusing - at least in retrospect - and noted that her 'dirty' sense of humour stood her in good stead. Like many others, she felt that she was being tested and that it was very important to show that she could withstand the pressure.

J.L. recounted the awkwardness of her early days at work. Conversation was initially very stilted, and one of the older men attempted to set up a swear box; this attempt foundered when it was realised that J.L. might be the main contributor. However, the older men were not comfortable with J.L.'s language.

> At first it was hush, daren't swear, didn't know what to say. They know now what they throw at me I'll throw back. The older ones don't like it. One of them tried to have a swear box, but they realised I'd probably pay the most anyway.

Another tactic for promoting male solidarity and making the women feel uncomfortable was to tell dirty jokes or to brag about sexual exploits. A.S. complained, 'They do go on and on about their motor bikes and their women'. In a similar vein, P.H. found it 'a bit of an eye opener', listening to them talk about their wives. She added, '... the way they talk about women, I think to myself, I hope nobody ever speaks about me like that'.

Although most of the young women established fairly relaxed relationships with their male colleagues, many of them described having to pass a series of 'social tests' for becoming accepted as a member of the group. One woman described how a circuit was wired into the mains and everyone laughed when she got a shock. Several women referred to times when men had tried to 'take the mickey' and had said that they had had to learn to answer back and 'give as good as they got'. W.J. felt that experience in dealing with her brothers helped her cope with men at work; she was used to male wisecracks and teasing and was soon able to return insults in the spirit in which they were given. However, not all of the women were comfortable with this sort of relationship, and some elected to remain relatively aloof from their male colleagues. A few of them saw themselves as superior or as having 'different standards' and viewed the men's behaviour as childish and immature.

Many women remarked on differences between masculine and feminine styles of behaviour and described how they learned new skills which made it easier to fit in with a group of men. Some of the young women felt that men and women were quite similar in their basic motivation although the forms of their behaviour were quite different. A.S. observed that men were 'pretty weird creatures' who were fully as nasty and catty as women but in a different way:

> They say women are catty and nasty to each other. But blokes are just the same, but they do it in a different sort of way. And they're always taking the mickey out of each other and being really nasty to each other, but not so that they would fight or anything.

J.B. described the differences in being the new member in a male rather than in a female group. She felt that in a female group there would be an effort to talk to the newcomer and include her in the group whereas in the predominantly male group the newcomer would be left by herself unless she were especially good looking:

> ...if I went into an office with a group of girls and sat in a corner on my own...the girls will sort of say, 'I suppose we ought to go and speak to her.' They feel sorry for you. So they come over and say, 'What's your name?' and all the rest of it. But if you're in a group of blokes they tend not to bother unless you're especially wonderful looking. Then they'd bother, but if you just sit in a corner quietly they'll leave you to it.

Whilst the present research was not designed to examine changes in the strategies used by the young women engineers over time, anecdotal evidence and findings from related research suggests that many of the women modified their styles of interaction and adopted a more masculine approach. In becoming a member of the work group, they found it easier to minimise differences and usually preferred to be treated as 'one of the lads'.

This view is supported by data from a survey of women who were interested in doing a university degree in engineering. Newton and Weinreich-Haste (1982) found that two-thirds of the women anticipated maintaining 'a feminine style' when they entered engineering and one third preferred to be 'one of the lads'. In contrast, when women in the 1978 sample of technicians were asked a similar question, 50% said that they were usually 'one of the lads' and 32% stated that they used a feminine style. The remaining 18% described their own styles as 'a bit of both' or claimed that they were not bothered about the issue (see Table 3.3).

Table 3.3 Preferred Style of Behaviour* (1978 Sample of Engineers)

	N	%
One of the lads	11	50
A feminine style	7	32
Both**	4	18
TOTAL NUMBER OF SUBJECTS	22	

* Subjects were given four pairs of strategies that could be used by women who are in a minority position and were asked to select one alternative in each pair as representing the strategy they were most likely to use. One of the pairs of strategies was "Try to be 'one of the lads'" and "Maintain a feminine style".

** These subjects suggested that the strategy they would use would depend on the situation and that they would employ both strategies.

The tendency of the technicians to see themselves as 'one of the lads' fits with the process that Kanter describes as assimilation. The token woman is forced to accept the culture of the dominant group; however, she can deal with the situation in one of two ways. She can choose to be relatively isolated from members of the dominant group although remaining an audience in some situations, or she can try to become an insider and a member of the dominant group. In the latter situation she may see herself as an exception and as different from other women in having more in common with men than with other women.

Both sorts of response occurred in the sample of technicians although it is not clear how much room for negotiation existed within various work places. Some women were isolated from informal contacts during tea break and dinner breaks or at the pub and claimed that they preferred to remain apart from men. Others were included in some situation, but not in others. Some women associated with their male colleagues during breaks and at the pub, but several of these respondents described incidents in which male-female differences were emphasised and male prerogatives were preserved.

For example, one woman described going to the pub and instead of ordering her usual Martini she asked for 'a pint'. She observed that '... it really quite annoyed them' and goes on to recount that the men wouldn't sit near her and went over to sit on the other side of the bar.

Perhaps the most extreme example of isolation occurred with a woman who has since left engineering. In the company where she worked tea and dinner breaks were segregated by status. However, she was told that although she was a technician she should take her breaks with the women operatives. She found that the other women regarded her with suspicion, and she was unable to get on with them. Her own strong career interests contrasted strongly with their interests in marriage and the family. She eventually felt totally ostracised by the other women and remained excluded from all social interactions with the men in her department.

Being the Only Woman

When the young women engineers were asked whether they preferred to be on their own or with at least one other woman, opinions were almost equally divided between the two options with 45% wishing to be on their own and 42% wishing to be with at least one other woman. A further 13% claimed that they were 'not bothered' (see Table 3.4).

Women who felt it was preferable for women to be on their own justified their answers with both task-related and social reasons. Many felt that lone females were in a better position to prove themselves and that they were likely to work harder. Others felt that it was easier to work with men than with women. Some pointed out that because there were so few women in engineering they needed to face the situation and learn to cope

with it. One woman believed that '... it was better for men to get used to women slowly', whilst others pointed out the advantages of preferentia[l] treatment as the only woman in the work group.

Table 3.4 Preferences for Being the Only Woman or With Other Women in Engineering* (1976, 1977, and 1978 Samples)

	N	%
On own; only girl	33	45
With at least one other girl	31	42
Not bothered	10	13
TOTAL NUMBER OF SUBJECTS	74	

* The respondents were asked the following questions: 'Providing that they can find well qualified applicants, some companies try to take on more than one girl at a time, while others prefer to hire girls on their own. For you personally, would you prefer to be on your own or with at least one other girl?'

Many of the women who preferred to be on their own stressed the problems of relationships between women. One respondent observed that '... more than one girl causes friction'; another believed that '... girls together are "bad news"'. Other reasons included a statement that '... (other) girls are narrow-minded and only interested in marriage' and a professed dislike of 'more feminine' girls. These latter examples fit closely with Kanter's idea that women who strive to become members of the dominant grou[p] frequently reject other women and see themselves as diffe[r]ent.

In contrast, the women who believed that it was better to have women together stressed the potential for solidarity and friendships between women. They saw other women as providing companionship and as having similar interests and topics of conversation. They also perceived other women as a source of moral support and saw them as potential allies against men at work.

These women frequently mentioned the impossibility of ever being accepted by males in the work group, and several pointed to negative characteristics of men, such as their boring conversation and childish behaviour.

An interesting example of both attitudes is provided by W.J., who had the experience of joining another female already in the company and then working on her own for several months and subsequently being joined by another woman. She described her initial feelings of competitiveness with the other woman but noted that after their early insecurities and suspicions had been dispelled they discovered that they had many things in common. Over time they were able to share experiences and came to feel that they were like 'a team versus the world'.

Although many women enjoy being the only female in the group, recent research suggests that men view the lone woman quite differently and look on her unfavourably. In a clever well-designed study, Taylor (1981) examined the responses of male apprentices to either one or two female apprentices during their first year of training. She interviewed sixteen male apprentices in four firms in which there was only one girl and sixteen male apprentices in four firms in which there were two female apprentices. (There were four male apprentices in each of the eight firms included in the study.)

Taylor asked the male apprentices about how well they got on with the female apprentices, how well they knew them and whether it made a difference

to have a girl in the class. Responses to all of these questions suggested that two girls were better accepted than one. All differences were highly statistically significant.

On the question about the effect of having a girl in the group only one boy out of the sixteen in the two-girl condition reported a detrimental effect while in the condition with one girl, five boys reported bad effects. They were particularly resentful about over-lenient treatment of girls. Other complaints included the feeling that the girl might 'grass' on them, the feeling that they couldn't have a good laugh because the girl had a different sense of humour. Only three good effects were noted by any of the boys - a decrease in swearing, a greater variety of conversation and a general 'brightening up' of the place.

All boys whether with one or two girls complained about the girls receiving preferential treatment. Examples that were mentioned included not being sworn at, not being made to do heavy work, not being expected to do so well and being given more attention, help or courtesy. These observations fit closely with those made by the girl technicians in the present research.

When the boys in Taylor's study were asked whether it was better to work with one girl or two girls, those had had a preference felt that it was better to work with two girls. There was a tendency for boys in the one-girl condition to be slightly more negative about working with girls. Two boys in this group spontaneously suggested that they would prefer to have no girls at all working with them.

Taylor's results reinforce the evidence given by the young women in the present study and provide a note of caution for those who see the problem of prejudice towards women being solved quickly by education and the accomplishments of some outstanding women. Her findings also point up the need to study issues of interpersonal perception from the perspective of each of the parties involved. It appears that young women and young men see the dynamics of their interaction somewhat differently with young women seeing their presence as less of a problem than young men see it.

Implications

The findings reported in this chapter draw attention to the complexity of the situation faced by the young woman technician. She often begins her career slightly handicapped by lack of relevant school preparation. She is less likely than her male counterpart to have hobbies that are related to engineering and she frequently has less experience in using tools and in operating machinery. These initial deficits can usually be overcome, but it may be more difficult to change the interpersonal dynamics that have been set up at the beginning of her training.

Personnel and training officers should consider carefully the department in which they first place female apprentices when they begin spending in time in different departments after their first year of off-the-job training. Whenever possible, young women should be placed in a department with a supervisor and workers who have had previous positive experiences of working with women.

Throughout the apprenticeship there is a need to consider ways in which differences in the treatment of female and male apprentices can be minimised. Supervisors need to be reminded that giving the female apprentice

extra help and preferential treatment is likely to lead to tensions with other workers. Young women need to learn to be more self-reliant and to develop the confidence to ask for assistance only when necessary. The goal for all should be to see her as an apprentice <u>first</u> and to consider her strengths and weaknesses as her training needs - not as an extension of her being female.

Since the young woman apprentice often feels isolated, she may find it useful to talk to others about her feelings about her job. She may find that she has misinterpreted some of her experiences at work and that some of the ways in which she has been treated reflect her status as an untried apprentice rather than her position as a woman in the group. Her choice of confidante will necessarily depend on the people who are available and who are sympathetic to her concerns. It is often useful for female apprentices to meet each other and to discover that they are not alone in what they feel. It may also be helpful to discuss work with her male counterparts. Sometimes a personnel or training officer can provide a sympathetic ear. However, it is important that offering the apprentice a chance to talk about work does not carry with it the expectation that she must have problems which she cannot deal with herself.

Until young women form a significant proportion of the intake of apprentices, the role of being a female technician is likely to be somewhat uncomfortable and to carry with it extra burdens not faced by male apprentices. This does not mean that young women cannot do the job or that they do not wish to cope with the pressures they face. The majority of the apprentices in the present research felt that the struggle was well worth it. As J.H., notes, the job gave her status and respect that she would not have had in an ordinary job:

> I'm an engineer and I don't want to give that up, because that is really, honestly, something you can really hit people with when they ask you. It's nice to be able to run 'round and say and to have some status... It's really good.

CHAPTER FOUR LOOKING TOWARDS THE FUTURE

How does the future look at age 20? How important is one's career? What about marriage and children? Do careers and families mix?

Most of the young women in the study are involved in their careers. At the time of the survey, the engineers had another year of their apprenticeships before they would have a 'proper job' in their companies. Although the secretaries had completed their training, many had done temporary work before finding a good position and were now just beginning to feel settled in their jobs. The majority of the young women plan to marry and have children; however, most of them see these events as quite far in the future.

Career involvement and domestic plans are obviously linked. In the present study, the engineers appear more committed to their careers than secretaries. More of the engineers plan not to marry and those who do wish to marry intend to have fewer children. As they talk about their careers now, they are obviously aware of the hard work they have put in and are concerned about becoming well established and known in their jobs.

The ideas of women's liberation and equality are familiar notions from the media, but for many young women the concepts remain theoretical ones. They are uncertain about how these ideas are translated into daily life. Most of them come from families with traditional roles, and they are unsure about new models. They like the idea of their hsubands being involved in child care, but many feel that some tasks belong only to mothers and that it is unmanly for men to do too much around the house.

It is in this context that the young women's notions of their future careers and family life must be considered. This is not to discount their opinions, merely to point out that most of them find these issues confusing. In talking about them, they discover that many of their ideas are contradictory. Their ideas of child care alternatives are hazy and they are quick to point out that they don't know much about young children.

Career Involvement

The majority of engineers and secretaries see themselves as satisfied in their present jobs and there are no significant differences between the two groups. As can be seen in Table 4.1, 61% of engineers and 60% of secretaries reported themselves as very satisfied or quite satisfied in their present jobs. When asked about the likelihood of their being in the same field of work in ten years' time, 58% of engineers and 43% of secretaries believed that it was very likely to quite likely that they would be in the same field in ten years (see Table 4.2).

Table 4.1 Job Satisfaction: Comparison of Engineers and Secretaries in all Samples

	Engineers		Secretaries	
	N	%+	N	%+
Very satisfied	14	18	12	18
Quite satisfied	33	43	28	42
Somewhat satisfied	14	18	13	19
Not very satisfied	8	11	7	10
Not at all satisfied	7	9	7	10
TOTAL NUMBER OF SUBJECTS	76		67	

\+ Owing to rounding errors, percentages do not always add up to 100%.

Table 4.2 Likelihood of Being in the Same Field of Work in Ten Years' Time: Comparison of Engineers and Secretaries from the 1977 and 1978 Samples

	Engineers		Secretaries	
	N	%	N	%
Very likely	13	24	12	18
Quite likely	19	34	16	25
Somehwat likely	13	24	14	22
Not very likely	5	9	15	23
Not at all likely	5	9	8	12
TOTAL NUMBER OF SUBJECTS	55		65	

Respondents in the 1976 and 1977 groups were asked why they might leave their current field of work. Engineers, unlike secretaries, saw marrying and starting a family as being the most likely cause of their leaving work. In contrast, secretaries were more likely than engineers to see getting a better job as a reason for leaving work. The differences between the two groups are statistically significant (see Table 4.3).

Table 4.3 Reasons for Leaving Present Field of Work: Comparison of Engineers and Secretaries from the 1976 and 1977 Samples

	Engineers		Secretaries	
	N	%	N	%+
Marriage; starting a family*	26	52	20	29
Finding a better job**	5	10	27	39
To try something different	5	10	11	16
Boredom	2	4	4	6
Desire to travel	1	2	2	3
Moving house	-	-	3	4
Redundancy or failure at work	5	10	1	1
Ill health	4	8	-	-
Nothing; would not leave	2	4	2	3
TOTAL NUMBER OF SUBJECTS	50		70	

\+ Owing to rounding errors, percentages do not always add up to 100%.
* Differences between engineers and secretaries are significant at .05 level (see Appendix 4.1 for details of the analysis).
** Differences between engineers and secretaries are significant at .01 level.

It should be noted that at the time they completed the questionnaire the secretaries had completed their training and were often in a good position to find a better job and change their field of work. For most of the engineers this was not a realistic possibility. Unless they wanted to leave engineering entirely, they needed to complete their apprenticeships and spend several years on the job before being able to find a better job in a similar field of work.

Four engineers but none of the secretaries saw ill health as a potential reason for leaving work. This difference, which approaches statistical significance, probably reflects the more physical nature of the engineering technician's job. Two of the engineers mentioned that they had encountered problems with industrial dermatitis and several referred to other workers who had been injured or become ill and who were unable to continue working.

Plans for Marriage and Children

Engineers and secretaries in the 1978 sample were asked about their plans for marriage and children. There were no differences between the two groups in the proposed timing of marriage (see Table 4.4). When the two groups are combined, the largest number 44% plan to marry within five years. However it is worth noting that 37% see their marriage as within the next 10 years and 12% see themselves as not marrying at all.

For some, there are definite reasons for not marrying early. One engineer wanted to do a degree course and felt that this would be impossible to do if she were married. Other respondents expressed an interest in establishing oneself securely in one' career before marriage. Another desire was

Table 4.4 Marriage Intentions: Comparison of Engineers and Secretaries in the 1978 Sample

	Engineers		Secretaries	
	N	%*	N	%
Already married	1	4	2	-
Within two years	1	4	2	7
Within five years	9	38	14	50
Within ten years	9	38	10	36
Never	4	17	2	7
TOTAL NUMBER OF SUBJECTS	24		28	

* Owing to rounding errors, percentages do not always add up to 100.

for financial security. A.H. wanted to wait about five years before marriage. She liked the independence of her job and wanted to have enough money of her own if the marriage did not work out as planned:

> I like my job; it makes me independent. I've my own money and car and then I can go and buy my own things. I think that's good. Even if you get married, it's good to have some money of your own - in case things go wrong, you're OK.

Whilst only one respondent in the 1978 sample saw herself changing her pattern of work upon marriage, many saw increasing household responsibilities as possibly hampering their careers. W.J. was one of several engineers who expressed the hope that she would marry an engineers who would understand the demands of her job. In that way any conflict between work and home responsibilities would be minimised:

> Chances are I would probably marry an engineer. I don't know. I can't tell now. The chances are I would. In that case... I don't think marriage would affect it (my career) much. It would make a stabler person I suppose. It wouldn't affect my career...

Most of the young women felt that the major changes in their lives and careers would come with the advent of children. However, surprisingly few of the young women who were interviewed talked in an active way about planning their families. Several of them used the phrase, 'When the children come' to describe the inevitability of children in the marriage. Without further information it is impossible to know whether the respondents found it easier to talk about children in this way or if the use of the phrase represented a lack of knowledge or intention not to use birth control.

When the engineers and secretaries were asked about the number of children they did intend to have, there were significant differences between the two groups with engineers planning to have fewer children than secretaries (see Table 4.5). Since only the respondents in the 1978 sample were asked these questions, the numbers are small. However, it is interesting to note that only one secretary but four engineers planned to have no children. Even more striking is the fact that 46% of the secretaries but only 16% of the engineers saw themselves as having two or three children or three or more children.

Table 4.5 Numbers of Children Intended: Comparison of Engineers and Secretaries in the 1978 Sample†

	Engineers		Secretaries	
	N	%+	N	%
None	4	17	1	4
Not sure if wants children	5	21	4	14
Not sure of number of children	1	4	3	11
One or two*	1	4	-	-
Two	9	37	7	25
Two or three	2	8	9	32
Three or more than three	2	8	4	14
TOTAL NUMBER OF SUBJECTS	24		29	

\+ Owing to rounding errors, percentages do not always add up to 100%.
† When the differences between the two groups are analysed by region, the result is statistically significant at the .05 level. (See Appendix 4.2 for details of the analysis).
* See Appendix 4.2 for an explanation of the categories used for the number of children desired.

Three of the engineers who were interviewed discussed their wish not to have children. They tended to see children as extremely restricting and as requiring an extended period of time away from work. S.B. was against children at least partially because of the responsibilities and restrictions involved. She saw herself as lacking an interest in and patience with children:

> I'm just not interested in them. I think I'd get fed up with them quickly. I've got no patience and I wouldn't want to tie 20 years of my life down to them and then have them grow up and think, 'I should have done this and this. And if I had, they wouldn't have done that then'.

Women's Roles

When asked to complete a brief questionnaire on women's roles, most young women appear to have a feminist view and there are no differences between engineers and secretaries (see Appendix 4.2 for a list of items on the questionnaire). They feel strongly that girls and young women should have the same educational and training opportunities as young men and they believe that women should achieve equality in the professions. They also strongly endorse the notion that men should share in household chores. However, they are less certain about women's suitability for selection and promotion in some jobs. Over one third (38%) of the respondents agree that there are many jobs in which men should be given preference over women in being hired or promoted. Similarly there is considerable diversity of opinion in their response to some strongly-worded items about marriage. Just over half of the young women (51%) do not see the 'obey' clause in the marriage service as insulting to women. Although 53% of the respondents believe that women should be as free as men to propose marriage, the remaining 47% are uncomfortable with this notion.

Whilst there are dangers in attaching much importance to responses to individual items on the scale, the attitudes expressed on this measure appear to be similar to the ideas of the young women who were interviewed. In examining individual's concepts of marriage and child care, the complexity and contradictory features of the young women's views on the topics become apparent. An illustrative example is the issue of household chores.

Seventeen of the engineers who were interviewed discussed how they and their future husbands would share domestic duties. When the transcripts of their interviews were rated, seven were judged to hold with primarily traditional roles and seven were judged to favour relatively equality-based roles (see Footnote 1). The remaining three interviews contained a mixture of attitudes and could not be reliably rated.

W.J. was one of the engineers who favoured equality-based roles. In responding to the interviewer's question about the division of labour in the household, she noted that times and relationships were changing. Even her father was learning to do a few things around the house:

> ...I think times are changing and relationships are changing. My sister's married and her husband does some of the work 'round the house and they have a very give-and-take sort of relationship. It's not so important who washes the dishes or who doesn't wash the dishes any more. It doesn't seem to matter that much, which is good. And even my father is beginning to lean over a bit and make the bed and, shock horror, clean the basin, you know. I think times are changing. They have to.

P.H. was one of the few engineers who believed in the complete interchangability of household tasks. She observed, "He'd take his turn in

washing the baby's nappies. I'd take my turn in the garden, etc." P.M. also had relatively egalitarian views. However, she, like many of the respondents, described her future husband's role as one of 'helping' rather than his totally sharing domestic responsibilities. Like W.J. she believed that there were changes afoot:

> ...In fact it should be equal. I think it is more equal these days anyway. He'd have to help a lot, especially if we're both working.

K.B. saw the responsibility for household duties depending on whether she were at home. She hoped that if she were working, he would naturally do some work but was eager not to hassle him:

> Well if I'm at home I'd expect to do the work; he'd help with a few things. But if I was working I'd hope it would come naturally that he'd take his part though I imagine I'd do more than him, but not to have to hassle him.

Several of the engineers, whilst believing that husbands should help, were concerned that men should not have to do 'women's work'. J.B. felt that men wouldn't be happy doing female jobs and that she would do the domestic work. She assumed that her husband would 'share partly' in child care but that, 'the woman still does the mucky part of things.'

S.B. expected that she would do the majority of the housework and noted that many men were still against doing this sort of work. She did not see this as a problem for her:

> I think a lot of men are still against doing housework and I can understand that. That sort of stuff doesn't really bother me. I suppose it'd get done... I don't think there'd be a major problem there. But I can understand them not wanting to do it. And if they don't want to do it, it doesn't particularly bother me.

When asked why she felt that way, she talked about the notion of 'women's work'. She believed that whilst some men might be willing to do the hoovering, others would still see work as strictly divided according to sex:

> ...it's classed as women's work'.. You know, making beds, hoovering. Some men are probably not bothered; they'd run a hoover round, or make a bed. But other blokes are still in that frame of mind that there are certain jobs for men and certain jobs for women.

Several engineers and secretaries stated that the man should be the head of the house although their notions of the meaning of this title varied. A.J. saw this role as basically involving decision-making. However, she did see herself as actively engaged in decisions as well:

> I think the father should be the head of the house...I think he should lead a family. I'm not saying he should make all the decisions and say, 'That's it. You're going to do this. You're going to do that'. But I think when you're making family decisions you should listen to your husband - see what he has to say.

A.H. also believed that the man was in authority and saw herself in a subordinate role. She was concerned about not carrying equality to a 'silly stage':

> I like to think the man is the man of the house. I'm not for this equality when you get to a silly stage. In some cases the woman does earn more than the man. I'd have my job and I'd be quite happy to be the underneath one but not to be looked on as a housekeeper but see the woman as a supporting role.

Combining Family and Career

Engineers and secretaries in the 1978 sample were asked about how they would combine their careers with child care. They were asked to indicate how old their youngest child would be when they returned to part-time and to full-time work. They were also asked about the responsibilities of married mothers when their children were of various ages.

There are no differences between engineers and secretaries in their plans for working and child care. When the results for the two groups are combined, 26% of the sample plan to return to work (either part-time work or full-time work) within two years of their youngest child's birth (see Table 4.6). An additional 37% see themselves returning to work when their youngest child is aged five and 35% see themselves returning to work when their youngest child is ten. Only 2% see themselves as never returning to work.

Table 4.6 Plans for Returning to Part-time and Full-time Work
1978 Sample of Engineers and Secretaries combined

	Return to part-time work	Return to full-time work	Total	
	N	N	N	%
Timing of Return to Work				
Within two years of the youngest child's birth	8	5	13	26
Within five years of the youngest child's birth	14	4	18	37
Within ten years of the youngest child's birth	16	1	17	35
Never	1	-	1	2
TOTAL NUMBER OF SUBJECTS	39	10	49	

When the information is analysed by the type of work, 79% of the sample see themselves as first returning to part-time work. This finding fits with recent data on British working women, which indicates a strong preference for part-time working (Povall, 1981). However, it is worth nothing that almost one fifth of the sample (18%) plan to return to full-time work within five years of the youngest child's birth.

Respondents in the 1978 sample were asked to describe the responsibilities of married mothers when their children were of various ages. There were four statements, indicating different attitudes towards work and family:

1. She should not work at all.
2. She should work only if necessary.
3. She should see work and family as equal.
4. She should see work as her main task.

Since there were no significant differences between engineers and secretaries, the results for the two groups have been combined. As can be seen in Table 4.7, 39% of the respondents believe that the mothers of under-fives should not work at all and an additional 48% believe that she should work only if necessary. However, when the children are under age eleven, only 9% of the respondents see mothers as not working, whereas 41% see mothers as working only out of necessity, and 50% expect her to see work and family as equal.

Table 4.7 Responsibilities of Working Mothers: 1978 Sample of Engineers and Secretaries combined

Age of Children	<5		5-10		11-18		>18	
	N	%	N	%	N	%	N	%
Attitude								
Should not work at all	21	39	5	9	-	-	-	-
Work only if necessary	26	48	22	41	9	17	2	4
Work and family equal	7	13	27	50	37	68	24	44
Work as main responsibility	-	-	-	-	8	15	28	52

When her children are between eleven and eighteen, two-thirds of the respondents feel that work and family responsibilities should be equal, and by the time the children are over 18 just over half (52%) of the respondents believe that work should be the mother's main task.

Some of the young women who were interviewed attributed their own attitudes towards work and child care to their own experience as the children of working mothers. A.J. was one of the several young women who felt that she had known her mother when she was young and wanted a different relationship with her own children:

> I don't think I'd like to work and have a family. From my own experience, my mum started work when I was about five... and I can never remember talking to my mum during those years. It wasn't up until I was about 11 that I remember being with my mum and I think it's important that a mother should be with her child up until a reasonable age...

A.S. felt that she would need to leave work until her child was of school age. Like A.J. she worried about her child not knowing its parents:

> ...I don't think it's fair to leave the child from an early age in nurseries and things like that, because it never grows up to know its parents very well. If you're always working it's going to be latch key as well, so it's never had any proper contact with parents, and I don't think it's a good idea.

Patterns of Child Care

Respondents in the 1978 sample were asked to rate six types of child care, indicating the desirability of each of the choices. When the choices of each group are rank-ordered, the orders for the two groups are very similar (see Table 4.8). Both engineers and secretaries see relatives as the most desirable choice. However, secretaries are private nurseries as more acceptable than engineers, and secretaries in London see a company creche as more acceptable than engineers in London. Child minders and au pairs are unpopular with both engineers and secretaries, with both groups ranking them as their lowest choices.

Table 4.8 Acceptability of Various Types of Child Care†
Comparison of Engineers and Secretaries in the 1978 Sample

	Engineers (N=22)			Secretaries (N=29)		
	Mean	Stnd. Dev.	Rank	Mean	Stnd. Dev.	Rank
Relatives	2.42	1.41	1	1.93	1.41	1
Company creche	2.82	1.68	2	2.45	1.38	3
Private nursery*	3.09	1.34	3	2.21	1.21	2
Friends	3.43	1.34	4	2.75	1.24	4
Child minder	3.91	1.02	5	3.45	1.30	5
Au pair	3.81	1.54	6	4.00	1.25	6

† Subjects were asked to rate each of the choices on a five-point scale for acceptability with 1 representing the most acceptable and 5 the least acceptable possibility.
* Differences between the two groups are significant at the .05 level. (See Appendix 4.4 for details of the analysis).

Many respondents felt that only the parents should be involved in the care of children. They believed it was irresponsible to have children unless they were personally involved in their early care. C.L. observed, 'I don't think it's right to leave them to someone else as long as a parent is there'. B.C. felt that either the father or mother should stay at home with children. She commented, 'Someone should stay at home and look after the kids. It's wrong to both work but either the father or mother (should look after them).'

Several of the young women who were interviewed mentioned the financial necessity of both parents working. When asked whether mothers should have careers, P.M. responded, 'Absolutely, yes. Anyway I don't think many women can afford to stay at home all the time'. W.J. was sympathetic to the plight of mothers who needed to work and felt that they were pulled in many directions.

> A lot of working mums have to work and I feel for them. I really feel for them because it can't be easy for them and they're pulled even more ways than mums who don't work because they have to go to work and then come home and cook the meals and things. And so they're stretched even more.

Returning to Work?

Most of the young women in the study wished to return to their original field of work. However, many of the engineers were quite pessimistic about the possibilities of returning to engineering part-time or after a break of more than a year or two. In contrast, most secretaries anticipated no problem in finding part-time work and expected to be able to combine work and family with relative ease. Several of those interviewed were looking forward to working from home when the children were young. A few engineers toyed with the idea of their husbands taking major responsibility for child care, but only one of them was completely comfortable with this notion.

A.S. believed that careers were only for single women or married but childless women. She felt that after having children it was only possible to have a job and not a career:

> I don't think I'd have a career because I think bringing up children's a full-time job. But it'd be just a job to keep the money coming in. Careers are for people that are eithe married with no kids or not married and they're independent. They're on their own then. It's not just a job; it's a career. If they're married with children, they've got their children to think about, and the home, so they can't really have a career as well. It's very difficult.

Although highly committed to her career as an engineer, J.H. felt that the burden of work for a working mother was a very heavy one. She felt that when she was faced with the dilemma of her career versus children that she would have to choose one or the other:

> It's OK while you're young and you can learn easy and you've got the strength and the energy to run about and do this, that and the other. But then when you've got to be in engineering, have a husband, look after a house and kids - I mean you are really taking on too much. That's why I think when it comes to the crunch I'll have to either pick one or the other.

When asked by the interviewer if there were any compromises possible to make combining a career and family easier, she concluded that there weren't. She observed that if either parent were heavily involved in child care, the parent's career was ruined:

> ...I don't think there is. Unless you've got an especially good husband who'd take over quite a bit. There again that's ruining his career then, really. But then mine shouldn't be ruined either. No, there's not going to be any compromises, or not that I can see. It's going to be difficult... There's no solution, or doesn't seem to be. Because as much as you want to do everything you've got to pick between the two.

The idea of role reversal with the husband staying at home with children appealed to several respondents; however, most of them saw it as unfair to their husbands. A few felt such an arrangement would be accepted by an undesirable man or that it would destroy the man's pride.

Many of the young women who were interviewed worried about losing confidence when they were at home with small children. They were concerned about becoming narrow-minded and having no interests outside home and family. They also felt that they would have no real status if they stayed at home.

J.L. described housewives as 'walking zombies'. S.K. commented, 'It would drive me 'round the bend being at home all day'. J.A. felt that she would become boring if she stayed at home. Whilst being at home with children was seen as a duty and a responsibility, it was seen by many as a difficult time with no clear outcome. Career investments might be lost; the field of work might change so dramatically that their training was no longer relevant. Part-time work was seen as the best solution for 'staying in touch' and keeping career interests alive.

W.J. was an engineer who saw dangers of years of giving as a mother, resulting in a loss of self. She felt strongly that she wanted to be involved with her children and yet she wanted to remain a person with a life of her own:

> Children's such a responsibility. A home and mortgage is a hell of a responsibility. You have to stop thinking of yourself and start thinking of other factors - your kids and that for years you won't reap the benefit... But I think what happens is you have kids and you spend all that time giving and giving and giving and you're getting older all the time.

She worried about becoming narrow-minded and never being as a person:

> I think I'd become narrow-minded and well, not narrow-minded. But if you only ever see your house and your kids. I see it with my mother. It's very difficult because you feel much more than that and yet people put you in that little slot and you reach 50 and you've got these kids and this house and the kids go away and you're still a person yourself.

Implications

The young women in the research are beginning to think about how they will continue their careers during the next decade of their lives. Some of them are reluctant to marry as they see this step as closing down opportunities. Most of them would like to have children, but they are faced with contradictions. They have invested in their careers and they are reluctant to lose the benefits gained. However, most of them are not willing to leave the care of their children to others. Whilst equality and sharing are familiar words, they do not expect to see their husbands assuming a full half of the resposibilities in the home.

Most of the young women engineers are committed to their careers. In spite of the difficulties of the work place, most of them would make the same career choice again. As a group they intend to have fewer children than the secretaries and the majority wish to combine their careers and families.

Joshi and Owen (1981) have estimated that, on average, women are likely to be out of employment for a total of approximately seven years while they are forming a family. If a woman's potential working life is calculated as spanning forty years, from age 20 to 60 and involves a seven year family break, she has thirty three years of working life. There is an obvious need to provide her with some sort of bridging experience, so that her original training and experience will not be wasted when she returns to work.

Unfortunately most women find that returning to work after the birth of the child involves a drop in responsibility and often a change in the field

of work. Many women are unable to make use of their previous training and are forced to take jobs which involve little training and offer few prospects. Very few fields of work provide formal arrangements for workers who wish to keep in touch with their careers and who plan to re-enter work. Some notable exceptions are the Doctor's Retainer Scheme, the Oxford Regional Health Authority's Part-Time Post-Graduate Training of Doctors (CEDEFOP, 1979) and the National Westminster Bank's Re-entry and Retainer Scheme (Adams, 1981).

The first programme to provide educational opportunities for women engineers who have temporarily left work for family reasons was recently launched by the Open University and Manpower Services Commission. Known as the Women in Technology Scheme (Swarbrick, 1982), the programme enables women to plan a course of study at home which will broaden and update their knowledge of engineering. The experience of women on the first intake of the course provides encouraging evidence both of the women's continuing interest and motivation in engineering and of potential possibilities for employment.

Forty one women comprised the programme's first intake in 1981. During a residential weekend at Loughborough University they had a chance to meet each other and to discuss their career plans with Open University staff. They were assisted in choosing appropriate Open University courses and were invited to attend summer schools that were relevant to their study. They will continue to receive counselling and vocational advice from the Open University staff.

Although the programme had originally been intended to prepare women for returning to full-time employment, most women following the course preferred to work part-time. This preference stems both from the pressures of continuing family responsibilities and from the current economic climate, which provides few vacancies for any engineers. There is also a feeling on the part of some of the women that their values had changed and that they were no longer happy about working in a traditional industrial environment.

Course organisers have found several firms that are interested in employing women in engineering on a part-time or flexible basis. They have been able to create jobs for themselves that fit in with their family responsibilities. These women have held a wide range of consultancies and temporary posts and have also worked on computer programming from home. Some women have found that the companies which have previously employed them are willing to provide part-time work. One firm involved in helicopter manufacture attempts to re-employ women part-time and often allows them training opportunities. The computer company, F International (Green, 1981), employs primarily women who work from home doing programing. However, there do not appear to be any general patterns for the retraining of women and most arrangements seem to be on a 'one-off' basis.

This lack of general provision for women in engineering (and in virtually all other fields of work) creates special problems for women who find it necessary to move from the area in which they worked before they had their children. In moving they often lose their former contacts in engineering and often experience difficulty in establishing credibility in firms who do not know how to evaluate their previous experience.

In spite of its obvious advantages, women do find drawbacks in part-time work. Employment is often insecure and frequently denies workers fringe

benefits recieved by full-time employees. This is a particular problem when women work for several employers or for relatively short contracts.

Since the Women in Technology Scheme is a new one, there has not been time to evaluate its effects on the women's employment prospects. As employers become more familiar with the course, it is hoped that some of them will provide periods of industrial experience for women participating in the course. These placements could be useful both for the women and the companies involved by providing the women with recent practical experience and by giving companies an extended opportunity to 'try out' potential employees. In situations in which companies had no vacancies, women would have recent industrial experience which could be used in future job applications.

When the women in the present research are involved in child care, it is hoped that there will be several ways in which they can keep in touch in engineering and can re-enter the field. The Women in Technology Scheme is a promising development and the Open Tech also offers potential opportunities for them.

Footnote 1:
Transcripts were rated independently by one of the authors and a research student. Complete agreement was obtained on thirteen transcripts. Discussion produced agreement on one other transcript and the remaining three transcripts were judged to contain insufficient or contradictory information, so that a judgment could not be made.

CHAPTER FIVE CONCLUSIONS

If the number of women in engineering at technician level is to be increased, schools and the engineering industry, itself, must consider how young women select a scientific career. Schools should revise their approach to the teaching of science and mathematics, so that both teachers and pupils see these subjects as important for girls as well as boys. In turn, industry should consider ways of making engineering more accessible to women. This could be done by emphasising the more socially useful aspects of engineering and by modifying its image as a heavy dirty occupation that is suitable only for men.

The engineering industry in conjunction with colleges and universities needs to confront the issue of retraining. If there are rapid changes in technology, many engineers - both male and female - will require re-training. With imagination and good will such training could be adapted to meet the needs of women who wish to return to engineering after child-bearing.

Four areas have been identified as crucial to increasing the number of young women entering engineering: subject choice, careers advice, re-training and the proportion of women in engineering. Each of these topics will be considered separately.

Subject Choice

In secondary schools careful thought should be given to the curriculum and to the system of option choice, so that sexism and sex role stereo-typing are minimised. Academic and craft subjects should be available

equally to girls and boys - both during the first three years and as options for exminations. All too often the stereotyped attitudes of teachers, peers and parents are reinforced by features of school organi-sation which preserve traditional sex role boundaries. The old labels of 'girls' subjects and 'boys' subjects are potent ones, influencing the design of the curriculum, the planning of timetables and the amount of attention given to female and male pupils.

Girls need role models and exemplars of women who are successful in science and technology. Although single sex schools are disappearing, there is an argument for preserving this pattern of education and for examining the characteristics of girls' schools which encourage girls to choose and excel in science and mathematics.

Subject choice is an entrenched feature of the educational system, but the question must be raised as to whether it should exist at all. Are pupils and their advisors in a position to make decisions at age thir-teen or fourteen which may prevent them from entering careers in science and technology? In comparison with other western democracies, Britain is unusual in requiring that these choices be made at such an early age.

Byrne (1978) argues passionately for a core curriculum in which pupils are not allowed to opt out of key subjects, such as science and mathe-matics. Ormerod (1981) supports this notion but also maintains that the content and approach currently used in the teaching of physical sciences needs to be modified, so that girls' interests and preferences in teaching styles are considered.

Where subject choice exists, girls and their advisors should be aware of the career implications of the choices being made. Although the girl with strong academic promise and an interest in medicine will be encouraged to study sciences, her less academic sister may not receive the same support for her scientific interests. She may not realise the importance of studying physics or chemistry or the need to do well in mathematics if she is to consider a career with a scientific basis.

Although there are related problems in the choice of academic and craft subjects, the specific issues which arise are somewhat different. Therefore, the two areas will be considered separately.

Academic Subjects. Girls are less likely than boys to be offered the opportunity to study physics and chemistry in the fourth and fifth form and are less likely to choose these subjects for examination. They are also somewhat less likely than boys to attempt and to pass O level examinations in mathematics (Kelly, 1981). In mixed schools the ratios between female and male pupils are more unbalanced, with both sexes choosing in terms of sex stereotypes (DES, 1975).

Girls need to be urged to continue their study of mathematics and the physical sciences. Both areas of study are crucial for future scientific and technical careers, but are often dropped because they seem to difficult or unfeminine. The situation is seen most dramatically in the case of physics, but similar factors operate in the choice of chemistry and mathematics. In 1973 only 17% of girls who had the opportunity of studying physics chose to do so. The comparable figure for boys is 52% (DES, (1975).

The unpopularity of physics stems at least partly from its image for girls as a boring and difficult subject. Kelly et al (1981) have shown that whilst there is little difference in girls' and boys' science knowledge at age eleven, there are already distinct differences in their scientific interests. These differences are frequently accentuated by the type of science taught in the first three years of school, thus increasing the likelihood of girls opting for biology and boys choosing physics.

This situation can be changed. One promising effort in this direction is seen in the Girls Into Science and Technology project. As part of a large scale research programme, Kelly and her colleagues (1981) are developing guidelines for a science curriculum which reflects the interests of both sexes and emphasises the social and humanitarian implications of science. For example, they have discovered that both girls and boys have a keen interest in human biology and have found topics from biology which are useful in demonstrating principles of physics. They suggest that physical forces can be illustrated through examples of how muscles work rather than how machines work. Other topics of interest to both sexes include the more spectacular topics in science, such as volcanoes, earthquakes and rainbows.

The reputation of physics as a difficult subject is a well-deserved one. Ormerod (1981) contends that physics and chemistry are more difficult than other school subjects and that they are perceived this way by students of both sexes. He found that girls' perceptions of the difficulty of subjects were related to their preferences for subjects. This finding is consonant with a large number of psychological studies, suggesting that girls underestimate their abilities and attribute their academic success to luck rather than their work in the subject (Deaux, 1976). These lines of research suggest the importance of giving girls confidence and support, so that they see difficult subjects as a challenge rather than as areas to be avoided.

Girls' attitudes to science and mathematics are also influenced by the style in which the subjects are taught. Summarising the results from several American studies, Stoney and Reid (1981) note that females prefer a well organised and structured learning environment whereas males prefer to learn by direct experience. This fits with the British observation that girls dislike the open-ended discovery approach offered by Nuffield science (Kelly, 1981). Girls also tend to prefer a friendlier and more relaxed classroom atmosphere whilst boys are more comfortable with competitive and individualistic work.

Research based on classroom observations suggests that teachers differentiate in the way they treat girls and boys. In particular, boys are likely to be given more attention and more opportunity to talk and participate in the class than are girls (Spender, 1982). Teachers are also likely to praise and criticise female and male pupils for different aspects of their behaviour (Dweck et al, 1978). Boys attract more criticism but are usually criticised for non academic aspects of their work or behaviour, whereas girls receive critical remarks on the academic features of their work. Conversely girls tend to be praised for non essential aspects of their work, such as neatness.

Change needs to be direct at several levels: curriculum content, teaching methods, and teacher behaviour. Although the prescriptions are necessarily wide-ranging, teachers can begin to help girls by being aware of their needs and preferences and by helping to foster their interest and feelings of competence in science and mathematics (see Footnote 1).

Craft Subjects. Sex discrimination in the provision of options is particularly likely to occur with craft subjects. Kant (1982) refers to a survey by Her Majesty's Inspectorate which estimated that 65% of schools differentiate between the sexes in the provision of craft subjects. In retaining sex-related distinctions, traditional patterns are upheld and girls are often prevented from discovering interests and abilities in 'boys' craft subjects.

Barriers to girls doing 'boys' craft subjects operate at several levels. Although formal discrimination is no longer legal under the Sex Discrimination Act (1975), stereotyped assumptions about the needs and interests of girls and boys are incorporated in the curriculum and timetable. For example, many schools timetable 'boys' craft subjects against girls physical education, so that it is difficult for girls to take more than one 'boys' subject.

Another source of bias lies in the curriculum offered before option choices. Although most mixed schools formally offer girls and boys the same subjects for examination, some schools still segregate craft subjects by sex during the first three years. This practice may effectively prevent girls from taking 'boys' craft subjects as options, since teachers often refuse to take pupils who have not previously studied the subject. Where girls are permitted to take these subjects, they begin the course seriously behind the boys in the class.

'Boys' craft subjects, such as woodwork, metalwork and design technology can be particularly important for girls. They serve as an introduction to unfamiliar topics and provide girls with basic skills and knowledge that they are unlikely to acquire outside of school. They also give girls experience in what Kelly and her colleagues (1981) have termed 'tinkering activities'; these activities appear to promote mechanical reasoning and analytic skills and offer girls concrete experience in 'how things work'.

Recent evidence suggests that experience in 'boys' craft subjects is related to the development of spatial ability - an area in which girls tend to be behind boys. Kelly et al (1981) have found that as little as twelve weeks of experience in technical craft subjects is associated with improved performance on tests of spatial visualisation. Girls in their study showed greater improvement than boys and made most dramatic gains on a test that required them to visualise a three-dimensional object. These findings, in conjunction with other data on sex differences in scientific hobbies reported by Kelly et al, suggest that experience in 'boys' craft subjects may help girls to compensate for experience that they were previously lacking and may have an important role in fostering intellectual skills.

Many secondary schools provide mixed crafts by operating 'craft circuses' during the first three years. However, there is a problem in that teachers and pupils may not take these subjects seriously. Kelly et al (1981)

observe that there is a tendency to see 'craft circuses' as having social rather than educational value. They offer a strong argument for instituting a design-based technical craft course with clear educational aims for all pupils until age sixteen. Such a course should emphasise analytic and logical planning skills which are needed by both girls and boys.

Unlike mathematics and science, craft subjects are not required for entry into engineering at technician level, and many girls participating in the research were successful without this preparation (see Footnote 2). However, those with craft experience found it a useful introduction to engineering and felt that they began the course with an added confidence, both in their own abilities and in their career choice.

Careers Advice

Girls and boys should be given advice on a wide variety of careers, including those which are usually associated with the opposite sex. Whenever possible careers lessons should be mixed, since the frequent practice of separating girls and boys for careers advice, reinforces the cultural notion that women's jobs are profoundly different from men's jobs.

Schools and the Careers Advisory Service should provide a variety of information about apprenticeships. Since most girls are unaware that they might be eligible for a traditionally male apprenticeship, careers information should be directed at them. It is crucial that this information be provided early in secondary school - before they choose their options.

Girls need specific information about what engineering entails and opportunities to discover whether they are really interested in engineering and have a flair for it. Schools and companies should consider running special 'Introduction to Engineering' courses which would give girls a chance to try engineering; these courses should be basically experiential and should provide examples of the types of problems which are encountered in engineering. Such courses should emphasise the socially useful aspects of engineering and address topics which are likely to build on girls' interests.

Since 1979, the Engineering Industry Training Board (EITB) has run a series of week-long summer schools, known as 'Insight', for fifth and sixth form girls who are considering an engineering course at university. In this programme girls meet women who are working as engineers and have an opportunity to gain detailed information about engineering as a career. They also are given practical experience in working on small group projects which are designed to illustrate the types of everyday issues faced by engineers. The overall aim of the course is to give girls sufficient information, so that they can make an informed decision about engineering.

Many of the concepts incorporated in the Insight programme could be adapted for a similar course for younger girls who were interested in engineering at technician level. Where schools offer work experience, such a course might be run as part of that programme. Alternatively courses could be offered during the school holidays.

Retraining

The majority of young women engineers in the present survey intend to have children and wish to take a career break of at least five years when their children are young. Although most of them would like to return to engineering, many of them see this as an impossibility. They assume that the industry will have changed so dramatically during that time that re-entry will be impossible.

There is a need to examine these assumptions carefully. They are held strongly by the young women and presumably reflect the attitudes of management in many companies. However, there is a danger that changing technology will become a new and convenient excuse for not employing women in jobs that have career prospects.

Although there are probably many superficial changes in some parts of the engineering industry over a period of five years, it is difficult to imagine such cataclysmic changes that would render a four-year apprenticeship and several years of experience useless. There should be some means of providing women with 'refresher' or 'update' courses which would enable them to return to engineering.

Ideally such courses would be offered by the engineering companies, themselves. In practice, it is probably more convenient and economic to provide courses through universities or polytechnics. A pioneering effort in this direction is the Women in Technology Scheme, described in Chapter Four. It is hoped that this course may provide a model for other similar courses that would meet the needs of returning women engineers.

In designing courses for retraining women (or men), there is a need for close co-operation between the industry and the educational institutions, so that both groups are in agreement with the basic objectives of such a course. The isolation and mutual suspicion which operates between the two groups often prevent the creation of courses that are educationally sound and meet the requirements of the industry.

There is also a need to explore further possibilities of part-time work and job sharing in engineering. Although there is a strong tradition of full-time work at technician level, other patterns of work may be feasible. However, in creating such jobs it is important that they do not become down-graded and labelled as 'women's work', thereby losing their status and possibilities for promotion.

Proportion of Women in Engineering

The EITB Scholarship Scheme has provided a clear demonstration that young women can be trained as technicians and has shown that many young women who participated in the Scheme are highly commited to engineering as a career. However, because of its limited scale the Scheme has had relatively little impact on the numbers of women who are entering technician training (see Footnote 3). Girls who are entering apprenticeships are still likely to be the only girl in their year and in some companies they may be the only female technician. Whilst there are positive aspects of working in a predominately male environment, many women find the position of being the only female in the immediate workplace a lonely and uncomfortable one. As discussed in Chapter Three, the status as a token, makes the rare women highly visible and subjects her to extra pressures.

She is never regarded as 'just another technician' but is always viewed as 'the lady engineer' with special privileges and responsibilities. She is usually seen first as a woman and then as an engineer.

The presence of token women accentuates sex differences and leads men to emphasise distinctive aspects of male culture. Whilst some expressions of male culture may be relatively benign, others contain strong elements of hostility. Women represent symbolic as well as real threats to male pride and self esteem and at the present time they provide competition for scarce jobs.

The position of women at technician level is unlikely to be improved unless women form a much larger proportion of the technician force. Their increased presence is required for social relationships in the workplace to be altered. Until these changes occur, the achievements of individual women are likely to remain isolated examples and only provide limited help for other women who wish to enter engineering.

The problems for women in engineering lie not in the tasks required but in the attitudes of both women and men towards engineering. Engineering is seen as a heavy dirty job suitable only for men. This image needs to be replaced by a realistic one which portrays engineering as a highly skilled field offering opportunities for both sexes. In the following passage, A.S. observes that there is always a way around problems of lifting heavy objects but that there are real difficulties in convincing people that women enjoy engineering and that they make a positive choice to follow it as a career:

There are things you can't do - heavy things. But there's lifting gear; there's always a way 'round. As for general engineering, I don't know what all the fuss is. Women did it during the war. But it was done (then) because it had to be. But doing it (now), out of choice, people don't understand...

Footnote 1:
Two excellent reviews of the literature on the factors relating to women's underachievement in science are provided by Kelly (1981) and Stoney & Reid (1981).

Footnote 2:
The EITB recommends that school leavers have four O levels (CSE grade 1 equivalents). Subjects that are highly recommended are English, mathematics, physics or engineering science.

Footnote 3:
The Scholarship Scheme recruited three intakes of girls. In 1979 it was superseded by the Premium Grant scheme whereby the EITB offered grants to employers to recruit and train girls as technicians. In 1979, 165 girls entered training through this scheme; in 1980, 185 girls were recruited.

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APPENDIX 1.1

Courses of Study Undertaken by Subjects Participating in the Research

		Number
1976* Sample		
ENGINEERS: EITB Scholarship Scheme		
Birmingham		13
London		12
		25
SECRETARIES		
Birmingham:	Private Secretaries Course	9
	Medical Secretaries Course	9
		18
London:	OND Course	14
	Bilingual Secretaries Course	3
		17
1977* Sample		
ENGINEERS: EITB Scholarship Scheme		
Birmingham		15
London		17
		32
SECRETARIES		
Birmingham:	Private Secretaries Course	16
	Medical Secretaries Course	13
		29
London:	OND Course	17
1978* Sample		
ENGINEERS: EITB Scholarship Scheme		
Birmingham		18
London		10
		28
SECRETARIES		
Birmingham:	Private Secretaries Course	10
	Medical Secretaries Course	11
		21
London:	OND Course	8

* This year refers to the year in which subjects began their courses.

APPENDIX 1.2

Summary of Subjects Participating in the Research*

Engineers		Secretaries	
1976 Sample			
Birmingham	13	Birmingham	18
London	12	London	17
	25		35
1977 Sample			
Birmingham	15	Birmingham	29
London	17	London	17
	32		46
1978 Sample			
Birmingham	18	Birmingham	21
London	10	London	8
	28		29
Total No. Engineers	85	Total No. Secretaries	110

* The numbers include subjects who were trained as engineers and secretaries but who have subsequently found other fields of work. See Appendix 1.3 for the jobs held by the subjects when they participated in the research.

APPENDIX 1.3

Jobs Held by Young Women With Engineering Training*

	1976	1977	1978	Total	%
Technician apprentice	22	28	17	67	79
Engineering related	2	3	3	8	9
University course**	-	-	5	5	6
Job unrelated to training	1	1	3	5	6
Total No. Subjects	25	32	28	85	

* Engineering training refers to the completion of the two year EITB Scholarship Scheme.

** All University courses are in engineering or in engineering related subjects.

APPENDIX 1.4

Jobs Held by Young Women With Secretarial Training

	1976	1977	1978	Total	%
Secretary/PA	16	18	11	45	41
Medical Secretary	10	13	10	33	30
Other Clerical*	5	6	7	18	16
Clerical Officer	-	1	1	2	2
Clerk/Trainee (financial)**	2	2	-	4	4
Travel/Sales	-	2	-	2	2
University course***	1	1	-	2	2
Job unrelated to training****	1	3	-	4	4
Total No. Subjects	35	46	29	110	

* This category includes temporary secretaries and clerks, specialist typists and shorthand typists.

** This category includes bank clerk, branch assistant (building society) trainee accountant and junior financial counselor.

*** The courses followed are psychology and law.

**** Jobs in this category include groom at riding stable, banqueting co-ordinator, newsagent and debt collector.

APPENDIX 1.5

Response Rates to Questionnaires Used in the Research

Engineers	1976	1977	1978	Total
Questionnaires completed	25	32	28	85
Questionnaires returned, incomplete	1	1	-	2
Unknown at address	2	2	3	7
No reply	6	6	10	22
Total No. Questionnaires	34	41	41	116

Response rate: 73%

Secretaries	1976	1977	1978	Total
Questionnaires completed	35	46	29	110
Emigrated	-	1	1	2
Unknown at address	-	2	2	4
No reply	26	14	17	57
Total No. Questionnaires	61	63	49	173

Response rate: 64%

APPENDIX 1.6

Numbers of Respondents Interviewed

Engineers*	1977	1978	Total
Birmingham	6	4	10
London	6	2	8
Total No. Interviewed	12	6	18

Secretaries**	1977	1978	Total
Birmingham	6	4	10
London	5	4	9
Total No. Interviewed	11	8	19

* Three additional engineers from Birmingham 1978 group completed repertory grids and were interviewed about their grids. One of the young women in the 1977 group from Birmingham was interviewed in the above group and also completed a repertory grid.

** Four of the secretaries completed repertory grids and were interviewed about their grids. One of the secretaries was from the 1977 Birmingham group and the remaining three were from the Birmingham 1978 group.

APPENDIX 1.7

Outline of Topics for Open-ended Interviews*

The Career Decision

Age when first considered career
Choice of school subjects
Family influences
Peer career choices and influences
Careers advice and school influences
Other careers considered

The College or Training Course

Positive and negative features
Adequacy of training

The Job

Description of responsibilities
Relationships with supervisor/boss and workmates
Characteristics of good technician/secretary
Dress and image at work
Social relationships at work

The Future

Plans for marriage and children
Division of household responsibilities
Child care
Career break and return to work

The Career Reconsidered

Future prospects in the field
Advice to schoolgirls considering a similar career

* Interviewers were asked to cover the most of the major issues on outline. However, it was considered more important to have the young women talk comfortably and freely than to ask about each item listed, so that not all subjects spoke about exactly the same topics.

APPENDIX 1.8

The Mantel-Haenszel Test

Most of the results in this report require analysis controlling for the potentially confounding effects of location, year of entry into the study, or both. If the results were continuous and normally distributed, analysis of variance would be appropriate, but this is rarely the case in studies of this type.

Simply grouping the data from all conditions together is unsatisfactory. Confounding effects can result in the calculations being either overly optimistic or overly pessimistic. The direction of this effect is not always easily predictable; combining the data from several groups, all of which show a statistically significant association in the same direction, can result in a grouping which fails to demonstrate a significant association if tested by the traditional chi squared methods, a problem known as Simpson's Paradox.

This problem occurs extremely frequently in epidemiology, and has been extensively studied by Mantel and Haenszel who have developed methods for combining the results of 2 × 2 and 2 × K tables. These methods are based on an exact calculation of the variances of the quantities involved using the hypergeometric distribution, and so are valid even for small samples where the usual chi squared approximation would be inappropriate. In the case of a single group, they give results which are close approximations of Fisher's exact test but are much easier to calculate.

The description and notation given below is adapted from Fleiss (1973) and Beslow and Day (1980) using a notation partially suggested by Colin White of the University of Minnesota Summer School in Epidemiology. In Fleiss' presentation, the variances given below are shown as 'weights' equal to the reciprocal of the variances given here.

The principle in the 2 × 2 and 2 × K cases is the same. For each subgrouping, calculate a difference d and its variance var(d) which reflect the degree of association in the subgroup. The degree of association within each table is measured by the ratio of square of this difference to its variance. As with any random variable, this difference is distributed as a chi squared variate with one degree of freedom.

$$d^2/\mathrm{var}(d) = X_1^2 \text{ (within group)}$$

Likewise, since the variance of the sum of random variables is the sum of their variances, if we add the variances for all the groups:

$$\mathrm{var}\{\mathrm{SUM}(d)\} = \mathrm{SUM}\{\mathrm{var}(d)\}$$

SUM(d) is also a random variable, and therefore the ratio of its square to its variance is distributed as chi square with one degree of freedom:

APPENDIX 1.8 (continued)

$$\mathrm{SUM}(d)^2/\mathrm{var}\{\mathrm{SUM}(d)\} = X_1^2 \text{ association}$$

This chi squared (association) is a measure of the overall association within all the groups. The sum of the individual chi squared (within groups) is also a chi squared variate with G degrees of freedom, where G is the total number of subgroups, since it is the sum of independent chi squared variates. The difference between this total chi squared and the chi squared (association) is known as the chi squared (homogeneity) and is a measure of the degree to which the different subgroups show the differences to the a 'homogeneous' degree. It is distributed as chi squared with G-1 degrees of freedom.

$$X_G^2 \text{ (total)} = X_1^2 \text{ (assoc.)} + X_{G-1}^2 \text{ (homogeneity)}$$

If the measure of homogeneity is significant (ie. the groups were significantly nonhomogeneous) then the results of the test must be treated with great caution.

For the 2 × 2 case, in the i'th group:

$$d_i = x_{i11} - (n_i - 1)(p_{i1} - p_{i2})/n_i \bar{p}_i \bar{q}_i$$

$$\mathrm{var}(d_i) = (n - 1)/\bar{p}_i \bar{q}_i \, n_{i1} \, n_{i2}$$

where n_i is the number of subjects in the k'th group, p_{i1} is the proportion of subjects in the subgroup in the first condition showing the characteristic in question. $\bar{p}_i$ is the average proportion over the two conditions showing the characteristic. In each case the q's are the complements of the p's.

In the 2 × K case, the measures are slightly more complex, if there are K levels, k = 1...K, each with a measure y_k, and these y_k s are ordered (but need not form an interval or other scale) then:

$$d_i = \mathrm{SUM}_{k=1}^{K}(x_{i1k} y_k) - \mathrm{EXPECTED}\{\mathrm{SUM}_{k=1}^{K}(x_{i1k} y_k)\}$$

and

$$\mathrm{EXPECTED}\{\mathrm{SUM}_{k=1}^{K}(x_{i1k} y_k)\} = \mathrm{SUM}_{j=1}\{\mathrm{SUM}_{k=1}^{K}(x_{ijk} y_k)\} \, \mathrm{SUM}_{k=1}^{K}(x_{i1k})/n$$

APPENDIX 1.8 (continued)

The corresponding variance is given by:

$$var(d_i) = n_{i1} n_{i2} V_{yi} / (n - 1)$$

where V_{yi} is the variance of y in the i'th group given by the computational formula:

$$V_{yi} = \{\sum_{k=1}^{K} (n_i \bar{P}_{ik} Y^2_{ik}) - (\sum_{k=1}^{K} (n_i \bar{P}_{ik} Y_{ik})^2 / n)\} / n_i$$

In the 2 × 2 case this reduces to the formula given above.

n_i is the total number of subjects in the ith group and $\bar{P}_{ik}$ is overall proportion of the subjects in the ith group with scores at the kth level.

Breslow N E and Day N E (1980). Statistical Methods in Cancer Research Vol 1. Lyon: International Agency for Research on Cancer (IARC) Publications. Chapter 4.

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APPENDIX 2.1

School Influence on Career Choice by Job: Comparison of Engineers and Secretaries

Group 1 1976 Sample

	Yes†	No		
ENG	6	8	14	
SEC	0	11	11	
	6	19	25	component chi squared (df=1) 5.95*

Group 2 1977

	Yes†	No		
ENG	5	7	12	
SEC	4	15	19	
	9		31	component chi squared (df=1) 1.47

composite chi squared (df=1) 6.31*
homogeneity chi squared (df=1) 1.11

School Influence on Career Choice by Region: Comparison of London and Birmingham Engineers

Group 1 1976 Engineers

	Yes†	No		
LON	5	3	8	
BIRM	1	5	6	
	6	8	14	component chi squared (df=1) 2.73

Group 2 1977 Engineers

	Yes†	No		
LON	4	3	7	
BIRM	1	4	5	
	5	7	12	component chi squared (df=1) 1.52*

composite chi squared (df=1) 4.20*
homogeneity chi squared (df=1) 0.05

† 'Yes' refers to the number of subjects mentioning teachers, careers teachers or careers officers as a source of influence on career choice.
'No' refers to the number of subjects mentioning other people as a source of influence.

* Statistically significant: $p<0.05$

APPENDIX 2.2

Influence of Female and Male Family on Career Choice: Comparison of Engineers and Secretaries

Group 1 1976 Sample

	Male	Female	
ENG	7	1	8
SEC	1	3	4
	8	4	12

component chi squared (df=1) 4.30*

Group 2 1977 Sample

	Male	Female	
ENG	4	1	5
SEC	1	5	6
	5	6	11

component chi squared (df=1) 4.01*

composite chi squared (df=1) 8.29**
homogeneity chi squared (df=1) 0.02

Discouragement Expressed on Career Choice: Comparison of Engineers and Secretaries in 1978 Sample

Group 1 London

	Yes†	No	
ENG	6	3	9
SEC	1	6	7
	7	9	16

component chi squared (df=1) 4.12*

Group 2 Birmingham

	Yes†	No	
ENG	15	3	18
SEC	7	14	21
	22	17	39

component chi squared (df=1) 9.60**

composite chi squared (df=1) 13.72***
homogeneity chi squared (df=1) 0.00

† 'Yes' refers to the subjects who mentioned one or more people who discouraged them.
'No' refers to subjects who did not mention anyone who discouraged them.

* Statistically significant: $p<0.05$

** Statistically significant: $p<0.01$

*** Statistically significant: $p<0.001$

APPENDIX 2.4

Comments on Appropriateness of Career: Comparison of London and Birmingham Engineers and Secretaries in the 1978 Sample

Group 1 Engineers

	Yes†	No	
LON	3	6	9
BIRM	14	4	18
	17	10	27

component chi squared (df=1) 4.89*

Group 2 Secretaries

	Yes†	No	
LON	1	6	7
BIRM	13	8	21
	14	14	28

component chi squared (df=1) 4.59*

composite chi squared (df=1) 9.49**
homogeneity chi squared (df=1) 0.00

Comments on Appropriateness by Female Friends: Comparison of Engineers and Secretaries in the 1978 Sample

Group 1 London

	Yes†	No	
ENG	3	6	9
SEC	0	7	7
	3	13	16

component chi squared (df=1) 2.69

Group 2 Birmingham

	Yes†	No	
ENG	6	12	18
SEC	2	19	21
	8	31	39

component chi squared (df=1) 3.28

composite chi squared (df=1) 5.79*
homogeneity chi squared (df=1) 0.18

† 'Yes' refers to the subjects who mentioned one or more people who commented on the appropriateness of their career for a girl.
'No' refers to subjects who did not mention anyone who commented on the appropriateness of their career choice.

* Statistically significant: $p<0.05$

** Statistically significant: $p<0.01$

APPENDIX 2.1 (continued)

School Influence on Career Choice by Region: Comparison of London and Birmingham Secretaries

Group 1 1976 Secretaries

	Yes†	No	
LON	0	4	4
BIRM	0	7	7
	0	11	11

component chi squared (df=1) 0.00

Group 2 1977 Secretaries

	Yes†	No	
LON	2	5	7
BIRM	2	10	12
	4	15	19

component chi squared (df=1) 0.36

composite chi squared (df=1) 0.36
homogeneity chi squared (df=1) 0.00

Parents Influence on Career Choice by Job: Comparison of Engineers and Secretaries

Group 1 1976 Sample

	Yes†	No	
ENG	6	8	14
SEC	7	4	11
	13	12	25

component chi squared (df=1) 1.02

Group 2 1977 Sample

	Yes†	No	
ENG	2	10	12
SEC	10	9	19
	12	19	31

component chi squared (df=1) 3.88*

composite chi squared (df=1) 4.53*
homogeneity chi squared (df=1) 0.38

† 'Yes' refers to the number of subjects mentioning teachers, careers teachers or careers officers as a source of influence or career choice.
'No' refers to the number of subjects mentioning other people as a source of influence.

* Statistically significant: $p<0.05$

APPENDIX 2.1 (continued)

Parents Influence on Career Choice by Region: Comparison of London and Birmingham Engineers

Group 1 1976 Engineers

	Yes†	No	
LON	2	6	8
BIRM	4	2	6
	6	8	12

component chi squared (df=1) 2.26

Group 2 1977 Engineers

	Yes†	No	
LON	0	7	7
BIRM	2	3	5
	2	10	12

component chi squared (df=1) 3.08

composite chi squared (df=1) 5.00*
homogeneity chi squared (df=1) 0.33

Parents Influence on Career Choice by Region: Comparison of London and Birmingham Secretaries

Group 1 1976 Secretaries

	Yes†	No	
LON	1	3	4
BIRM	6	1	7
	7	4	11

component chi squared (df=1) 3.69

Group 2 1977 Secretaries

	Yes†	No	
LON	4	3	7
BIRM	6	6	12
	10	9	19

component chi squared (df=1) 0.09

composite chi squared (df=1) 0.83
homogeneity chi squared (df=1) 2.94

† 'Yes' refers to the number of subjects mentioning either or both parents as a source of influence on career choice.
'No' refers to the number of subjects mentioning others as a source of influence.

* Statistically significant: $p<0.05$

APPENDIX 2.4 (continued)

Comments on Appropriateness by Careers Teachers: Comparison of Engineers and Secretaries in the 1978 Sample

Group 1 London

	Yes†	No	
ENG	3	6	9
SEC	0	7	7
	3	13	16

component chi squared (df=1) 2.69

Group 2 Birmingham

	Yes†	No	
ENG	5	13	18
SEC	1	20	21
	6	33	39

component chi squared (df=1) 3.84*

composite chi squared (df=1) 6.49*
homogeneity chi squared (df=1) 0.05

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† 'Yes' refers to the subjects who mentioned one or more people who commented on the appropriateness of their career for a girl. 'No' refers to subjects who did not mention anyone who commented on the appropriateness of their career choice.

* Statistically significant: $p<0.05$.

APPENDIX 2.5

Advice to Schoolgirls to Think Seriously About Career: Comparison of Engineers and Secretaries

Group 1 1976 London

	Yes†	No	
ENG	4	2	6
SEC	8	13	21
	12	15	27

component chi squared (df=1) 1.49

Group 2 1976 Birmingham

	Yes†	No	
ENG	4	13	17
SEC	2	15	17
	6	28	34

component chi squared (df=1) 0.79

Group 3 1977 London

	Yes†	No	
ENG	4	16	20
SEC	1	10	11
	5	26	31

component chi squared (df=1) 0.60

Group 4 1977 Birmingham

	Yes†	No	
ENG	4	10	14
SEC	0	27	27
	4	37	41

component chi squared (df=1) 8.34**

Group 5 1978 London

	Yes†	No	
ENG	3	5	8
SEC	1	6	7
	4	11	15

component chi squared (df=1) 0.96

Group 6 1978 Birmingham

	Yes†	No	
ENG	4	14	18
SEC	4	16	20
	8	30	38

component chi squared (df=1) 0.03

composite chi squared (df=1) 6.95*
homogeneity chi squared (df=5) 5.26

---

† 'Yes' refers to the number of subjects suggesting that schoolgirls should think seriously about their careers. 'No' refers to the number of subjects offering other advice to schoolgirls.

* Statistically significant: $p<0.05$.

** Statistically significant: $p<0.01$.

APPENDIX 2.5 (continued)

Note: Subjects were asked to record the advice they would offer school-girls who were considering a similar career. The responses were transcribed and coded into 15 categories. One of the authors and a research student achieved an inter-rater reliability of 0.76 in their coding of the responses. There were only two disagreements over comments that could be coded as falling into the 'think seriously' category and these were excluded from the analysis.

APPENDIX 2.5 (continued)

Career Choice Reconsidered: Comparison of Engineers and Secretaries

Group 1 1976 London

	Yes	Maybe	No	
ENG	7	4	0	11
SEC	8	5	1	14
	15	9	1	25

component chi squared (df=1) 0.34

Group 2 1976 Birmingham

	Yes	Maybe	No	
ENG	7	5	1	13
SEC	10	4	3	17
	17	9	4	30

component chi squared (df=1) 0.03

Group 3 1977 London

	Yes	Maybe	No	
ENG	12	1	1	14
SEC	3	7	2	12
	15	8	3	26

component chi squared (df=1) 6.40

* Statistically significant: $p<0.05$.

APPENDIX 2.5 (continued)

Group 4 1977 Birmingham

	Yes	Maybe	No		
ENG	7	8	1	16	
SEC	12	7	7	26	
	19	15	8	42	component chi squared (df=1) 0.56

Group 5 1978 London

	Yes	Maybe	No		
ENG	5	4	0	9	
SEC	3	2	2	7	
	8	6	2	16	component chi squared (df=1) 1.30

Group 6 1978 Birmingham

	Yes	Maybe	No		
ENG	15	3	0	18	
SEC	7	9	5	21	
	22	12	5	39	component chi squared (df=1) 10.24**

composite chi squared (df=1) 12.08***
homogeneity chi squared (df=5) 6.78

** Statistically significant: $p<0.01$

*** Statistically significant: $p<0.001$

APPENDIX 3.1

Treatment by Work-Mates: 1976 and 1977 Samples of Engineers

See Table 3.1 which is self-explanatory.

APPENDIX 3.2

Comparison of Treatment by Various Work-Mates; 1978 Sample of Engineers

Comparison of Treatment by Male Work-mates of the Same Age and Older Work-mates

	Special Case	One of Lads	
SAME AGE MEN	4	14	18
OLDER MEN	14	5	19
	18	19	37

chi squared (df=1) 7.85**

Comparison of Treatment of Older Male Work-mates and Immediate Supervisors

	Special Case	One of Lads	
OLDER MEN	14	5	19
IMMED SUPER.	4	14	18
	18	19	37

chi squared (df=1) 7.85**

Comparison of Treatment by Male Work-mates of the Same Age and Female Shop Floor Workers of the Same Age

	Special Case	One of Lads	
SAME AGE MEN	4	14	18
SAME AGE SHOP FLOOR WOMEN	9	5	14
	13	19	32

chi squared (df=1) 4.16*

Comparison of Treatment by Female Shop Floor Workers of the Same Age and Immediate Supervisors

	Special Case	One of Lads	
SAME AGE SHOP FLOOR WOMEN	9	5	14
IMMEDIATE SUPERVISOR	4	14	18
	13	19	32

chi squared (df=1) 4.16*

* Statistically significant: $p<0.05$.

** Statistically significant: $p<0.01$.

APPENDIX 4.1†

Reasons for Leaving Present Field of Work: Comparison of Engineers and Secretaries from the 1976 and 1977 Samples

Comparison of Marriage and Starting a Family with all Other Reasons (combined)

	Family	Other Reasons	
ENG	26	24	50
SEC	20	50	70
	46	74	120

chi squared (df=1) 5.81*

Comparison of Finding a Better Job with all Other Reasons (combined)

	Better Job	Other Reasons	
ENG	5	45	50
SEC	27	43	70
	32	88	120

chi squared (df=1) 10.76**

Comparison of Ill Health with all Other Reasons (combined)

	Ill Health	Other Reasons	
ENG	4	46	50
SEC	0	70	70
	4	116	120

chi squared (df=1) 3.58††

† Relates to Table 4.3

* Statistically significant: $p<0.05$

** Statistically significant: $p<0.01$

†† Approaches but does not quite reach 0.05 level of statistical significance.

APPENDIX 4.2†

Number of Children Intended††: Comparison of Engineers and Secretaries in the 1978 Sample

Group 1 London

	None	Unsure	1-2	2-3	3-3+	
ENG	2	0	5	1	0	8
SEC	0	1	3	3	1	8
	2	1	8	4	1	16

component chi squared (df=1) 2.71

Group 2 Birmingham

	None	Unsure	1-2	2-3	3-3+	
ENG	2	5	5	1	2	15
SEC	1	3	4	6	4	18
	3	8	9	7	6	33

component chi squared (df=1) 3.06

composite chi squared (df=1) 5.50*
homogeneity chi squared (df=1) 0.27

† Relates to Table 4.5

†† Respondents were asked to record the number of children they intended to have. Many of the respondents specified their answers in terms of ranges, eg. two or three. For purposes of analysis the following categories have been used: 1-2 represent respondents who wanted one or two or two children; 2-3 represents respondents who wanted two or three children; 3-3+ represents respondents who wanted three or more children. Respondents who wanted children but who did not specify a number were excluded from this analysis.

* Statistically significant: $p<0.05$

APPENDIX 4.3

Responses to Items on the Attitudes Towards Women Scale*: Engineers and Secretaries in the 1977 Samples (N=69)

Item		% of subjects endorsing the item
1.	Swearing and obscenity are more repulsive in the speech of a woman than a man	84
2.	Under modern economic conditions with women being active outside the home men should share in household tasks such as washing dishes and doing the laundry.	94
3.	It is insulting to women to have the 'obey' clause remain in the marriage service	49
4.	A woman should be as free as a man to propose marriage	53
5.	Women should worry less about their rights and more about becoming good wives and mothers	27
6.	Women should assume their rightful place in business and all the professions along with men	93
7.	A woman should not expect to go to exactly the same places or to have quite the same freedom of action as a man	21
8.	It is ridiculous for a woman to run a locomotive and for a man to darn socks	24
9.	The intellectual leadership of a community should be largely in the hands of men	11
10.	Women should be given equal opportunity with men for apprenticeships in the various trades	89
11.	Women earning as much as their dates should bear equally the expense when they go out together	85
12.	Sons in a family should be given more encouragement to go to college than daughters	6
13.	In general, the father should have greater authority than the mother in the bringing up of children	40
14.	Economic and social freedom is worth far more to women than acceptance of the ideal of femininity which has been set up by men	64
15.	There are many jobs in which men should be given preference over women in being hired or promoted	38

* The Attitudes toward Women Scale has been devised by Spence and Helmreich (1978) and has been used widely in research on sex roles in the United States. Subjects are given a four point scale: agree strongly, [illegible]

APPENDIX 4.4

Acceptability of Various Forms of Child Care: Comparison of Engineers and Secretaries in London and Birmingham in the 1978 Sample

Private Nursery as Form of Child Care

Group 1 London

	1	2	3	4	5	
ENG	1	4	0	1	2	8
SEC	3	3	2	0	0	8
	4	7	2	1	2	16

component chi squared (df=1) 2.33

Group 2 Birmingham

	1	2	3	4	5	
ENG	1	3	5	2	3	14
SEC	8	3	7	1	2	21
	9	6	12	3	5	35

component chi squared (df=1) 3.60

composite chi squared (df=1) 5.89*
homogeneity chi squared (df=1) 0.04

* Statistically significant: $p<0.05$

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Female Engineers: How Different Are They?

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ABSTRACT

Female Engineers: How Different Are They?

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Previous research on women entering science and technology has focussed on professional women and has suggested that they are very intelligent, highly committed and see themselves as more masculine than other women. Relatively little is known about women who enter non traditional fields at technician level.

In the present research females training as technicians in engineering were compared with their school friends and girls studying for two traditionally feminine occupations. Female engineers were distinguished by having positive attitudes towards mathematics and by a dislike of arts subjects. Although they did not achieve particularly high qualifications in science and mathematics, female engineers were more likely to have studied science than their friends. Both groups made their career choices relatively late in their school careers; this pattern of choice contrasted sharply with that of a group of girls studying nursery nursing and a group of boys training in engineering, suggesting the importance of traditional sex role expectations in the process of career choice.

An exploration of family background characteristics failed to reveal several factors previously identified in the literature. There were no differences between female engineers and their friends in birth order, number or sex of siblings or mother's working pattern. Subjects in both groups were equally likely to have a father who was an engineer, although female engineers were more likely to have fathers with highly demanding professional jobs. In recalling their childhood, female engineers were more likely to report having played with 'boys' toys and to have had boys amongst their playmates.

Female engineers perceived themselves as somewhat more masculine than their school friends, but there were no significant differences between the two groups in femininity. Interpretation of the results obtained suggest that female engineers may be less concerned than their friends with traditional sex role boundaries and may be more likely to categorise people on the basis of characteristics other than gender.

Female Engineers: How Different Are They?

Peggy Newton

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Introduction

Much of the research on women in science and technology has been concerned with women who are highly intelligent or creative (Batchold, 1976; Batchold & Werner, 1973; Helson, 1971), women who have achieved national or international prominence (Brooks, 1972; Reid, 1974) or highly qualified women in academic jobs (Astin, 1969; Bernard, 1964). We know something these pioneers and about highly talented and committed women. We may believe that if a woman is good enough her quality will be recognised, [although we are becoming increasingly aware of outstanding women whose achievements have been largely ignored (Sayre, 1975).] But what about other women with scientific interests, more ordinary women, who are not quite so intelligent or quite so talented? What happens to them? What are they really like?

By posing these questions I do not mean to suggest that all women who enter careers in science and technology are alike and that there is only one mould for success in these fields. In fact, my research suggests that there may be important differences between women entering engineering and some of the other sciences. But I would like to talk about some characteristics of a group of female technician engineers which may help us to identify other potential women technologists.

Several years ago I attended a conference in Cambridge where an eminent American educator asked her audience why girls did not achieve as much as boys in mathematics (Fennema, 1980). Various people offered suggestions about negative conditioning, differential socialisation, classroom processes, and so on. She allowed that these factors might have an effect, but the 'right answer' to her question was a simple one, girls tended to give up on mathematics. Once they have fulfilled the compulsory requirements, they didn't study mathematics.

Currently I believe we have a comparable situation with science and technology. We are beginning to see some changes in schools with such exciting projects as G.I.S.T. (Smail, Whyte and Kelly, 1982), G.A.T.E. (Harding, 1983) and Girls and Physics (Times Higher Educational Supplement, 1982), which encourage girls to continue studying science and give them information about scientific careers. We have had some important initiatives from the Engineering Industry Training Board (EITB, 1984) in attracting women into all levels of engineering and providing them with encouragement once they have entered engineering. However, this can only be a beginning.

I would like to suggest that there are three reasons why girls do not consider careers in technology: (1) they know very little about these careers, (2) they assume that they are not clever enough, and (3) they see these careers as too masculine. These perceptions of technological careers are often shared by their parents, teachers and friends and yet these ideas may not be justified or grounded in real information about these careers and the people who follow them.

The 'image' problem of engineering is well documented. Girls see it as a dirty and highly masculine field (Rossi, 1964; Weinreich-Haste, 1981; Newton and Weinreich-Haste, 1982). Like their parents and teachers, they assume that the only girls who can succeed in engineering must be very brainy and determined or have strongly masculine interests and hobbies. A girl who goes into engineering is seen as rather strange and not at all like other girls. In short, the potential female engineer is seen as either amazingly talented and committed or as very 'butch'. She certainly isn't just an ordinary girl.

The Research

My research is based on several groups of girls who trained as technicians in engineering under the EITB's Girl Technician Scholarship Scheme, which operated from 1976-1980. Under this programme the EITB recruited girls to study engineering and sponsored the first two years of their training as technicians. They also assisted the girls to find employment as apprentices, so that they could complete their technician training. The programme was highly successful in realising its basic aims, and a survey of particpants in the Scheme showed that the majority of the young women who took part in the Scheme were employed as technicians [1].

As part of the monitoring and evaluation of this programme, I have compared girls trained under the EITB Scholarship Scheme with three groups of girls following more traditionally feminine options: a group of friends of the female engineers, a group of girls studying nursery nursing and a group of girls studying an OND course in business studies which included training in secretarial skills [2]. To facilitate comparison, I have divided the 'friends' group into two subgroups: those who left school at the same time as the female engineers and who entered or who were preparing to enter traditionally feminine occupations ('friends') and those who stayed on at school to study for A levels ('friends-A').

The findings from my research suggest that these female engineers were both ordinary and extraordinary. In most ways they were very much like other girls; however, they did appear to have some special characteristics which may have contributed to their success.

School Factors

One of the problems the EITB had in begininng the Girl Technician Scheme was in finding appropriately qualified applicants. Their initial attempts to find girls to come on the Scheme failed because parents and teachers did not see engineering as an appropriate career for a girl. Head teachers were often unwilling to allow the EITB into schools to talk to the girls.

Research on how the girls found out about the Scheme has shown that the girls were most likely to learn about engineering through 'formal' sources of information: teachers, careers advisors and the media. They were unlikely to hear about engineering from their family or friends (Newton, 1981). However, in analysing the role of the school in encouraging girls to consider engineering, a curious paradox was revealed. Although many girls described the attitudes of their teachers as highly negative, teachers remained one of the most important sources (and often the only source) of information about careers in engineering. This phenomenon has been reported both at technician level (Newton, 1981; Newton, 1983) and at graduate level (Weinreich-Haste and Newton, 1983). Similar findings have also been reported amongst female and male engineering students in the United States with females being more likely to be influenced by direct recruitment efforts and relative formal agencies and males being more likely to gain information from family and friends (Greenfield et al., 1982).

The girls who joined the Scheme were in many ways similar to their friends. They were somewhat more likely to have studied science and a few of them had studied craft or technical subjects (Newton, 1981), although as a group their overall exam results were not quite as good as their friends. Some of them considered staying on for A levels, but many of them had not done well enough at school for this to be a serious possibility. Because the EITB was unable to find girls who were interested in engineering who had three or four examination passes in English, mathematics and physics, they selected girls who had shown some interest in science and mathematics and who appeared keen to learn about how these subjects related to engineering.

As can be seen in Tables 1 and 2, future female engineers were significantly more likely to have studied physics than both groups of friends and significantly more likely to have studied chemistry than their friends who left school at the same time [3]. However, only 20% of the 'engineers' group actually achieved a good qualification in physics -- that is an O level pass or a CSE pass at grade one, two or three. In a similar fashion, only slightly over half of the engineers (51%) received a good qualification in mathematics and they did significantly worse in mathematics than their friends who stayed on at school for A levels.

Insert Tables 1 and 2 about here

The factor which appeared to distinguish female engineers from their friends was their liking of mathematics and their dislike of arts subjects. Neither group had strongly positive or negative attitudes about science, which may reflect the fact that many not studied science, except for biology, so that they knew very little about it.

When asked about their favourite school subject, 50% of the engineers suggested it was mathematics. This is dramatically higher than the proportions in either group of friends. Conversely, future engineers were particularly likely to have negative attitudes towards arts subjects but relatively few negative attitudes towards mathematics or science. However, their friends who stayed on at school had strong negative feelings about mathematics and science.

Insert Tables 3 and 4 about here

A recent follow-up study of these girls suggested that their relatively poor school leaving qualifications were not a handicap and that they actually received more engineering qualifications than a control group of boys who entered training at the same time (EITB, 1983). A particularly important finding was that physics, a subject strongly favoured by employers as a selection criterion, did not appear to be necessary for girls to attain engineering qualifications. (However, it should be noted that without of special initiatives, such as the EITB programme, employers are unlikely to consider girls without the recommended school leaving qualifications.)

Family Background and Childhood Interests

Much of the literature on women in non traditional careers suggests that they come from unusual families. They are more likely to be an only child or the first born child. They are likely to be particularly close to their fathers and share his professional interests (Hennig, 1973) or to model after their mother's example of a working woman who successfully combines a career and family life (Angrist & Almquist, 1975). They have often demonstrated their commitment from early on, showing unusual interests and great perserverance.

In comparing this group of female engineers and their friends, I found surprisingly few differences. Female engineers were quite likely to be the daughters of engineers, but this was also true of their friends and of a control group of male engineers. In my sample, 40% of the female engineers had fathers in engineering, but the figure was almost as high amongst their friends with 34% of this group reporting that their fathers were engineers. The explanation for this finding may lie in the way girls perceive their fathers' influence on their career choice.

Previous data on this sample suggests that fathers were unlikely to suggest engineering as a possible career choice to their daughters (Newton, 1981); however, they were usually highly supportive and encouraging to their daughters after the initial decision had been made (Newton & Brocklesby, 1982). This interpretation is in line with Wolpe's study (1971) of professional engineers. She found that 59% of her sample had fathers or brothers in engineering; however, they frequently did not see their family as influential in their career decision. It appears that fathers may serve as important exemplars of engineers and that they are often described as being positive about their daughters' interest in engineering (Weinreich-Haste & Newton, 1983); however, they are not seen as directly inluencing career choice. Their influence is perceived indirectly and their role in providing a model of an engineer is often not recognised.

In the present study there was no tendency for female engineers to be first or only children. In fact, both female engineers and their friends were most likely to be second or third children. There was no difference in the numbers of brothers and sisters they had nor in the pattern of their families. Mothers in both groups usually worked and there was no difference in their occupations or their pattern of working. The only family difference I could find was that female engineers were more likely to have fathers who were in very demanding professional jobs - the Registrar General's Class 1, with 19% of the sample having fathers who fell into this group. This finding confirms the results of several other studies in suggesting that professional families are more likely to support a non traditional career choice. (Epstein, 1968; Standley & Soule, 1974; Helson, 1971; Wolpe, 1971).

I was interested in remembered patterns of interests and playmates, so that I asked young women in each of the four groups: engineers, friends, business studies, and nursery nurses about their friends and the toys they played with. Although there were some differences between the groups, they were less dramatic than might be imagined. Female engineers were somewhat more likely than their friends to have played with both boys and girls in their childhood and less likely than the other groups to have played with 'girls only'. They were significantly more likely to have played with unconventional ('boys') toys in their childhood than all other groups.

This link between childhood activities and achievement in non traditional fields has also been reported by Connor and Serbin (1977) and by Standley and Soule (1974). Coupled with the information on subject choices and preferences, the picture is

beginning to emerge of the prospective female engineer as being somewhat more willing than her friends to cross usual sex role boundaries. She appears to enjoy activities that are often labelled as masculine and is more likely to spend time in mixed groups or groups which are predominantly male than to associate only with other girls.

Insert Table 5 about here

Career Commitment and Timing of Career Choice

In explaining the choice of a career in science or engineering, there is a tendency to look for early dedication and commitment (Astin, 1969; Davis, 1975; Burks, 1975). Women in scientific fields have frequently described how their talents have been apparent from an early age and they have been encouraged by their parents to commit themselves to a demanding career (Kundsin, 1973). This did not appear to be the case with the majority of women in this sample of engineers. Most of them chose engineering relatively late in their school careers and many of them first decided on engineering when they first heard about the EITB's special programme of scholarships. Previous research on the process of their career choice suggests that one of their reasons for their delayed choice was that they were not aware that engineering was a possible career for women (Newton, 1981).

However, the engineers were not alone in this pattern of making their career decisions during their final year at school. The timing of their choice was similar to that of their friends who left school at the same time and also to the group of girls who studied business studies. This pattern of choice contrasted sharply with a group of boys in engineering who had been interested in engineering for significantly longer, a finding which has also been reported by Wolpe (1971). The timing of choice of the female engineers was also significantly different from that of the nursery nurses.

Insert Table 6 about here

Slightly over one third (36%) of the girls who entered the Scheme had considered engineering as a career for at least two or three years, so that most of them were able to chose their options with their career in mind. As noted previously, the remaining girls had been interested in mathematics and science and had studied them in preference to arts, but made their career decision relatively late. These findings may be interpreted in several ways.

The most common interpretation would rest on the comparison between boys and girls. It is easy to claim that most girls are not really serious about their careers and lack commitment to them. However, several writers have suggested that girls may realistically appraise their possibilities and see their future careers as offering them fewer certain prospects and rewards (Angrist and Almquist, 1975; Laws, 1978). Their career aspirations are conditioned by the possibilities open to them and they are aware of potential discrimination and also of the practical problems of combining work and family life. Angrist and Almquist (1975) have suggested that for women career commitment is necessarily contingent upon other considerations (or potential considerations) in their lives and that women need to be relatively certain of their success in a field before committing themselves to it.

The pattern of data shown in Table 6 also suggests that early commitment is more likely when it accords with conventional sex role expectations. Boys who choose engineering will have heard about engineering as a possible career at an early age and will have pursued hobbies which have allowed them to confirm that this is a field which they have some aptitude and interest. In a similar way girls who enter nursery nursing will have had an opportunity to gain experience with young children and to learn about their own skills. In both cases they will have had a chance to 'try out' a future occupation.

This opportunity for sampling or 'rehearsal' has also been identified as a factor in young women's choice of non traditional or 'role innovative' occupations. Angrist and Almquist (1975) found that work experience was an important factor in differentiating young women who were preparing for non traditional careers from those who were preparing for traditionally feminine careers. It may be argued that work experience or other opportunities to sample non traditional fields are essential, simply because these opportunities to find out about and try out these fields of work do not occur naturally in most families. Traditional sex role boundaries mean that certain occupations are simply not considered as possibilities.

Several researchers have suggested that girls consider the widest range of occupations at about age 13 but that their choices are progressively narrowed as time progresses (Matthews and Tiedeman, 1964; Tyler, 1964). Whilst the present findings do not disprove this contention, it is worth noting that the majority of girls in the present study were willing to consider a non traditional occupation at age 15 or 16 and that this relatively recent 'commitment' did not appear to be a handicap to their subsequent achievement in engineering.

Perceived Masculinity and Femininity

One of the questions that most interested me in the research was that of masculinity and femininity. Was the female engineer more masculine and less feminine than her friend? And what happened when she became an engineer? How did she change?

Traditionally masculinity and femininity have been considered to be opposites, to be feminine was to not be masculine and vice versa. This concept is well enshrined in the psychological literature and in common ways of thinking. In fact I would suggest that one of the reasons discouraging girls from becoming engineers has been a worry about losing their femininity. This has also been a concern of women working as managers (Baines, 1984).

Recent psychological theory suggests that masculinity and femininity are not opposites but that they are independent dimensions (Constantinople, 1973; Bem, 1974; Spence & Helmreich, 1978). It suggests that most people view themselves as having both masculine and feminine characteristics and that a useful way to describe people is in terms of the relative balance of their masculine and feminine characteristics. Several researchers have suggested that the most desirable ratio of these characteristics is a high degree of both masculinity and femininity which is known as 'psychological androgyny' (Bem, 1974; Kaplan, 1976; Gulanick et al., 1979).

Psychologically androgynous people are believed to have an advantage in being able to be more flexible and able to engage in a wider repertoire of behaviours (Bem, 1974). They are more likely than people who are traditionally sex typed to be comfortable in engaging in behaviour which is usually seen as characteristic of the opposite sex (Bem & Lenney, 1976). There is also some evidence to suggest that they may be more mentally healthy and higher self esteem (Bem, 1977; Spence & Helmreich, 1978; Williams, 1979), although the evidence on this point is somewhat contradictory (Lenney, 1979; Kelly & Worell, 1977).

As part of the literature of psycholgical androgyny a special nomenclature has grown up to allow us to describe how people score on scales of masculinity and femininity. (See Figure 1.) People who are high on both scales are termed 'androgynous', whereas those scoring high on the masculine scale but low on the feminine scale are known as 'masculine sex typed'. Conversely people scoring high on the feminine scale but low on the masculine scale are known as feminine sex typed. Individuals who score low on both scales are known as 'undifferentiated'.

Insert Figure 1 about here

In my research I compared the female engineers with their friends and the girls studying business studies and nursery nursing, using the Bem Sex Role Inventory (BSRI), a commonly used measure of psychological androgyny. As shown in Table 7, I found that female engineers were more likely to be androgynous than their friends and the other two groups of girls studying for traditionally feminine jobs. Although they were less likely to be feminine sex typed (low on masculinity; high on femininity) than the other groups, there were no significant differences amongst the the engineers and their friends on the actual level of femininity. Contrary to the popular stereotype, relatively few female engineers (11%) were masculine sex typed and they were no more likely to be masculine sex typed than their friends.

Insert Table 7 about here

How does one explain these findings? I believe that there are two sorts of answers: one concerning the sort of girl who chooses engineering and the other which says something about the selection process for female engineers.

Not surprisingly a woman choosing engineering is likely to perceive herself as having masculine qualities. However, the cultural values placed on femininity make it unlikely that the prospective female engineer will wish to see herself as "unfeminine" and indeed, the decision to do engineering may encourage her to emphasise her feminine as well as her as masculine qualities. Informal conversations with male engineers and training officers who were involved in the selecting the women in this sample suggest the selectors did not want girls whom they felt were 'too masculine' and that they preferred girls whom they saw as 'fairly tough' and 'able to cope', but as also retaining feminine qualities.

Therefore, women who choose engineering as a career are most likely to see themselves as having both feminine and masculine characteristics. Past research on androgyny measures (Kelly and Worell, 1977) suggests that they are more likely to be high on both femininity and masculinity scales than to be low on both scales and thus be classified as 'undifferentiated'.

As expected, the group of 'friends' lies somewhere in between the engineers and other two traditionally feminine groups. They are are more similar to the female engineers in being androgynous and somewhat less likely to be feminine sex typed than the Business Studies and Nursery Nurses groups.

Further information about group differences is gained if we examine differences in the levels of masculinity and femininity on the measure of androgyny. These results are presented in Table 8.

Insert Table 8 about here

We find that female engineers are more masculine than their friends and than girls studying Business Studies. [The difference between engineers and their friends just misses the conventional .05 level of statistical significance ($p = .056$); however, the difference between engineers and the Business Studies group is highly significant ($p < .005$).] Somewhat surprisingly the differences in masculinity between the female engineers and the nursery nurses can be seen only as a trend ($p = .10$) and do not represent a convincing difference between these two groups.

However, if we look on femininity scores, we find that the Nursery Nurses are dramatically higher on femininity than all other groups. All differences are statistically significant at beyond the .01 level.

On the basis of this evidence, we may suggest that girls entering a traditionally masculine field such as engineering are unusual in that they see themselves as more masculine than their school mates, whereas girls entering a tradionally feminine field are unusual in that they see themselves as more feminine than their school mates.

The importance of considering masculinity and femininity and independent dimensions is seen clearly in the present sample, where (as in Bem's research) the scores have a low negative correlation ($r = -.16$). Previous researchers who have conceptualised masculinity and femininity as polar opposites frequently portrayed the future female scientist or technologist as being more masculine and less feminine than her friends or schoolmates studying arts subjects (Smithers & Collings, 1981; Harding, 1981). However, these studies appear to have described the relatively high degree of masculine traits possessed by these young women and to have assumed that they implied a corresponding lack of feminine characteristics. The pattern of results presented here suggests that knowledge of the relative proportions of masculine and feminine characteristics can provide useful information in predicting and explaining occupational choice.

Implications of the Present Research

The present research challenges the popular conception of the female engineer as a very masculine person and suggests that she continues to see herself as a having both feminine and masculine characteristics. It confirms the findings of a similar study by Yanico and Hardin (1981) who found that female engineering students were more likely to androgynous than female students of home economics. It also fits well with literature reviewed by

Lemkau (1979) who suggests that women in non traditional occupations are no less feminine than women who occupy more tradtional roles.

According to Bem's recent theoretical formulations of 'gender schema' theory (1981, 1983), androgynous people are more likely to be relatively unconcerned about issues of gender and to processs information less in terms of gender attributes. They may be less involved in current stereotypes and see people more in terms of their psychological characteristics with relatively little reference to current cultural definitions of femininity and masculinity.

Preliminary results from my research support this interpretation. I have found that female engineers were no more feminist than their friends and that they changed relatively little during the first two years of their training. Whilst they believed strongly in equal rights at work, the majority of them defended a traditional division of labour in the home. Although they became somewhat more feminist during their training, the changes were not dramatic and few members of the group labelled themselves as feminists.

Findings from the present research suggest that some of the commonly held fears about girls in engineering are unfounded. Girls who enter engineering are not less feminine than their friends and they do not become less feminine as they proceed in their training. Indeed girls in one region where the Scheme operated became significantly more feminine during the first two years of their training and those who were interviewed expressed a concern with maintaining feminine values and a desire to become more feminine (Newton and Brocklesby, 1982).

As there is an increasing interest in increasing the number of entrants to engineering and technology, I believe that it is important to realise that there are careers for women at many levels. Although not all prospective female engineers are alike, most of them are not remarkably different from their friends who will enter traditionally feminine fields of work. The future female technician engineer probably enjoys mathematics and science and has shown some aptitude in these fields. She has played with unconventional toys, has socialised with both girls and boys and is relatively unconcerned with current notions of what is masculine and what is feminine. She is clever, but she may not have outstanding academic qualifications. She is committed, but this may have been a growing commitment, not a lifetime's ambition. She maintains feminine interests but may well see her role in terms of improving social conditions through contributions to science and technology, rather than working directly with people.

In conclusion, I would like to suggest that the female engineers in the present study were pioneers in that they dared to do it. They were comfortable in feeling different from their friends, a factor also noted by Wolpe (1971), and they were able to deal

with or ignore those who questioned their femininity. Sometimes they were accused of having the 'wrong' motivation in wanting to be different, but their success is a record to stand by. I believe that there are many future female engineers sititing in our classrooms. They need encouragement and they need information about careers in technology, so that they can make an informed decision abut whether they will enjoy these careers. But I think we can shelve some of our worries and discard two ill deserved stereotypes: female engineers are not extraordinary people, who are unbelievably clever and committed; and they are not unfeminine or particularly different from other women. Their interests and their occupations are somewhat more masculine than their friends and they may display more assertive characteristics. Although they are not feminists by the usual definition, they may be less sensitive to distinctions based on gender. In seeing gender as an unimportant dimension, they may offer a model for the future, in which people are seen in terms of their real characteristics and not in terms of societal definitions of what is masculine or feminine.

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Table 1: Subjects Most Liked by Female Engineers and their Friends

	ENG (N = 44)	FRD* (N = 34)	FRD-A+ (N = 27)
Mathematics	22 (50%)	4 (9%)	4 (15%)
Science	8 (18%)	5 (15%)	2 (7%)
Arts	10 (23%)	25 (73%)	21 (78%)
Craft/Techn.	4 (9%)	0	0

---
* Group comprises Friends who left school after CSEs and O levels.

+ Group comprises Friends who stayed on at school to study for A levels.

Table 2: Subjects Most Disliked by Female Engineers and their Friends

	ENG (N = 44)	FRD* (N = 34)	FRD-A+ (N = 27)
Mathematics	3 (7%)	10 (29%)	9 (33%)
Science	3 (7%)	4 (12%)	8 (30%)
Arts	33 (75%)	18 (53%)	8 (30%)
Technical	1 (2%)	0	0
None	2 (5%)	2 (6%)	0
Missing data	2 (5%)	0	2 (7%)

---
* Group comprises Friends who left school after CSEs and O levels.

+ Group comprises Friends who stayed on at school to study for A levels.

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Table 3: Physical Sciences Studied at School by Female Engineers and their Friends

		ENG (N=92)	FRDS* (N=68)	FRDS-A+ (N=57)
PHYSICS	Studied	46 (50%)	13 (19%)	18 (32%)
	Not Studied	46 (50%)	55 (81%)	39 (68%)
CHEMISTRY	Studied	36 (39%)	14 (21%)	20 (35%)
	Not Studied	56 (61%)	53 (79%)	34 (60%)
	Missing Data	0	0	3 (5%)

---
* Group comprises Friends who left school after CSEs and O levels.

+ Group comprises Friends who stayed on at school to study for A levels.

Table 4: Mathematics and Physics Qualifications of Female Engineers and their Friends

		ENG (N=92)	FRDS! (N=68)	FRDS-A+ (N=57)
PHYSICS	O lev pass++	14 (15%)	4 (6%)	9 (16%)
	CSE 2, 3	5 (5%)	6 (9%)	5 (9%)
	O lev entry*	18 (20%)	1 (1%)	2 (4%)
	Other**	9 (10%)	2 (3%)	2 (4%)
	Not Studied	46 (50%)	55 (81%)	39 (68%)
MATHS	O lev pass++	34 (38%)	27 (45%)	36 (63%)
	CSE 2, 3	12 (13%)	12 (18%)	4 (7%)
	O lev entry*	21 (23%)	9 (13%)	7 (12%)
	Other**	21 (23%)	13 (19%)	4 (7%)
	Not Studied	4 (4%)	7 (10%)	6 (11%)

! Group comprises Friends who left school after CSEs and O levels.

\+ Group comprises Friends who stayed on at school to study for A levels.

++ This category includes CSE grade 1 passes.

* This category includes those who received O level grades lower than C or unknown results.

** This category includes CSE grades which were below grade 3 or unknown results.

Table 5: Childhood Toys and Playmates of Female Engineers, their Friends, Girls Studying Business Studies and Girls Studying Nursery Nursing

	ENG (N=45)	FRNDS (N=68)	BUS. STUD. (N=13)	N. NURSE (N=14)
TOYS:				
Unconventional+	16 (36%)	8 (12%)	4 (31%)	0
Conventional	28 (62%)	59 (87%)	9 (69%)	14 (100%)
Missing data	1 (2%)	1 (1%)	-	-
PLAYMATES:				
Boys	8 (18%)	9 (13%)	1 (8%)	2 (14%)
Both	34 (75%)	45 (66%)	9 (69%%)	8 (57%)
Girls*	3 (7%)	14 (21%)	3 (23%)	4 (29%)

\+ Differences between female engineers and their friends are statistically significant at the .005 level. (Chi square = 7.96, 1 df; missing data excluded from calculations.) Differences between female engineers and nursery nurses are also highly statistically significant.

* When the engineers are compared with the combined group of friends and girls studying business studies or nursery nursing, the engineers are significantly less likely to describe their playmates as being 'mainly girls' than is the combined group. (Chi square = 4.09, 1 df, p<.05.)

Table 6: Number of Years Interested in Present Career: Comparison of Male Engineers, Female Engineers, Friends of Female Engineers and Girls Studying Business Studies and Nursery Nursing.

	M. ENG (N=48)	F. ENG (N=45)	FRNDS (N=34)	BUS. STUD. (N=13)	N. NURSE (N=14)
None+	0	17 (38%)	15 (44%)	7 (54%)	4 (29%)
c. 1 yr.	22 (46%)	12 (27%)	7 (21%)	0	0
2-3 yr.	15 (31%)	9 (20%)	4 (12%)	4 (31%)	2 (14%)
> 3 yrs.	11 (23%)	7 (16%)	5 (15%)	1 (8%)	6 (43%)
missing data	-	-	3 (9%)	1 (8%)	2 (14%)

Figure 1: Patterns of Perceived Masculinity and Femininity on Measures of Psychological Androgyny+

	Androgynous	Masculine Sex Typed	Feminine Sex Typed	Undifferentiated
Masculinity	High	High	Low	Low
Femininity	High	Low	High	Low

+ In the present research, subjects were classified as masculine or feminine sex typed, if their scores on the Masculinity and Femininity Scales on the Bem Sex Role Inventory were significantly different ($t > 2.025$); see Bem (1974) and Bem & Watson (1976) for further information. Group medians were used to determine whether subjects' scores were 'high' or 'low' for assignment to the androgynous and undifferentiated groups.

Table 7: Patterns of Perceived Masculinity and Femininity in Female Engineers, their Friends and Girls Studying Business Studies and Nursery Nursing on the Bem Sex Role Inventory

	Androg.+		Masculine		Feminine*		Undiff.	
	N	%	N	%	N	%	N	%
Engineers (N = 37)	25	68	4	11	3	8	5	14
Friends (N = 57)	24	42	9	16	18	32	6	11
Business Studies (N = 13)	4	31	0	0	7	54	2	15
Nursery Nursing (N = 12)	3	25	0	0	8	67	1	8

+ Female engineers are significantly more likely to be androgynous than their friends (Chi square = 4.85, 1 df, $p < .03$), than girls studying business studies (Chi square = 3.94, 1 df, $p < .05$) and girls studying nursery nursing (Chi square = 5.08, 1 df, $p < .02$).

* Female engineers are significantly less likely to be feminine sex typed than their friends (Chi square = 5.84, 1 df, $p < .02$), than girls studying business studies (Fisher's exact test, $p = .001$) and girls studying nursery nursing (Fisher's exact test, $p = .001$).

Table 8: Masculinity and Femininity Scores on the Bem Sex Role Inventory for Female Engineers, their Friends, and Girls Studying Business Studies and Nursery Nursing*

	Masculinity Score+		Femininity Score++	
	Mean	s.d.	Mean	s.d.
ENG (N = 37)	93.03	12.71	89.97	13.36
FRND (N = 57)	86.83	16.61	93.65	13.70
BUS. STUD. (N = 13)	77.01	15.97	92.79	14.71
N. NURSE (N = 12)	84.08	15.70	106.25	9.02

-----

* The mean scores of engineers and their friends have been compared using t tests; to allow for differences in sample size, comparisions between engineers and the business studies and nursery nursing groups have been made with unpaired t tests with unpooled variances using a correction for degrees of freedom as described by Hays (1963), pp. 317-322. All significance values quoted are for two tailed tests.

\+ Engineers tend to be more masculine than their friends ($t = 1.93$, 92 df, $p < .06$) and they are significantly more masculine than girls studying business studies ($t = 3.16$, 18 df $p < .005$) and are somewhat more masculine than girls studying nursery nursing ($t = 1.73$, 16 df, $p < .10$).

++ Engineers are not significantly different from their friends or the girls studying business studies on femininity. However, nurserry nurses are significantly more feminine than engineers ($t = 4.63$, 29 df, $p < .001$), friends ($t = 3.84$, 24 df, $p < .001$) and girls studying business studies ($t = 3.02$, 23 df, $p < .006$).

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(3)

Engineering Technician Interview 1

I.D. Number	510	1-3	510
Interviewer	J. LOTTRELL	4	
Date of Interview	14.9.77	5	1
		6-7	~~II~~ 2

Name: JANET HART — 8 | 1

Address: 6 REDFERN CLOSE, SOLIHULL — 9,10 | 09

Telephone No: 7424930 — 11 | 2

Sex: Male 1, Female (2)

Place of Interview and/or Company: — 12 | 2

- Lucas (1) — 13 | 1
- Delta Metals 2
- Croydon E.I.T.B. 3
- Kingston College of Further Education 4 — 14 | 1
- Home 5
- Other (Write in) 6

Secondary School: (Name and place) ST. PETER'S COMP.

Type of School: (Note if single sex or mixed) — 15 | 1

- Comprehensive (mixed) (1)
- Comprehensive (single sex) 2 — 16 | 1
- Grammar school 3
- Secondary modern 4
- Independent 5
- Other (Write in) 6

Approximate size of school (number of pupils): 600 — 17 | 2

I.D. No. ______

1. When did you leave school?

(RECORD APPROXIMATE DATE AND YEAR AND SPECIAL REASON, IF ANY, e.g. July, 1977, after O levels.)

Date	Reason
June 1976.	Finished course.

2. What qualifications (exams) did you get at school?

(RECORD SUBJECT AND TYPE OF EXAM, e.g. CSE, O LEVEL, A LEVEL; FOR CSE ONLY NOTE ANY GRADE 1 PASSES. DO NOT COUNT O LEVELS WITH GRADE LOWER THAN C.)

Subject	Type of Exam	Tick if CSE Grade 1 Pass
Maths	C.S.E. 2	
Geog	3	
German	4	
Physics	3	
Chemistry	5	

18	2
20	3
24	8
25	2
26	2
27	2
28	1
~~29~~	~~2~~

Total Number CSEs ______

Total Number CSEs (Grade 1) ______

Total O Levels ______

Total A Levels ______

I.D. No.

3. Did you have any other qualifications before you started this training programme? Solihull Tech.

(VARY WORDING AS NECESSARY; PROBE FOR NIGHT SCHOOL, FURTHER EDUCATION CLASS)

Yes 1
No 2

31 1

IF YES, RECORD TYPE OF CLASS, DURATION, AND QUALIFICATION, IF ANY.

Type of Course	Length	Qualification
Eng. Lang. 'O' level	1 yr.	C.

4. Did you have any careers advice or careers lessons at school?

Yes 1
No 2

33 1

IF NO, GO TO Q7.
IF YES, ASK:

5. What sort of careers advice (lessons) did you have?

(PROBE FOR AS MUCH DETAIL AS POSSIBLE; e.g. regular careers lessons, interview with the head, interview with Careers Service, films, etc.)

In last year. How to fill in app. forms. Writing letters. Where to go to get more advice. Interview w. careers teacher - asked what like to do & not advised as to what subj. would get. accepted wanted to do eng. - but didn't find any further info at all.

6. Looking back on the careers advice at school, would you say that it was: (READ OUT)

Very useful	1
Quite useful	2
Somewhat useful	3
Not at all useful	4
A complete waste of time	5

34 3

COMMENTS: Not very good - didn't really seem to care.

I.D. No.

7. Have you had any contact with the Careers Service (local Careers Office)?

Yes 1
No 2

35 2

IF NO, GO TO Q10.
IF YES, ASK:

~~36 5~~

8. What help or advice did you get?
(PROBE FOR AS MUCH DETAIL AS POSSIBLE)

9. Would you say that the Careers Service had been: (READ OUT)

Very useful to you	1
Quite useful to you	2
Somewhat useful to you	3
Not at all useful to you	4

36 5

CODE SEPARATELY A RESPONSE SUCH AS:

They tried, but they weren't any use to me	6

COMMENTS:

10. What did you do between leaving school and beginning this course?

Looked for a job	1
Signed up for further education	2
Went on the dole	3
Other (Write in)	4

COMMENTS: Went to coll. for O levels - was going back to do Medic Secretary course.

37 6
38 7

I.D. No. ______

IF DID NOT LOOK FOR JOBS, GO TO Q15.
IF LOOKED FOR JOBS, ASK:

11. What sort of jobs did you look for?
(PROBE FOR DETAILS)

______
______
______
______

12. About how many jobs did you apply for? 39 7

Number of applications ______

COMMENTS: ______
______
______
______

13. Were there any jobs you were offered?

Yes 1 40, 7
NO 2 41 7

IF NO, GO TO Q15.
IF YES, ASK:

14. What were they?
(LIST JOB AND REASON FOR NOT DOING IT.)

Job	Reason for not doing it

I.D. No.

15. How did you hear about the E.I.T.B. programme (this job)?

(VARY WORDING AS APPROPRIATE.)

Looking thro' evening mail - ~~43~~ 3

had always wanted to do this but given ~~44~~ 2

this up & decided to do conventional things

Pleased to find this opening 42 3

FOR BOYS, GO TO Q33.
FOR GIRLS BEING TRAINED BY EITB, ASK:

16. Was this the first time you considered engineering as a career?

Yes 1
No 2 44 2

IF YES, GO TO Q18.
IF NO, ASK:

17. When did you first think about training as an engineer?

About 4th year

45 3

46

18. What did you have to do to get on the E.I.T.B. course?

Had to have 2 O levels Applied

Tests & interview.

19. In the interview what sort of girl did you think they were looking for?

(PROBE AS NECESSARY)

Somebody who'd work hard. Got along

with the lads - worked with hands.

I.D. No.

20. Why do you think they chose you?

Regarded as a challenge to do a man's job.

21. When did you find out that you had a place on the course?

8th Sept.

46 2

22a. At that time did you have any other job possibilities or other opportunities?

Yes 1
No 2

IF NO, GO TO Q23.
IF YES, ASK:

22b. What were they?

To carry on at college (see before).

23. What made you decide to come on this course?

The only one offered of its kind
Seemed a good course

24a. Were there any courses that you took in school that prepared you for engineering?

Yes 1 Tech. drawing at college.
No 2

IF NO, GO TO Q25.
IF YES, ASK:

47 1 ?
48 1

24b. What were they?

I.D. No.

25a. Were there any options (classes) that you wanted that you weren't able to get at school?

Yes 1
No 2

IF NO, GO TO Q26.
IF YES, ASK:

49 1

25b. What were they?

Woodwork, metalwork.

50 1

51 1

25c. Why couldn't you take them?

Not given the option - had to do cooking, needlework (Do now, but didn't then).

52 1

26a. What did your parents think about your doing engineering?
(PROBE FOR REACTIONS OF BOTH PARENTS.)

Mum - bit wary of it - of accidents etc didn't mind - good trade - better than receptionist.

54 5

55 3

26b. Were there any jobs your parents didn't want you to do?

Yes 1
No 2

IF NO, GO TO Q27.
IF YES, ASK:

56 2

26c. What were they? (PROBE FOR REASONS)

57, 8

58 8

27a. Is there anyone else in your family or do you have any close friends in engineering?

Yes 1
No 2

IF NO, GO TO Q28.
IF YES, RECORD RELATIONSHIP OF PERSON AND JOB.

59 2

60 0

27b.

Relationship	Job

I.D. No.

28. What did your friends think about your deciding to do engineering?

Amazed. Man's job (Pleased - by this reason better than reaction to receptionist) - they're all recepts. etc - They wish they were doing it. different. 61 | 1

29. What does your boyfriend(s) think about it?

Really pleased - didn't want to be receptionist (mainly because of money) - also no money going back to coll. for ano. yr. 62 | 2

30. What sort of job is he doing?

Labourer - hod carrier. 63 | 8

64 | 1

31. What sorts of jobs have your friends at school taken?

Receptionists hairdressers etc. 65 | 4

66 | 2

67 | 2

32. How would you say you are different from them (in deciding to do engineering)?

Working w. machinery - not in office, bank etc.
More courageous & adventurous.

~~[illegible]~~

68 | 2

69 | 4

NOW SKIP TO Q 48

I.D. No. ____________

46. What sorts of jobs have your friends at school taken?

____

____

____

47. How would you say you are different from your friends who have done other jobs?

(PROBE AS NECESSARY)

____

____

____

ASK BOTH BOYS AND GIRLS:

48. What sort of person do you need to be to get on engineering?

(PROBE AS NECESSARY) NA NA

70 5

Average sort likes working w machinery + 71 4

other people doesn't mind male company,

working indoors, getting dirty.

49. How do you feel about your job? (SHOW CARD A)

I love it	1
I am enthusiastic about it	2
I like it	3
I am indifferent to it	4
I don't like it	5
I dislike it	6
I hate it	7

72 2

50. What stands out about the first days at work in this job?

Actually being able to work on

machinery - straight onto shop floor.

thrown in at deep end

____

____

I.D. No.

51. In what ways is the job different from what you expected?

Not

73 1

52. What things would you have liked to have known before you started this job?

Nothing

53. What have been your best moments at this job? (What things do you like most about the job?)

Way days split up - do ~~sa~~ one thing all day. Set up own machine Tutor there all the time - to help - only helps when ask him. Talks ~~to~~ with you as a person rather than at you.

54. What have been your worst moments since you started the job? (What things do you like least about your job?)

Having to stay late at college. Here it's O.K. Dinner hour a bit short.

55. Thinking about your mates at work, would you say they are (READ OUT)

Very easy to get on with	1
Quite easy to get on with	2
Sometimes difficult to get on with	3
Very difficult to get on with	4

74 1

COMMENTS: All in same boat - nobody knows anybody from before

I.D. No. ______

FOR BOYS, GO TO Q57
FOR GIRLS, ASK:

56a. What about the lads on the course, how do you get on with them?

Don't really know them yet - Monday didn't really speak. Helpful - stronger (less strength not really a disadv. - could do it if nec.) 74

56b. What do you think the lads think about you?

Feel won't be as good as them (or fear girls might be better) - might really like it. 75)

NOW GO TO Q58.

ASK BOYS:

57a. What about the girls on the course, how do you get on with them?

57b. What do you think the girls think about you?

I.D. No.

ASK BOYS AND GIRLS:

58. What about the supervisors and instructors. On the whole do you find them

(READ OUT)

Very easy to get on with	1		
Quite easy	2	76	2
Somewhat difficult	3		
Very difficult to get on with you	4		

COMMENTS: Very nice

59. How do they treat you? Do you think they believe in you and think you can do the job?

Yes. Hope girls will be able to do it. Help the girls more - will explain things again to them whereas won't w. boys 77 1

60a. What about the girls and lads, are they treated the same way or are there some differences?

Treated the same way	1		
There are differences	2	78	2

60b. IF DIFFERENCES:

What are they?

(PROBE FOR AS MUCH DETAIL AS POSSIBLE)

See above. More or less the same - don't swear as much.

61. How interesting do you find your job? Would you say that it is -

(READ OUT)

Very interesting	1		
Quite interesting	2	79	1
Somewhat interesting	3		
Somewhat boring	4		
Quite boring	5		
or Very boring	6		

I.D. NO. CARD 2.

61b. Here is a card with some things that people have said about their jobs. Which of the statements seem to apply to your present job? (HAND RESPONDENT CARD D) RESPONDENT MAY CHOOSE AS MANY ITEMS AS DESIRED; TICK OR CIRCLE NUMBERS OF ITEMS CHOSEN

1. not enough skill required
2. monotonous
3. responsible
4. competitive
5. clean
6. difficult
7. a steady job
8. work with a good crowd
9. the product is interesting
10. too routine
11. boring
12. keeps you busy
13. varied
14. you have to concentrate
15. offers prospects of promotion
16. too heavy
17. mainly indoor work
18. mainly sitting
19. skilled
20. interesting
21. uses your brains
22. gives you a chance to use your initiative
23. dirty
24. a lot of moving about
25. well paid
26. badly organised
27. needs nimble fingers
28. I work with those of my own age
29. you can pause when you want to
30. noisy
31. teaching me something useful

13 (
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25 |
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33
35
40 |
41 |
Otherwise C

CARD 3

61c. Here are some things that have been said about [illegible] ctors [illegible]. Which ones describe the person or people most in charge of your work? (HAND RESPONDENT CARD E) RESPONDENT MAY CHOOSE AS MANY ITEMS AS DESIRED; TICK OR CIRCLE NUMBERS OF ITEMS CHOSEN

1. fair
2. strict
3. expects too much
4. considerate
5. efficient
6. moody
7. knows his/her job
8. clever
9. too young
10. listens to me
11. sincere
12. reliable
13. helpful
14. nagging
15. full of ideas
16. too old
17. good to work under
18. confident
19. praises me when I do well
20. sarcastic
21. treats me like a human being
22. muddled
23. pleasant
24. always keeps promises
25. encourages me
26. explains things clearly
27. frightening
28. has favourites
29. interfering
30. kind
31. doesn't seem interested

11 |
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35 |
40 |

I.D. No. CARD 4

62. Career-wise, how ambitious a person would you say you were? Would you say that you were -

(READ OUT)

	Very ambitious	1	
	Quite ambitious	2	
	Somewhat ambitious	3	11 1
	Not very ambitious	4	
or	Not at all ambitious	5	

63a. How sure are you that you will stay in engineering and still be in training a year from now?

(READ OUT)

Very sure	1	
Quite sure	2	12 1
Somewhat sure	3	
Not at all sure	4	

COMMENTS: ____________________

63b. What about two years from now, would you say that you are -

(READ OUT)

Very sure	1	
Quite sure	2	13 1
Somewhat sure	3	
Not at all sure	4	

COMMENTS: ____________________

63c. What would you say your chances of completing your training as a technician are? (VARY AS NECESSARY) Would you say that there is a -

(READ OUT)

-	A very good chance you will complete the training	1	
-	A fairly good chance you will complete the training	2	14 1
or	Not a very good chance you will complete the training	3	

COMMENTS: Stick at it

I.D. No.

63d. What about in 10 years time, would you say that you are - (READ OUT)

- Very likely to be in engineering (1)
- Quite likely to be in engineering 2
- Somewhat likely to be in engineering 3

or Not at all likely to be in engineering 4

15 1

COMMENTS: - hope to be - also only thing trained for -

64. If you left engineering, what sort of job do you think you would go for?

Want to stay w. engineering - not considered much else.

16 3

17 7

Why?

IF NOT WORKING FOR A COMPANY, GO TO Q66, OTHERWISE ASK:

65. What sorts of products does this company make?

All sorts. tools parts for machines.

66. What sort of job would you like to have in engineering when you complete your training?

Technician - still on practical side

Why?

Don't want to go thro' training just to be in an office

I.D. No.

What would you do as a ________?

Shop Floor. on machinery

67. Can you tell me what a technician does and how that is different from being a craft apprentice?

(VARY WORDING AS NECESSARY)

No.

68. What is the training for a technician? How is it organised?

(VARY WORDING AS NECESSARY; PROBE FOR DETAILS)

Getting used to machines Going to coll. for mechanical science + tech drawing. day release for 6 weeks. Block release for 6 weeks. Not sure Day release again or here all time. Next yr. - diff him then more block release!

NOW I HAVE SOMETHING RATHER DIFFERENT FOR YOU TO DO.

69. Here are some cards which have on them things which different people have said that they are looking for when they decide what kind of job they want. First of all I want you to have a quick look through the cards to get an idea of the things we are asking you about.

(HAND CARDS TO RESPONDENT AND LET HIM/HER LOOK THROUGH THEM.)

Now I'd like you to sort the cards into these boxes and show how important each of these things seems to you. If any of the cards has something on it that you would rather not have in your job, put it in this box marked:
"Something I don't want at all."

I.D. No.

	One of the most important things	Important but not one of the most important things	Not very important	Something I don't want at all	Don't know	
1. Good money to begin with	1	2	3	4	5	21 3
2. A chance to make plenty of money later on	1	2	3	4	5	22 1
3. A chance to travel	1	2	3	4	5	23 2
4. Good chances of promotion	1	2	3	4	5	24 1
5. Variety of work	1	2	3	4	5	25 1
6. Friendly people to work with	1	2	3	4	5	26 1
7. A good training scheme	1	2	3	4	5	27 1
8. Time off to go to college	1	2	3	4	5	28 4
9. Plenty of responsibility	1	2	3	4	5	29 3
10. A chance to make new friends	1	2	3	4	5	30 1
11. A secure job	1	2	3	4	5	31 1
12. A job you can forget when you go home	1	2	3	4	5	32 4
13. Being left to work on your own	1	2	3	4	5	33 4
14. A chance to learn new things	1	2	3	4	5	34 1
15. A job near home	1	2	3	4	5	35 1
16. A job where I know what is expected of me	1	2	3	4	5	36 3
17. A job that fits in well with family life	1	2	3	4	5	37 4

I.D. No.

70. Thinking back to school, would you say that your last year in school did you -

(READ OUT)

A lot of good	1
Some good	2
Not much good	3
No good at all	4

38 | 3

COMMENTS: Just revision - nobody took any notice 'They're the 5th yrs -- they'll be leaving soon' - Pushing into exams - makes want to repeat it.

71. What is the lowest age at which you think people should be able to leave school?

14	1
15	2
16	3
17	4
18	5
Other (WRITE IN) ____	6

39 | 3

~~39~~

COMMENTS: Should stay on and take exams.

72. All things considered, are you happier now than when you were at school? Would you say that you are -

Much happier now	1
A bit happier now	2
About the same	3
A bit less happy now	4
Much less happy now	5
Not asked/Not apply	9

40 | 1

Why? More freedom - own money - more independence.

I.D. No. ______

73. How do you think going out to work has changed your life?
(How do you think leaving school has changed your life?)

Get up earlier. Not much difference
Getting to know new people.

41 1

42 1

74. How has working changed your life at home?
(How has leaving school changed your life at home?)

Not at all. Mum just same.

Think for a moment about the future and the jobs you might have.

75. If you had good luck and worked very hard, what is the best job you could see yourself getting?

Diploma - technician - don't really know
what's above that - could get degree.

76. What is the best job you think you are likely to get?

Same as above.

I.D. No.

77. What do you hope to be doing when you are 25?
(RECORD SPONTANEOUS COMMENTS)

Still working trained Good steady job
Enjoying self. Not married w. kids.
Career girl. Carry on working if married
Stay at home w. kids - till about 10 or 12
(money depending) - go back to work. Stay at
home if he demanded it & had enough money.

IF NOT MENTIONED ABOVE, PROBE FOR EXPECTED JOB, ATTITUDES TOWARD MARRIAGE, CHILDREN, AND WORKING WOMEN.

I.D. No.

NOW I'D LIKE TO ASK A FEW QUESTIONS ABOUT YOUR FAMILY.

78. What job does your father do?
(PROBE FOR AS MUCH DETAIL AS POSSIBLE)

43 9

44 9

79. What about your mother, does she go out to work?

Yes 1
No 2

45 4

IF NO, GO TO Q81.
IF YES, ASK: 46 9

80. What job does she do?
(PROBE FOR AS MUCH DETAIL AS POSSIBLE)

Machinist at Rover - 4 yrs.
Skilled tailoress

NOW GO TO Q82.

81a. Has she ever had a paying job?

Yes 1
No 2

IF NO, GO TO Q82.
IF YES, ASK:

81b. What did she do?
(PROBE FOR DETAILS)

I.D. No.

82a. Do you have any brothers and sisters?

Yes 1
No 2

IF NO, GO TO Q83
IF YES, ASK:

47 2

82b. Could you tell me their christian names and how old they are?

(ASK ABOUT JOBS OF ALL OVER 16.)

Name	Age	Job (if any)		
Barbara	21	Technical graphics	48	1
Christopher	15	school	49	1
			50	?
			51	?

83. Thinking about your parents for a moment, would you say you were more like your mum or more like your dad?

Mum. 52 2

Why?

Temperament. (though temper like Dad) 53 ?
look same

84. Are there any questions you would like to ask me about the research?

THANK RESPONDENT AND CLOSE INTERVIEW.

I.D. No. ______

55

TO BE COMPLETED BY INTERVIEWER

Approximate time to complete interview ______

Interviewer's rating of rapport achieved.

Very good/Good/Fair/Poor/Non-existent

Comments and impressions:

Clever. Determined. Keen on the challenge.
Might get bored.

INTERVIEW CONDITIONS:

Were others present during interview?	Yes	1
	No	2

IF YES, RATE AMOUNT OF DISTRACTION AND INTERFERENCE:

Great deal of interference	1
Some interference	2
No interference	3

COMMENTS: ______