Moving the Frame Forward: Hidden Profiles, group decision-making, and the role of Mental Simulation

Dawn H. Nicholson

School of Psychology, University of Kent

October, 2019

Thesis submitted in accordance with the requirements of the University of Kent for the degree of PhD in Psychology. Funded by the Vice Chancellor's Scholarship, University of Kent.

Abstract

Despite the ubiquity of group decision-making, research suggests that groups do not perform to their full potential in making decisions when information is distributed asymmetrically, and when certain biases in information exchange and processing are at work in the group. These asymmetric information conditions are known as Hidden Profiles (Stasser and Titus, 1985) and, despite a significant body of research, Hidden Profile decision tasks have proven robust to a range of interventions designed to improve group performance. Most interventions have been focused at the level of the group, however, some researchers suggest that effective interventions need to be capable of working at *both* the individual group member level, *as well as* the level of the group. The challenge taken up by this research is three-fold: (i) to expand our understanding of asymmetric information and the interactions of group members in Hidden Profile decision tasks; (ii) to consider whether the Individual Preference Effect (IPE), which has been shown to play a significant role in groups' failures to solve Hidden Profile decision tasks, manifests itself differently in men and women; and (iii) to test a mental simulation intervention designed to work at *both* the individual group member *and* group level, leading to improvements in both information exchange *and* decision quality. This research investigates these aspects of decision-making through one qualitative thematic analysis; three face-to-face group studies; three online individual decision-making studies and one meta-analysis. Results suggest a need to focus greater research attention on the role of the individual group member and interventions to overcome their initial suboptimal selection decisions. Furthermore, this research suggests that the IPE does indeed manifest differently for men and women. Finally, the mental simulation tested in this research proves to be a valuable new tool to improve individual and group decision-making in Hidden Profile decision tasks.

Acknowledgements

Actions always speak louder than words. So for those who have played a role over the course of this journey, I will always be eternally grateful for your support, love and kindness: first and foremost, to my wife, Sarah V. Duncan and to my family. Special thanks also to Dr Tim Hopthrow, Professor Georgina Randsley De Moura, Dr Giovanni Travaglino, Tamsin Rowe, Kris Bahadur, Sean Latus, Dawn Rollason, Sharon Cullen, Lizanne Allcock, Catarina Morais, Lynsey Mahmood and Group Lab. Last but by no means least, thank you to the University of Kent. The journey began here many, many years ago - and now the circle is closing. Time for a couple more chapters yet. . .

General Index

Index of Tables

Index of Figures

Thesis Overview

The present work is divided into nine chapters. The first chapter sets out the case for good decision-making and the challenges of achieving it, specifically asymmetric information, when not all parties to the decision are privy to the same information. The second chapter focuses on a discussion of efforts to overcome some of these challenges, describing interventions which have met with varying degrees of success. Chapters 3-7 present and discuss the main studies. Finally, Chapter 9 discusses the principal theoretical contributions and the practical applications of this work, together with its limitations and suggestions for future research.

Chapter 1 begins by discussing the case for good group decision making, then moves on to elucidate the factors which influence how decisions are made in situations of ‘information asymmetry’ (Akerlof, 1970). This Chapter introduces the concept of the Hidden Profile (Stasser & Titus, 1985) which is the principle conceptualisation of information asymmetry in social psychology and is the main focus of the present thesis. Challenges to information exchange and application in Hidden Profile research are discussed.

Chapter 2 extends the discussion of Hidden Profile research, examining extant research into differing interventions designed to overcome the challenges of solving Hidden Profiles. I introduce mental simulation, defined as “imitative cognitive constructions of an event or series of events” (Gaglio, 2004. p. 537) and suggest it may have a valuable role to play in overcoming challenges to successful Hidden Profile outcomes. The Premortem (Klein, 2003) on which the mental simulation tested in this present thesis is based, is also introduced and discussed.

Chapter 3 seeks to broaden and expand knowledge of what underlies group performance in Hidden Profile decision tasks through the adoption of a mixed method approach, with Thematic Analysis as my chosen qualitative methodology. Bolaños, Fotela, Nenclares and Pastor (2005) noted that qualitative research can improve the understanding of group phenomena, such as leadership and communication styles, which is important in decision-making. This Chapter tests an early version of the mental simulation intervention, which is the focus of this thesis, as well as focusing on understanding and interpreting the motivations, actions and utterances of the individual group members, which I contend is key to better understanding the challenges operating at both individual and group level in Hidden Profile decision tasks. To my knowledge, no Hidden Profile research has taken a similar qualitative approach, so this Chapter makes a unique contribution.

Chapter 4 presents a face-to-face group study and empirically examines for the first time the effectiveness of the mental simulation in improving information exchange and group decision quality in a Hidden Profile hiring decision task, measuring outcomes prior to and after the intervention. The results show initial positive support for mental simulation as an important procedural intervention in Hidden Profile decision tasks, leading to an increase in group members' exchange of critical, unique information and a reduction in confidence in the Suboptimal Candidates. Results for group decision quality are, however, less clear.

Chapter 5 presents the first individual online decision-making study, with the aim of examining the "Individual Preference Effect", an important barrier to optimal decision outcomes in Hidden Profile tasks. Individuals are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct them, and even if the accompanying group processes are perfectly conducted. This implies interventions aimed at improving performance in Hidden Profile tasks must firstly operate successfully at the level of the individual group member. Yet remarkably few studies have examined specifically how to attenuate the IPE. In Study 3, I describe how I firstly created and tested an online paradigm to replicate the IPE in Hidden Profile tasks as a precursor to testing a mental simulation intervention as one approach to attenuate the IPE (Study 6 and 7).

Chapter 6 presents two face-to-face group studies, continuing my examination of the effectiveness of a mental simulation intervention in improving information exchange and group decision quality in a Hidden Profile hiring decision task, measuring outcomes prior to and after the intervention. Study 4 investigates the potential confounding effect of the Individual Preference Effect and explores whether the mental simulation intervention may trigger the presence of "Affective Conflict" (Amason, 1996) in groups undergoing the intervention. Study 5 builds on the preliminary examination of "Affective Conflict", comparing the effect of the mental simulation on perceived levels of anger and friction amongst members of groups undergoing the mental simulation versus members of groups in: (i) a Control condition; and (ii) undergoing a devil's advocacy procedure. This is an extension of Waddell et al.'s (2013) work, which compared levels of "Affective Conflict" in Devil's Advocacy versus free discussion groups in a Hidden Profile decision task.

Chapter 7 reports two online studies which test whether a mental simulation can successfully attenuate the IPE, measuring individual decision outcomes prior to and after the intervention. The results from Study 6 show positive outcomes towards attenuation of the IPE. Study 7 replicates the result of Study 6 with a larger sample size, drawn from an organizational population, one required to be working in full-time employment. In sum, both studies provide further positive support for mental simulation as an important procedural intervention in Hidden Profile decision tasks, specifically with respect to attenuation of the IPE.

Chapter 8 involves a meta-analysis of five online studies to examine whether the IPE may manifest differently between men and women, something which previous research does not seem to contemplate. Research elsewhere has identified differences between male and females in the way they process and utilise information. The meta-analysis in this Chapter explores this in the context of the IPE and finds that males and females may differ in their ability to overcome the IPE and thereby switch from a suboptimal to an optimal candidate selection decision.

The final Chapter (9) comprises a summary of the main findings and the key conclusions of this thesis. This includes a discussion of the theoretical and practical implications, together with limitations and suggestions for future research.

Chapter 1: The Challenge of Good Decision-Making

We all make thousands of decisions every day, either alone or in tandem with others (Latham, 2015; Ryan, 2018). Some decisions are made automatically, others need our individual, or collective, time and investment. Stanovich and West (2000) labelled the systems used to make such decisions as ‘System 1’ and ‘System 2’. System 1 is quick and automatic. It needs little or no effort and has no real sense of voluntary control. System 2 is different: the mental activities associated with it require effort. Individuals engaged in System 2 have agency; they need to make choices and can act independently. This requires concentration.

System 2 requires activation whereas System 1 cannot be turned off (Kahneman, 2011). This would not be problematic were it not for the fact that System 1 has “biases [and] systematic errors that it is prone to make in specified circumstances” (p. 25). Problems arise in decision-making when System 1 decision-making processes are applied to making System 2 decisions – decisions that require effortful thought and concentration. Whilst we may think that the obvious solution to this is to avoid making decisions as individuals and ensure all decisions are made in groups, which can act as a check and balance, the superiority of group decision-making is by no means clear. For example, with respect to intellective decision tasks, for which there is a demonstrably correct answer, research shows collective groups outperform the average individual (see Kerr & Tindale, 2004 for an overview). However, task type maters, since conversely, in brainstorming research, nominal groups have been shown to outperform collective groups in the quantity of ideas generated (Stroebe, Nijstad, & Rietzschel, 2010, cited in Kämmer, Gaissmaier, & Czienskowski, 2013).

These problems can be compounded when the information that is used to make the decisions is imperfect or not uniformly distributed in instances where decisions are being made with others, for example, where one party to the decision knows something different to the other party[ies] (Information Asymmetry: Akerlof, 1970) or, as in group decision-making. Human decision-making is unreliable at best and cognitive biases, which are universal, can significantly prejudice decision quality (Arnott, 2006). Moreover, flaws in the decision-making process itself, whether operating at an individual or group level, can also increase the challenges associated with reaching an optimal decision (Lovallo & Sibony, 2010).

In this chapter, I begin by discussing the case for good group decision making. I then move on to elucidate the factors which influence how decisions are made including: (i) the concept of information asymmetry; (ii) the importance - and unreliability - of the human factor in decision-making; and (iii) the decision-making process itself.

1.1 The case for good decision-making

Most decisions in everyday life are made by groups rather than by individuals. Boards of directors decide corporate strategy; congresses and parliaments (not individual leaders) make national decisions; and families make decisions about their budgets together, rather than leaving it to individual family members (Kugler, Kausel, & Kocher, 2012).

At an organizational level, groups are ubiquitous, deployed in numerous tasks (Morgeson, DeRue, & Karam, 2010). Estimates of the percentage of organizations using teams vary but suggest 30-55% in the United States; 45% in Canada; roughly 50% in Europe and up to 65% in Great Britain (Allen & Hecht, 2004). Yet a large body of empirical work documents how poorly groups perform in certain tasks, including decision-making. The reasons for this vary: research has identified issues such as social loafing (Latané, Williams, & Harkins, 1979), group polarization (Bettenhausen, 1991) and groupthink (Janis, 1982) and poor decision-making in groups has been shown to negatively impact a wide range of outcomes. For example, an examination of some of the worst business decisions of all time (24/7 Wall Street, 2010) revealed the massive economic cost of failed decisions, including

Motorola, who went from $43.7 billion of sales in 2006, to $22 billion in 2010, accompanied by a decline in share price of over 90%. Similarly, Lehman Brothers went from peak revenue of $59 billion in 2007 to bankruptcy in 2008. A further example is hiring decisions, most of which are made by a panel following a lengthy interview process. Despite all of the effort to bring together the expertise, opinions and insight of everyone involved, poor hiring decisions are all too frequent. These suboptimal group hiring decisions carry significant costs. Harvard Business Review estimated as much as 80% of employee turnover is due to bad hiring decisions; for example, Zappos CEO Tony Hsieh estimated bad hires cost his company "well over $100 million" (Wei, 2010). There is a human cost to these decision failures also: some 25,000 employees of Lehman lost their jobs after the bankruptcy (Nova, 2018).

McKinsey's (2009) own research found 60% of senior executives believed bad strategic decisions were as frequent as good ones. Since most of these decisions are made in groups, it is important to understand how and why groups reach the decisions they reach, so that we can minimise the likelihood of these decisions being poor. Yet group decision-remains the norm rather than the exception. One reason for this is that group decision-making, together with other team and group-based tasks undertaken in organizational contexts, has advantages beyond decision quality, for example legitimacy and acceptance (Kämmer et al., 2013) and level of commitment to the decision (Bowman & Wittenbaum, 2012; Levine & Moreland, 1990). Specifically, with respect to decision-making, Allen and Hecht (2004) noted that the research into groups and teams suggests overwhelmingly that people should be involved in the decisions that affect them. Not only is this socially attractive, but it underscores important ideas of participation, democracy, transparency and empowerment. This in turn leads to higher acceptance and better implementation of a decision (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007). All of this means that group decision-making is not going away anytime soon, irrespective of the demonstrable flaws in group decision outcomes. Yet problems and challenges persist. A longitudinal survey of 300 C-suite level executives at large organisations from 16 different countries, conducted by the Chartered Institute of Management Accountants and the Association of International Certified Professional Accountants (CIMA, 2016) painted a bleak picture: failures in trust and collaboration in decision-making act as barriers to integrated thinking, with over 70% of respondents indicating a need to improve active collaboration between employees and their leaders; roughly 65% said the same about trust. Even within the C-suite itself, 43% indicated concerns around levels of trust within their own grouping that were adversely affecting their decision-making.

In their comprehensive theoretical analysis, Brodbeck et al. (2007) argued that failures in organizational group decision-making could be counteracted in certain circumstances, such that groups could outperform individual decision-makers and simple combinations of individual votes. These circumstances require the interaction of: (i) specific types of information asymmetry being present in the group; and (ii) specific types of asymmetries in information processing being absent from the group.

1.2 Information asymmetry

At its simplest, information asymmetry can be summarised as a condition where "different people know different things" (Stiglitz, 2002, p.470). This is a pervasive condition. Indeed, as Stiglitz noted, we can barely imagine what a world with perfect information would look like. Bergh, Ketchen, Orlandi, Huegens, and Boyd (2018) highlighted the central role of asymmetric information in management research, spanning subfields including strategic management, corporate social responsibility, human resource management, organization behaviour and theory, and international business and entrepreneurship.

In a review of 223 relevant articles from six leading management journals, Bergh et al. (2018) noted that research activity into information asymmetry grew from two articles published in the 1980s, rising to 40 in the 1990s, 96 in the 2000s and 85 in the current decade – and still counting - with ‘Strategic Management” accounting for the bulk of the research (65%).

Bergh et al. (2018) developed a useful framework for their review, focusing on: (a) the antecedents and conditions leading to information asymmetry; (b) the conceptualisation of asymmetric information and its theoretical application; (c) how to resolve information asymmetry; and (d) whether the intent of the ‘focal actors’ - those involved in the asymmetric information exchange - may act as a moderator in choosing how best to resolve the condition. The framework identified several different conceptualisations of information asymmetry including private information, different information, hidden information, and a lack of perfect information. All of these conceptualisations are relevant for this thesis and its focus on the Hidden Profile (see below). The authors concluded that “limited information may be one of the most common problems surrounding organizational interactions of any kind” (p.30) and ended with a call for researchers to give greater focus on how the meaning, application, properties and relationships of information asymmetry could open new “theoretical vistas”.

In the field of social psychology, asymmetric information has principally been conceptualised in group decision-making research using Hidden Profile decision tasks (Stasser & Titus, 1985). In a Hidden Profile decision task, there is always an “optimal” answer. However, information is distributed asymmetrically between group members: some shared amongst all members, whilst other information is partially shared or unique, known to only one group member. Groups may arrive at the optimal solution *only* by pooling information well enough to highlight the unique information, positive or negative, each member possesses, and which is critical to the decision outcome. Typically, groups perform suboptimally because they fail to do this, focusing more on shared versus unique information. The task is further complicated by the fact that the individual information sets held by each group member point to a different decisional outcome than the group's full information set (Brodbeck et al., 2007), with the individual group members being oriented towards an initial, suboptimal solution.

To succeed in decision-tasks, particularly those involving asymmetric information, group members must both uncover *and* assimilate information. But as Stigler (1961) noted, "the assimilation of information is not an easy or pleasant task for most people" (p.222). It is not surprising, therefore, that group decision-making research has focused on information processing in groups and how this impacts overall group decision-making, proving a "fruitful ground for research" (Kerr & Tindale, 2004, p.636). The presence of unique (hidden) information in Hidden Profile decision groups creates an immediate information asymmetry between those who hold the information and those who do not, but who could make different – even better - decisions if they had access to that information (Connelly, Certo, Ireland, & Reutzel, 2011).

The Hidden Profile decision task has been applied in many different contexts, for example, selection decisions relating to hypothetical cholesterol reducing drugs (Bowman & Wittenbaum, 2012) and suspects in a road traffic accident (Toma & Butera, 2009). It can also be applied to different organizational decision-making scenarios (e.g. recruitment panels: Baker, 2010; and medical decision-making groups: Hopthrow, Feder, & Michie, 2011). Irrespective of the context, research has consistently shown that Hidden Profile groups have a difficult time finding the optimal answer: in a meta-analysis of 65 HP studies covering 25 years of research, Lu, Yuan, and McLeod (2012) concluded HP groups were *eight times less likely* to find the solution than groups having full information ('Manifest Profile' groups).

One reason for this is that decision-making groups favour shared rather than unique information. Stasser and Titus' (1985) original research identified that group discussions were biased in favour of shared information, which was much more likely to be central in the group discussion (the *collective information sampling* (CIS) bias). Stasser, Taylor, and Hanna (1989) identified that due to this "collective sampling of information", three and six person groups discussed 45% of shared information given to all group members before discussion, compared with only 18% of unique information held by only one group member. Even when structured discussion led to an increase in the amount of information discussed, this was predominantly due to increases in discussing shared rather than unique information. This pattern has been consistently replicated throughout Hidden Profile research: decision-making groups rarely reveal, uncover and consider all information available to them because shared information is discussed more readily than unique information, which can lead the group to suboptimal decision-making (Larson, Foster-Fishman, & Keys, 1994; Larson, Christensen, Abbott, & Franz, 1996; Wittenbaum, Hollingshead, & Botero, 2004). Therefore, it is not surprising that solving a Hidden Profile decision task with asymmetric information is more difficult when group members focus predominantly on shared information; with the probability of switching from an inferior to a superior decision in a Hidden Profile task being higher when shared information was *not* repeated (van Swol, Savadori, & Sniezek, 2003).

Bringing all of this together underscores how poorly group decision-making outcomes are in scenarios with asymmetric information. Information exchange is particularly challenging: Lu et al. (2012) found that groups mentioned two Standard Deviations more pieces of common/shared information than unique information ($d = 2.03$, $p < .01$). When taken together with Lu and her colleagues' findings on the effect of pooling unique information on group decision quality, this is particularly problematic. Information coverage, the extent to which group members pooled unique information, was significantly and positively correlated with decision quality, with a large effect size ($r = .56$, $p < .01$). Discussion focus, the extent to which group members concentrated their discussion on unique information, was also correlated with decision quality, with a medium effect size, ($r = .25$, p

< .01). These findings are consistent with those of Mesmer-Magnus and DeChurch (2009), who found that Information Sharing was a positive predictor of team performance and the uniqueness of the information shared was a stronger predictor of team performance than the broader conceptualisation of the openness of the team communication. This was particularly true in intellective Hidden Profile tasks – a task where a correct answer exists, on the basis of available information and commonly accepted criteria. Getting the information out, particularly those critical pieces of information, perhaps only known to one group member, is a critical element of good decision-making.

These meta-analytic results, together with the underlying empirical research, underscore the original findings from Stasser and Titus (1985): in an HP paradigm, decision-making quality suffers when groups fail to discuss unique information needed to reach the optimal decision. Empirical evidence thus demonstrates that groups do not make optimal decisions when faced with the likely scenario that not all group members have access to all information.

The lack of perfect information may also have a profound effect on the behaviours of the group members, who may already be approaching the group discussion in different ways. More and more groups of employees make decisions under conditions of differing knowledge and expertise (Brodbeck et al., 2007): group work is more prevalent in organisations with multiple departments and divisions, so it is reasonable to assume that many decision-making teams are cross-functional and/or cross-divisional. The focus within these types of organisations has been to strive for greater teamwork and task interdependency. Jobs have been redesigned specifically with this in mind, bringing together employees with different knowledge and expertise, with the expectation that this will prompt the exchange of more and different information, whilst triggering innovation and improved group decision outcomes. Considering the research described above, this suggests that the anticipated premium is not being recognised: the evidence for the superiority of group-decision making is equivocal at best.

1.2.1 Information asymmetry as a boundary condition

Bergh et al. (2018) highlighted the important role information asymmetry plays as *a boundary condition* in research. Here, the concept of information asymmetry takes on the role of a moderator within a theoretical model and the interest level becomes how the focal actors, (i.e. the group members making the group decision) may change their behaviours depending on changes in the level of information asymmetry.

The intent of the focal actors is critical: Bergh et al. (2018) highlighted that the desired state in situations of information asymmetry is “reduce-reduce” (p.19), a scenario they defined as both parties on both sides of a transaction *collaborating*, with the aim of *reducing* levels of information asymmetry about each other. This requires the parties involved to actively share information, in order to reduce the information mismatch. This is in contrast with the alternative scenarios: (i) “reduce-increase”, where one party seeks to reduce information asymmetry whilst the other maintains it; and (ii) “increase-increase”, where both parties seek to increase the level of each other’s information asymmetry. As Bergh et al. noted, how these scenarios play out is largely dependent on the goals of the parties and the situation they find themselves in. For example, “reduce-increase” may emerge in scenarios where the same parties have differing goals, depending on the particular issue: shareholder boards and CEOs may, on the one hand, both want to reduce information asymmetry, whilst having conflicting or competing agendas at other times. The “increase-increase” scenario, is more likely to emerge when the parties seek to retain competitive advantage by maintaining the information mismatch. In Bergh et al.’s words “when the intent is to reduce information asymmetry on both sides of a relationship, positive resolutions. . .become more likely.” (p.19).

The *reduce-reduce* approach is highly applicable to Hidden Profile group decision-making scenarios: if all group members are able to collaborate successfully to reduce the information asymmetries inherent in Hidden Profiles, then optimal decision-making should emerge. However, this requires cooperation amongst the group members. Toma and Butera (2009) primed groups to either compete or cooperate in a Hidden Profile task. Group members in those groups primed to compete were more likely to withhold unshared information, that is to say, they were *more* likely to maintain the information asymmetry within the group, than those members of groups primed to cooperate. There was no such difference in how the group members managed shared information between groups primed to compete or cooperate. In addition, group members in competitive groups were more reluctant to disconfirm their initial preferences (see 1.3.1 below) and decision quality was poorer in these groups. Toma and Butera's findings underscored the fact that it is the aims and actions of the individual group members which hold the key to achieving optimal decision-making in groups. This focus on the importance of the individual group members now leads me into a consideration of the human factors prevalent in group decision-making.

1.3 The human factor in group decision-making

Cognitive biases are inherent in human reasoning. Such biases are cognitions or mental behaviours that can lead to prejudiced decision-making (Arnott, 2006, p.59). Following a detailed review and analysis, Arnott grouped 37 biases using the following taxonomy: (i) *memory biases*, focused on the storage and recall of information; (ii) *statistical biases*, which are to do with how humans process information; (iii) *confidence biases*, which lead to an overinflated sense of our prowess as decision-makers; (iv) *presentation biases*, which involve both the presentation of decisional data and impact how we perceive and process information and; (v) *situation biases*, which relate to how a person responds to a particular decisional situation. These biases overlap - to some degree - both in how they are defined and how they take effect, and all play a role – to some degree – in group decision-making.

Arnott (2006) highlighted *confidence biases* as particularly damaging: not only do they increase a person's belief in their own ability as a decision-maker, but they also curtail the search for new information relating to the decision task. Russo and Schoemaker (1992) identified four key cognitive causes of overconfidence: (i) *availability*: people have difficulty in managing all of the ways that events might unfold; (ii) *anchoring*: a tendency to anchor on one value or idea and be unable to shift away from it; (iii) *confirmation bias*: seeking evidence to confirm our initial view, rather than that which disconfirms it; and (iv) *hindsight*: we believe events are more predictable than they really are. In cases of asymmetric information distribution, where information may be hidden and hard to identify and extract, these individual biases, combined with the curtailment of the search for new information, may create a perfect decision-making storm. Dooley and Fryxell (1999) noted:

> "Information asymmetries exist in all exchange relationships. However, in the strategic decision process such asymmetries are accentuated as each strategic decision-making team member brings different perspectives, specialized knowledge, values, priorities, and goals to bear on the decision, factors it is difficult for other team members to know about." (p.309).

Emphasising the importance of multiple perspectives amongst team members, Hambrick and Mason (1984) observed that decision makers bring their own set of "givens", reflecting the decision maker's "cognitive base", including knowledge or assumptions about future events; knowledge of alternatives; and the consequences attached to those alternatives. How the decision-maker prefers to order those consequences or alternatives is a reflection of the decision-maker's values, which will, in turn, reflect on the decisions reached. On the one hand, these multiple perspectives could play a positive role and encourage cross-fertilisation and innovation (Brodbeck et al., 2007). Conversely, if these multiple perspectives reflect individual-level biases, this may lead to problems in group decision-making.

The relationship between individual decision biases and how these play out in group decision-making settings has been thoroughly reviewed. Kerr and Tindale (2004) noted that past research examining whether or not groups attenuate or exacerbate individual decision biases, concluded that groups may demonstrate the same heuristic-based biases as individuals. For example, if a particular bias is prevalent (or less so) at the level of the individual group members, a simple majority decision process (i.e. 'who is in favour of?') may attenuate or aggravate this (Tindale, 1993, cited in Kerr and Tindale, 2004). Furthermore, whether groups are biased in the same way or differently from individuals also differs, depending on factors such as the type and strength of the bias; how this is distributed and reflected throughout the individual group members and what type of group decision process the group is involved in (Kerr, MacCoun, & Kramer, 1996). In sum, as Kerr at al. (1996) noted, the relationship between individual and group biases is not a simple one: individual biases can influence group decision processes, but unbiased group decision processes can exacerbate individual biases at the group level and there are many factors to consider, including how bias itself is defined (p.707).

There is a further complicating factor which may operate in group interactions and underscores the automaticity of System 1 processing and the challenges this may bring (Kahneman, 2011; Stanovich & West, 2000). Gilead, Sela, and Maril (2018) recently identified an opinion-congruency effect, whereby the acceptance (rejection) of confirmatory (contradictory) opinions can occur *rapidly and involuntarily* – put simply, their findings suggest human beings cannot help but reject opinions and information which contradict their own. In Hidden Profiles, individuals typically enter the group discussion preferring a suboptimal decision and must overcome this in order for the group to move to an optimal decision. My research aims to identify and test a process by which we can enable the individuals in a decision-making group to successfully integrate and apply information to arrive at that optimal decision, overcoming this voluntary tendency to accept confirmatory opinions whilst rejecting contradictory opinions.

The combination of the human factors, together with asymmetric information, emerge clearly in group decision-making research into Hidden Profiles. Numerous reasons linked to biases and heuristics operating amongst individual group members, and within the group, have been advanced for the failure of groups to solve the Hidden Profile and these influence what, and how information is shared.

Brodbeck et al.'s (2007) analysis categorised these into: (i) negotiation focus; and (ii) discussion bias, operating at the group level of information processing; and (iii) evaluation bias, operating at the individual processing level. In negotiation focused processing, group members share only information that will help them identify and achieve the majority group verdict, even when that verdict is suboptimal. Information shared is largely based on individual (suboptimal) preferences and opinions (Gigone & Hastie, 1997) and shared information supporting those preferences. Discussion bias leads groups to spend more time discussing shared versus unique information (Larson et al., 1996). Evaluation biases favour (i) shared information; and (ii) preference consistent information (Brodbeck et al., 2007). Group members place a higher value on shared information, which is known to several group members (Greitemeyer, Schulz-Hardt, & Frey, 2003 cited in Brodbeck et al., 2007). Such information also provides social validation as it can be corroborated by others (Wittenbaum, Hubbell, & Zuckerman, 1999). Finally, individuals evaluate information as more credible when it is consistent with their personal opinions (Greitemeyer & Schulz-Hardt, 2003).

1.3.1 The Individual Preference Effect (IPE)

Further challenges at the individual level exist in the form of the Individual Preference Effect: (IPE: Faulmüller, Kerschreiter, Mojzisch, & Schultz-Hardt, 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch and Schulz-Hardt, 2010), whereby individual group members are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct them. This is particularly problematic, since the challenge in Hidden Profiles is for individuals to integrate and process *alternative* information and viewpoints during group discussion, *despite* their pre-formed opinions. Indeed, Faulmüller at al. (2010) attached serious significance to the IPE, identifying that, through a comparison against real interacting groups, almost half of all groups would fail to solve the HP, even when all information was exchanged and no co-ordination losses occurred, as a consequence of the IPE. Furthermore, in the absence of an initial preference exchange, other studies have found evidence of improved group decision quality. For example, Schulz-Hardt and Mojzisch (2012) found that only 22% of groups with initial preference exchange solved an HP versus 55% of groups with no preference exchange.

All of this suggests group discussions may compound the IPE, making discussion *more* damaging to group decision-making outcomes. In premature preference negotiation, group members use the group discussion to exchange and negotiate on the basis of their initial, (often) suboptimal preferences (Gigone & Hastie, 1997; Winquist & Larson, 1998). Groups also exchange more shared versus unique information, which is more likely to support the individual members' suboptimal preference (Wittenbaum et al., 2004). The group discussion also provides social validation (Wittenbaum et al., 1999). Yet, even removing the group discussion with a view to eradicating social validation does not automatically lead to improved decision-making outcomes. Greitemeyer and Schulz-Hardt (2003) demonstrated individuals failed to solve Hidden Profiles because they stuck to their initial preferences in a candidate selection task, even when it involved only a written discussion protocol. Faulmüller and colleagues (2010, Study 2) went one step further, replacing the discussion protocol with a bullet-point list of candidate attributes, removing any trace of socially validating group discussion. Even then, only 25% of HP condition participants, initially oriented towards a suboptimal candidate, identified the correct solution, compared to 87% of MP condition participants.

This research supports Brodbeck et al.'s (2007) assertion that these asymmetries may work singularly or together to adversely impact group decision-making outcomes, due to the inter-relationship between them. For example, the Individual Preference Effect means that a group member enters the group discussion favouring a suboptimal preference. Individual-level biases mean that they will then favour preference-consistent information and place a higher value on shared information. The discussion bias operating at the group level means that they will then be more motivated both to contribute, and recognise, information which supports that suboptimal preference, which underscores the preference for shared information; and the negotiation focus means that they will be negotiating with fellow group members on the basis of an initial suboptimal preference.

1.3.2 Gender differences in decision-making

A focus on biases and motivations at the individual group member level suggests that there is a greater need to recognise group member differences, which may have an impact on information processing and sharing. Specifically, gender difference in decision-making is not a new concept and receives wide support from a variety of literature, including biological and cognitive psychology (e.g. Cahill, 2006; Evans & Hampson, 2015; Reavis & Overman, 2001).

Byrne and Worthy (2015) attributed gender differences in reward sensitivity and information processing to different information processing styles: whilst females are more comprehensive processors of information, able to maximize either immediate or long-term benefits in different situations, males process information more selectively, and demonstrate a cognitive bias towards maximizing long-term benefits. On a practical level, processing differences between the genders have also been identified as playing a role in their differing responses to advertising, (Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991). It has also long been suggested that men and women differ in their decision-making, with stereotypical gender views suggesting that men are rational and analytic in their approach, whilst women are more intuitive (Delaney, Strough, Parker, & de Bruin, 2015).

These processing differences also have implications for how men and women approach information and their strategies for utilising it. In a study of audit students, Chung and Monroe (1998) postulated that female students would rate ‘disconfirming’ information as more important than male students. Furthermore, they suggested male students were more ‘hypothesis-confirming’ when compared to female students, making them more likely to integrate information confirming their hypothesis rather than information which disconfirmed it. Failing to account for disconfirming information could mean that solutions are arrived at too quickly, before all information has been properly considered, resulting in suboptimal outcomes. This is wholly consistent with the favouring of preference-consistent information, evidenced in Hidden Profile research.

These already identified differences between men and women open up the possibility that the IPE may manifest differently by gender, an idea which the extant Hidden Profile literature does not seem to contemplate and which I will examine further in Chapters 5, 7 and 8.

1.4 The process of group decision-making

In a review of 1,048 business decisions, the management consultants, McKinsey (2009), identified that the decision-making *process* accounted for 53% of the variance in decision outcomes and improvement from the bottom to the top quartile on decision-making processes could increase Return on Investment by 6.9%. This is not an insignificant amount. A focus on process gives rise to the question of *when* any intervention should occur. For example, Fisher (2017) determined that *in-process* rather than *pre-task* interventions had a more positive effect on critical information exchange and decision quality, principally because they prolonged discussions and reduced the groups' discussions of member preferences.

In this thesis I identify two key elements in the group decision-making process. On the one hand, there is the actual 'physical' process by which the group 'comes together' to make their decision. On the other hand, there is the process that determines how individual group members - and the group itself – approach and assimilate the information needed to reach the optimal solution. As well as developing and testing the intervention, this thesis will test whether other procedural changes, such as removing the individual decision-task, can impact group decision-making outcomes (see Chapter 6).

1.4.1 The process of bringing the group together

In the Chartered Institute of Management Accountants and the Association of International Certified Professional Accountants (CIMA, 2016) survey, numerous respondents indicated that their decision-making processes were flawed, with 72% indicating at least one strategic initiative failure in the last three years due to delays in decision-making. Similarly, 42% indicated they had lost competitive edges due to slow decision-making. An initial reaction to this challenge might be to deploy virtual teams as a means to reaching faster decisions. Indeed, evidence suggests this is precisely how organisations have responded: a recent survey found that 85% of 1,372 respondents, drawn from 80 countries, stated virtual teams were job critical (RW^3 Culture Wizard, 2016). Furthermore, corporate teams are also often virtual, with some 41% never meeting in person. This digital transformation means that more decisions are being made online by virtual groups. This is especially true for hiring decisions based on current trends for increasing online recruitment and selection: experts predict as much as 90% of all talent acquisition will happen online by 2020 (Patel, 2017).

But the removal of the face-to-face element from decision-making brings further challenges to the decision-making process. Hao, Yang, and Shi (2019) noted that knowledge sharing in virtual teams is particularly problematic, requiring extra time and energy to deal with issues such as establishing trust (compounded through lack of face-to-face engagement), complicated technologies, and lack of knowledge-sharing confidence and ability. The greater amount of knowledge and extensive flow of information may lead to a reticence to share such information for fear of losing face, misleading colleagues or letting them down. Shukor, Tasir, Van der Meijden, and Harun (2014) found that individuals engaged in Computer Supported Collaborative Learning discussions often aligned existing information with that of other team members, rather than construct new knowledge. This is suggestive of a greater likelihood of reliance on heuristics and short-cuts in decision-making (‘System 1’ processing): which may, in turn, drive teams towards false consensus around a suboptimal answer. Nor are virtual teams exempt from the challenges inherent in Hidden Profiles. Jefferson, Ferzandi, and McNeese (2004) examined the effect of Hidden Profiles on knowledge transfer in distributed teams and found that the presence of problem critical unique information, (i.e. that information which is key to solving the problem, but which may not be immediately obvious), obstructed the performance of such teams, decreasing their team cognition quality and impeding their ability to problem solve. This underscores the need to identify and test interventions capable of working in virtual decision-making environments as well as in face-to-face teams.

1.4.2 The importance of processing and applying unique information

In a series of reaction time tests, Gilead et al. (2018) found a processing bias in favour of opinion-congruent information: such information was rapidly and involuntarily associated with truthfulness, whilst opinion-incongruent information was involuntarily associated with falsity. Their findings suggest that members of decision-making groups should react to opinion-incongruent statements as if they were factually incorrect. In Hidden Profile tasks, where initial individual opinions have been formed on the basis of shared information, orienting individuals towards a suboptimal solution, one can easily see how this could increase the scepticism with which unique information might be greeted, particularly when it runs counter to those initial individual opinions. This recent finding provides further rationale, from a different psychological perspective, for the assertion that shared information is judged as more important and credible than unshared information (Greitemeyer, Schulz-Hardt, & Frey, 2003, cited in Faulmüller at al., 2010).

Gilead et al.'s (2018) finding underscored the importance of decision-making processing strategies amongst the individual group members. This is further borne out by work undertaken by Reimer and Hoffrage (2006), even in a study involving no individuals! Monte Carlo simulations involve a computerized mathematical technique, which allow people to account for risk in quantitative analysis and decision-making. Models of possible results are built by substituting a probability distribution for any inherently uncertain factor. Reimer and Hoffrage's simulations focused on how the decision strategies utilised by simulated group members affected overall group performance, using a candidate hiring task. Simulated group members firstly formed an individual decision and the [simulated] group then integrated the individual decisions into one group decision. Four decision strategies were programmed: two were standard benchmark strategies, requiring in-depth and exhaustive information processing (UWM, a linear model selecting the candidate with the highest sum score; and the Weighted Additive Model (WADD), a linear model which sums weighted cue values and selects the candidate with the highest score) and two were based on limited-information heuristics, where information processing ceased as soon as only one candidate was left (MIN, which compares candidates on the basis of randomly chosen cues; and 'Take the Best', which looks up cue values in an order established by cue validity). In addition, the quality and quantity of shared information were also varied. The simulations showed that the [simulated] individual group members' processing strategies exerted the strongest effects on group performance, much more so than manipulating the quantity of shared information items known by the simulated group members.

Reimer and Hoffrage's (2006) simulations also challenged the widely held assumptions that the best group decisions require exhaustive information processing and that the quantity of information shared amongst group members affects decision accuracy: here, lower amounts of shared information did not necessarily result in poorer decisions. Indeed, information sharing is only one part of improving group decision-making performance. If the information shared is not processed, assimilated and applied to the decision, then decision-making will not improve. In a study of new product development using a Hidden Profile paradigm, Xiao, Zhang, and Basadur (2013) found that *information use,* rather than *information sharing* fundamentally impacted team decision outcomes: when team members did not effectively use the information that they shared, decision-making remained suboptimal. Thus, in the context of Hidden Profiles, it is not only the process of unearthing and sharing unique information that is critical, but how that information is *used* in team decisions. The importance of information *use*, rather than information *sharing*, is also explicitly recognised in the model of Brodbeck et al. (2007), which referenced groups' failures to use information in group decision-making. Brodbeck et al. speculated that this failure may have specific motivational causes, for example, social loafing or even groupthink.

In addition, individual group members may be operating from different motivational perspectives, for example, to increase or maintain their own power, or to aim for specific decision outcomes for their own benefits. This dovetails with Bergh et al.'s (2018) "reduce-increase" or "increase-increase" scenarios with respect to information asymmetry, as described above.

1.5 Conclusion

The Hidden Profile has spawned over 30 years of research and numerous reasons have been identified for the effect. The fact that the research has now evolved into the examination of virtual teams and the presence of asymmetric information has been shown to adversely impact decision-making in such teams, means that this research continues to be highly important and relevant in today's digital world. In an extensive literature review and analysis, Sohrab, Waller, and Kaplan (2015) suggested researchers have exhausted the permutations offered by Stasser and Titus' (1985) seminal work and highlighted the need to move HP research forward into new avenues "embracing the dynamic and complex nature of team information processing" (p.1). My research takes up that challenge.

In the first instance, I have suggested that insufficient research attention has so far been paid to not only understanding, but overcoming, the Individual Preference Effect. Brodbeck et al. (2007) called for more research to "address the complementary and interactive effects motivational and cognitive processes have on group decision making" (p.470). As I have reviewed in this Chapter, the intent and actions of the individual group members appear to be key to optimising group decision outcomes in Hidden Profile decision tasks and overcoming information asymmetry. If individual group members enter the group discussion already holding suboptimal individual preferences, what hope is there of the group overcoming these to achieve an optimal solution? How are individual group members then motivated to share, discuss and integrate information that is other than preference consistent?

Research examining interventions has been focused by and large at the group level, but perhaps there is a need to focus interventions more at the individual group member level.

Secondly, I have argued that if research attention is more focused at the individual group member level, then there is a greater need to recognise group member differences, which may impact differently on information processing and sharing. Specifically, gender difference in decision-making is not a new concept and receives wide support from a variety of literature, including biological and cognitive psychology. These already identified differences open up the possibility that the IPE may manifest differently on the genders, which the extant Hidden Profile literature does not, to my knowledge, seem to contemplate (see Chapter 8).

With respect to the group decision-making process, the form of that process may have profound results on the actions of the group members. For example, I test whether group member actions and decision outcomes differ, depending on whether individual group member decisions precede the group decision-task or not (see Chapter 6). Consider a standard meeting approach, where information is distributed to the members of the decision-making group ahead of the meeting and they are asked to come to the meeting with some preformed ideas and opinions – in the interests of meeting efficiency. This very approach may trigger the IPE, raising the bar considerably for the chances of achieving an optimal group decision-making outcome.

As well as improving and increasing understanding of Hidden Profiles and asymmetric information, a key aim of this thesis is the identification of an intervention to improve decision-making outcomes in these tasks. This research also takes on that challenge, introducing and testing a mental simulation intervention, based on the Premortem (Klein, 2003), which is new to Hidden Profile research. Mental simulation, in the form of counterfactual thinking (Galinsky & Kray, 2004; Galinsky, Moskowitz, & Skurnik, 2000), has already achieved some success in Hidden Profile research but, as I will discuss, recent findings suggest a need to think beyond the counterfactual paradigms deployed thus far (see Chapter 2 and 4). Given the importance of focusing on the individual group members, I will also examine whether the mental simulation intervention can overcome the Individual Preference Effect (see Chapters 5 and 7).

Interventions to overcome the challenges of Hidden Profile decision tasks have met with varying degrees of success. Research has shown that information use, rather than simply information sharing, is key to solving Hidden Profiles. Both use *and* sharing may be down to the critical role of the motivation, actions and processing of the individual group members. Examining this in more detail may provide further valuable insights into how decision-making groups can better fulfil their potential. Much group decision-making research has focused on quantitative analysis, searching for causal explanations of why things happen as they do in group processes. As a subset of this, extant Hidden Profile research is centred in the quantitative domain. Yet qualitative research may improve the understanding of intragroup phenomena, such as leadership, communication styles, and the interactions between the individual group members. Chapter 3 seeks to broaden and expand knowledge of Hidden Profiles by adopting a mixed method approach, with Thematic Analysis as my chosen qualitative methodology. This allows the voice, motivations and actions of the individual group members to be examined and interpreted, away from the confines and rigours of a wholly quantitative approach. To my knowledge, no HP research has taken a similar, qualitative approach.

In Chapter 2, I examine extant research into differing Hidden Profile interventions to begin to elucidate how mental simulation may address some of the challenges I have highlighted in this Chapter. I extend Brodbeck et al.'s (2007) model, suggesting mental simulation has a valuable role to play in overcoming challenges to successful Hidden Profile outcomes, specifically at the level of group member decision-making.

Chapter 2: Improving Group Decision-Making

As discussed in Chapter 1, poor decision-making in groups negatively impacts a wide range of organizational outcomes, including failures of strategic initiatives, poor hiring decisions and difficulty in negotiations. It is, therefore, unsurprising that business leaders acknowledge that developments to enable better decision-making, whether training or skills based, or procedural interventions, are needed (Chartered Institute of Management Accountants (CIMA), 2016). This mirrors Brodbeck et al.'s (2007) call "to search for interventions that alter several information processing asymmetries at once" (p.472), whilst simultaneously recognising that achieving higher decision quality is vital in justifying the cost of any investment in training or skills.

2.1 Hidden Profile: an introduction

Brodbeck et al. (2007) suggested that Manifest Profiles, where all group members have access to the same information set, with consistent individual and group decisional outcomes, occur more often than Hidden Profiles. Whilst this may well be the case in terms of the physical information distribution, I contend that asymmetric information (and therefore Hidden Profiles) may still arise in these instances, driven by the differing perspectives, specialized knowledge, values, priorities, and goals each decision-making team member brings (Dooley & Fryxell, 1999). This is consistent with Bergh et al.'s (2018) different conceptualisations of information asymmetry as created by private information, different information, hidden information and imperfect information. I posit, therefore, that asymmetric information in group decision-making is much more widespread than may have been thought. This gives an urgent focus to the need to research and apply interventions to overcome Hidden Profiles.

As well as the need to increase our understanding of the Hidden Profile, how it works and the theories associated with it, including the Individual Preference Effect (Faulmüller et al., 2010), research has examined ways to overcome it. It is reasonable to focus any training or intervention on the aim of achieving better group decision outcomes and evaluate it against this benchmark (Brodbeck et al., 2007). After all, superior decision-making is the principal motivation for bringing decision-making groups together and, as I have noted in Chapter 1, all of the evidence suggests these groups are not operating at optimal levels.

To recap Chapter 1, Brodbeck et al.'s model suggests that only when information is distributed asymmetrically, and information processing is symmetric, can groups outperform individuals on decision quality. In order for information processing to be symmetric, groups need to overcome challenges operating at the group level of information processing, specifically: (i) negotiation focus, where group members share only information that will help them identify and achieve the majority group verdict, even when that verdict is suboptimal; and (ii) discussion bias, which leads groups to spend more time discussing shared versus unique information (Larson et al., 1996). Although identified as challenges operating at the group level, I suggest that these are largely driven by the actions of the group members, insofar as it is the group members who chose which items of information to share as well as what to discuss. Furthermore, group members themselves need to overcome challenges operating at the individual processing level, specifically: (iii) evaluation bias, which leads them to favour shared and preference consistent information (Brodbeck et al., 2007). Information shared by the group members is largely based on individual (suboptimal) preferences and opinions (Gigone & Hastie, 1997) and shared information supporting those preferences. This requires any intervention to have a three-pronged approach aimed at overcoming the negotiation and evaluation biases operating at the group level and, additionally, the individual-level biases.

To this should be added a further goal, for any intervention also needs to overcome the Individual Preference Effect (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010), which supplements the biases summarized by Brodbeck et al. (2007) in explaining groups' failures to solve Hidden Profiles. According to extant research, as a consequence of the IPE, individual group members are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct them. Russo and Schoemaker (1992) noted that, although group judgements may force a compromise or even encourage open-mindedness, problems may still arise in groups if individuals remain too strongly anchored to their initial view and return to it given the chance. This points to a clear need for an intervention which is effective at *both* individual and group level.

It is not just the quality of the group decision which matters, however, but the manner in which it is made and the effect on the group and its members. Groups can fall prey to "Affective Conflict" during their decision-making processes. Affective Conflict is dysfunctional conflict of an emotional nature, focused on personal incompatibilities and disputes (Amason, 1996). This can arise between group members during the decision-making process, with potentially damaging effects on *both* decision quality *and* the group dynamic. Amason found Affective Conflict was significantly and negatively correlated with decision quality and 'affective acceptance', that is, the affective relationships allowing group members to work together effectively. Indeed, there is little merit in arriving at the right decision if the group members do not then want to work together to implement it. Again, it is worth noting that the group members appear central to this concept, since it is largely driven by their reactions and relationships.

To summarise, Vallaster and Koll (2002) identified three key, interdependent factors jointly affecting the results of group decision-making: (i) cognitive variables (information search, information processing, perception/interpretation of stimuli); (ii) affective variables (group identification/attachment, satisfaction and commitment, role ambiguity/conflict, group member relationship); and (iii) communicative variables (e.g. competence and style of communication). These are complicated and dynamic factors, which require dynamic interventions, yet previous efforts have fallen short of this, or made only marginal differences. In this Chapter, I begin by discussing the research history of Hidden Profiles and the interventions tested, before introducing the mental simulation which I examine and test in this thesis, based on the Premortem (Klein, 2003). I will describe the intervention (see section 2.4) and suggest how it can offer an important theoretical and practical contribution to group decision-making research. Brodbeck et al.'s (2007) decision-making model will be re-capitulated to allow for the insertion of the mental simulation intervention.

2.2 The Hidden Profile paradigm

As discussed in Chapter 1, the Hidden Profile decision task (Stasser & Titus, 1985) has been applied in many different contexts, for example, suspects in a road traffic accident (Toma & Butera, 2009), and selection decisions relating to hypothetical cholesterol reducing drugs (Bowman & Wittenbaum, 2012). It has also been applied to different organizational decision-making scenarios (e.g. recruitment panels: Baker, 2010; and medical decision-making groups: Hopthrow et al., 2011). The decision task is set up in such a way that there is always an optimal answer. However, information necessary to solve the task is distributed asymmetrically between the individual group members: some is shared amongst all members, whilst other information is partially shared or unique, known to only one group member. It is only by pooling information well enough to highlight the unique information, positive or negative, each member possesses, that groups can hope to solve the Hidden Profile, reaching the optimal decision.

A typical task approach requires each group member to firstly reach an individual decision, without conferring or consulting with their fellow group members. Following this, group members come together (at which point group members can reveal their individual pre-discussion preferences) and are asked to reach a group decision. Assuming the group can uncover, pool and integrate all of the key, unique details held in the individual information sets, then they should find the optimal solution. There is a further task complication, however. The information sets held by each individual group member point to a different decisional outcome than the group's full information set (Brodbeck et al., 2007), with individual group members being presented with information in such a way that they are oriented towards an initial, suboptimal solution and the positive attributes of the optimal solution are hidden.

The search for interventions to overcome the Hidden Profile has been a major part of group-decision making research. Yet despite the significant time and effort devoted to this challenge, success has been mixed. Broadly, empirically tested interventions break down into three categories: (i) those that have achieved no improvement (e.g. Stasser et al., 1989; Stewart, Billings, & Stasser, 1998); (ii) those that have achieved improvement in information exchange (e.g. Larson et al., 1994; Wittenbaum, 2000); and (iii) those that have achieved improvement in both information exchange and decision quality (e.g. Brodbeck, Kerschreiter, Mojzisch, Frey, & Schulz-Hardt, 2002; Stasser, Stewart, & Wittenbaum, 1995). For those that have been successful in achieving improvements in a laboratory setting, there is a further consideration, however, which is whether they are in any way practical or capable of implementation in a "real" group setting (e.g. Schittekatte, 1996; Stasser & Titus, 1987). I will now discuss a non-exhaustive history of different intervention approaches.

2.2.1 No improvement of information exchange

Initial research focused on ways to unlock unique information in the group discussion, principally how best to introduce it into the group discussion and then maintain its salience through group repetition. For example, Stewart et al. (1998) tried to force greater group focus on unshared information by making groups accountable to an external audience for their decision. This had the reverse of the desired effect: accountable groups were less likely to focus on unshared information than groups not held accountable. The manner in which accountability was manipulated in this study may, in fact have been problematic and contributed to this reversal. In the accountability condition, participants were either told or not told the decision preference of their audience. However, more importantly, in both conditions they were told that, following their group discussion, each individual participant would be required to meet with a three-person panel to discuss the group's decision. In addition, they were told these meetings would be taped and that there was a possibility their voice could be recognised from the tape. To cement the manipulation, participants were asked to sign a consent form. In fact, these instructions were bogus and there was no interview panel. Stewart et al. subsequently posited that this manipulation approach may have created an overwhelming sense of evaluation apprehension amongst participants. It is also possible that Communication Apprehension (CA) may have played a role. Communication Apprehension (CA) is defined as the fear or anxiety associated with either real or anticipated communication with another person (or persons) (McCroskey, 1977). McCroskey differentiated between trait-CA, a fear of talking in *all* oral communication encounters, versus state-CA, which is specific to a given oral communication situation (Spielberger, 1966, cited in McCroskey, 1977). CA, in either form, can have behavioural consequences on people's ability to communicate. Ho and McLeod (2008) found that as CA increased, participants were less likely to express their own opinion in face-to-face settings when discussing a sensitive issue. This could also significantly raise the bar in bringing out critical, unique information in group decision-making, and may explain the findings in Stewart et al.'s study that accountable groups were less focused on critical information than those groups which were not accountable, contrary to their hypothesis.

With a focus on testing the effect of cognitive load and discussion structure on the group members and their groups, Stasser et al. (1989) varied group size (three/six-person), the amount of information shared (33%/66% and 100%) and asked some groups to refrain from citing any individual preference at the outset of the discussion and to concentrate on recalling information (structured discussion). Other groups were simply told to discuss the candidates and reach a decision (unstructured discussion). Notwithstanding this instruction, substantial amounts of unshared information were not discussed and, whilst structuring the group discussion did lead to more information being discussed, most of this was shared information; specifically, six-person teams without a structured discussion mentioned 13% unshared/45% shared information but in structured groups this increased to 23% unshared/67% shared. Although structured groups demonstrated improved recall for unshared information, this was accompanied by even more improved recall for shared information. Thus, in this instance, instructing members to focus on information exchange hindered rather than helped them.

A further finding from Stasser et al. (1989), with respect to the manipulation of the amount of information shared, pointed to an effect of information load on cognitive processing. Groups mentioned a larger proportion of information when only 33% was shared before discussion, compared to when 66% was shared. This is not surprising, since presumably, a lower percentage of shared information meant less reading and remembering for individual group members. This reduction in information load led to better recall amongst individual group members during the group discussion – although this was recall of *both* unshared and shared information – the latter demonstrating even more improved recall. Even so, in the 33% shared condition, where there was twice as much unshared as shared information in the total information pool, the group discussions still contained significantly more shared than unshared information ($p < .025$). Information load certainly is a factor in decision-making. Stasser and Titus (1987) did find that groups exchanged more unshared information when information load was low, but Stasser et al. could not replicate this effect. A possible explanation for this may be that the overall information load in Stasser et al.'s study remained the same; it was simply the ratio of shared-unshared information which was varied. Simply instructing members to focus on information exchange did not help, and possibly even hindered, their ability to bring out unique information, which suggests some kind of alternative approach is required to help groups and their members focus on critical unshared information.

By contrast, Mennecke (1997) *did* find an increase in information sharing for meeting groups given a specific structure to follow: groups were required to firstly recall and discuss relevant information about the candidate without stating any preference, before embarking on an open discussion. By contrast, unstructured groups were able to discuss the candidates as they wanted from the outset. Critically, this study used a computer mediated Group Support System for information sharing and discussion – so there was no face-to-face element in the study. Group information-sharing was more successful in the structured groups, resulting in the sharing of both more initially-unshared *and* shared information, although this did not translate into improved decision-making. Notwithstanding, the lack of a face-to-face element in this study, combined with a structured approach, appears to have made it easier for group members to contribute unshared information, perhaps by removing Communication Apprehension.

Forewarning group members about differences in information has also had little effect in many group decision-making scenarios. Procedurally, most Hidden Profile studies alert group members to the existence of different information amongst group members anyway, as well as to the fact that there is one superior alternative outcome in the decision-making task. This suggests additional steps are required when it comes to group members knowing who knows what. Stasser et al. (1995) forewarned all participants that information in a Hidden Profile murder mystery might be unshared. They then took this a step further, by alerting some participants in some groups that they would receive information about a specific suspect that others would not receive. In certain of these groups, expert roles were then assigned at the onset of the discussion, by identifying who in the group had received the additional clues. Simply forewarning individual group members that they would receive more information about a specific subject had no effect. However, this changed when those members were publicly identified as 'experts': groups were more likely to select the correct suspect and mentioned most of the unshared clues when they were told which of their members held additional information about each suspect (discussed further below). This study did not directly examine how knowledge of expert roles led to improved information processing and discussion strategies, although the authors speculated that this was due to better coordinated retrieval of information during discussion.

2.2.2 Improvement of information exchange

Positive results for improved information exchange have emerged from other intervention approaches. Larson et al. (1994) found that groups who underwent decision-training were more "information-vigilant". The training given to groups emphasized both strategy planning and information vigilance. Groups were asked to set aside a few minutes at the start of their discussion and plan how they intended to make their decision. Groups were also instructed in three common barriers to group decision-making: early solution adoption; changing minds uncritically (simply switching when presented with new information); and ignoring important information; and were given suggestions on how to overcome these. An instructional video was also shown to these groups covering these elements. Groups in the trained condition did discuss significantly more unshared information than those in the untrained condition. Contrary to the hypothesis, however, although the difference between the proportion of shared and unshared information mentioned at least once in the discussion was slightly larger in trained groups, the difference was small and the two-way interaction between information type (shared vs. unshared) and group decision-making training was not significant. Furthermore, the training had no impact on decision outcomes: irrespective of any training, groups chose the candidate most preferred by a majority of their members. Consequently, even with specific, targeted training, the group discussion had little impact on the ultimate decision outcome. This result is all the more significant since the decision material was not distributed amongst members in a classic Hidden Profile: participants were not oriented towards a suboptimal selection and the three candidate choices were designed so as to be broadly equally attractive. Had this same decision outcome pattern repeated itself following a Hidden Profile information distribution, then one assumes this would have resulted in suboptimal decision outcomes.

Wittenbaum (2000) also found that “high-status members”, with prior experience of the group decision-task, mentioned shared and unshared information equally often in a personnel selection task. Participants in the ‘prior experience’ condition were given a practice version of the task where they received all or some additional information, accompanied by a general CV. In addition, their increased level of experience with the task was made known to their fellow, less experienced group members, by which means they were accorded higher status. Importantly, experienced members were not more likely to mention unique information than inexperienced group members but, instead, lessened their focus on shared information, mentioning shared and unshared information equally often. In contrast, inexperienced members mentioned more shared than unshared information. Further hypothesis testing showed that this outcome was due in part to experienced members’ self-perception of their own increased task competence, compared to inexperienced members. This offers one explanation for group members’ ability to contribute unshared information.

Greater feelings of task competence were associated with greater confidence in contributing unshared information, which no group member can validate. Greater feelings of competence were also associated with higher levels of unshared information contributions, for *both* experienced and inexperienced group members. Experienced members were also rated as more task competent by their fellow group members: accordingly, when they contributed unshared information, it was given greater weight during the group discussion and accepted more readily than when offered by inexperienced group members. Consequently, in this study, higher status group members (by virtue of task experience) had to work much less hard than their inexperienced counterparts, who were more likely to have to build up their status, beginning by communicating shared information. It is also logical that lower status group members would experience higher Communication Apprehension (McCroskey, 1977). They may know less about the task or problem at hand, for example. They may be newer to the group, or more junior in status, perhaps surrounded by group members more senior than themselves. This focus on the individual group member is significant. As Wittenbaum (2000) noted, “the present study [made] an important move away from viewing collective information solely as a group-level phenomenon. . .members differ from one another in the manner in which they share information” (p.399).

As I noted above, Stasser, et al. (1995) alerted some participants in some groups that they would receive information about a specific suspect that others would not. They then assigned some participants to “expert” roles at the onset of the discussion, by identifying who in the group had received the additional clues. When those members were publicly identified, groups were more likely to select the correct suspect and mentioned most of the unshared clues when they were told which of their members held additional information about each suspect. The authors speculated that this was due to better coordinated retrieval and communication of information during group discussion, which they believed was set in train by forewarning members who were identified as experts, thus giving them the ability to prepare for their expert role. However, their study could not elucidate this clearly

Stasser, Vaughan, and Stewart (2000) re-examined this in a collective-recall versus collective-choice task. Three-person groups individually reviewed profiles of three equally attractive candidates for the role of student council president; each group member was given additional information on one candidate not held by the other group members. In the 'forewarning condition' the candidate's name was clearly highlighted to the participant. In the 'no-forewarning' condition, unshared information was the same; participants were told they might have additional information not held by other group members; however, they were not told this information was relevant to any one candidate and no one candidate name was highlighted. In the public assignment of expertise condition, prior to the group task, the experimenter revealed who held additional information about which candidate, thereby affording that participant the designation of 'expert' in certain groups, ('expert role assignment'). Groups without role-assignment recalled only 29% of unshared items compared to groups with role assignment, who recalled 34%. Thus, there remained a bias towards shared information which was decreased, but not eliminated, by role assignment.

This difference was not explained by improved information coordination, as Stasser et al. (1995) speculated. Further analysis suggested that social validation played a role: public identification of expertise did not increase the retention of unshared items, once mentioned. However, forewarning gave members additional opportunity to prepare, which in turn increased their ability to gain acceptance of their recall of unshared items. Forewarning and role assignment increased participants' sense of self-expertise and also *others* sense of their expertise. Consistent with Wittenbaum (2000), perceptions of 'other-expertise' promoted pooling of unshared information: there were significant correlations with both number of unshared items recalled during discussion and the pooling focus. This also replicated the findings of Stasser and Stewart (1995): introduction of recognised personal expertise promoted the sampling of unshared information. The reasons for this remained unclear, although results suggested recognising public expertise at the outset of a discussion aided with eliciting unshared information. Assigning someone to the role of expert also seems to impact their approach to the information they own, perhaps creating a sense of greater responsibility or ownership. There were also positive correlations between a higher sense of self-expertise and the retention of unshared information. Taken together, this line of research suggests confidence, both self and other, plays a key role, for example, greater confidence is likely to lead to higher levels of acceptance of recall by group members. Underlining this, when Stewart and Stasser (1995) included a briefing to the group, identifying which participants were experts in which candidates (by virtue of holding increased amounts of information), groups with assigned roles recalled 42% unshared information compared to groups without role assignment who recalled only 26%.

These results suggest the importance of individual group member credibility in a group setting. Not only can the presence of ‘experts’ seemingly make a difference, but Larson et al. (1996) identified a critical information management role played by group leaders, who repeated more information than other group members and, over time, increased their repetition of unshared information.

Dissent has also been shown to play a role in reducing the emphasis of the group discussion on shared information. Greitemeyer, Schulz-Hardt, Brodbeck, and Frey (2006) instructed each member of a three-person group to act as an advocate for each alternative candidate, to argue in favour of that candidate and against the other two, versus free-discussion groups with no such procedure. Advocacy facilitated an increase in unshared information, but decision quality was unaffected. However, contrived dissent, such as devil’s advocacy, has been shown to have downsides in decision-making groups. Waddell, Roberto, and Yoon (2013) found groups who underwent a devil's advocacy procedure showed improvement in decision quality - but participants in those groups reported higher levels of "Affective Conflict" (Amason, 1996) than free discussion groups, indicating more personal friction and personality clashes amongst group members within the group.

In a further examination of the impact of intragroup differences, Kolb and van Swol (2016) found that groups with a separatist (valuing uniqueness amongst group members) versus a synchronous (valuing similarity) orientation repeated more unshared information ($p = .05$) but there was no difference between conditions in the number of first mentions of shared/unshared information and no difference in decision quality.

2.2.3 Improvement of information exchange and decision quality

As Larson et al. (1994) noted, "whether the discussion of unshared information actually does improve the quality of group decision making when a Hidden Profile exists remains an open question" (p.460). Arguably, research 'nirvana' is represented by improvements in *both* information exchange *and* decision quality, but few interventions have achieved this. Procedural interventions have, however, shown some success. Hollingshead (1996) found that face-to-face groups instructed to rank order alternatives, compared to groups instructed to choose the best, were more likely to consider all of the alternatives, exchange information about unpopular alternatives and exhibit higher decision quality (although computer-mediated groups showed no such effects). Stasser et al. (1995) pointedly told group members who in the group held additional information about each subject in a Hidden Profile murder mystery task and found this led to improvements in *both* decision quality and the sharing of unique information. Brodbeck et al. (2002) manipulated minority dissent in pre-discussion preferences in groups and found it to be positively associated with increases in information gain for unshared information. Findings for decision quality were, however, less equivocal and more reliant on the presence of a group member advocating a superior alternative. Stewart and Stasser (1998) found only marginal support (*p* = .08) for the effect of a fully-informed minority group member on decision quality and little difference in whether the discussion focused on critical, unique information.

There has been less attention from researchers into the optimal positioning of any intervention designed to improve group decision-making outcomes. However, as noted previously, Fisher (2017) determined that *in-process* rather than *pre-task* interventions had a more positive effect on critical information exchange and decision quality, principally because they prolonged discussions and reduced the groups' discussions of member preferences. That is to say, preference negotiation changed in response to *in-process*, but not *pre-task*, interventions.

2.2.4 Improvement – but neither realistic nor practical

I have already alluded to the procedural trend in many Hidden Profile studies to alert participants to the existence of different information and optimal solution. This has been found to have no effect on group outcomes, and, I would argue, is not anyway an accurate representation of how 'real' groups gather and make decisions together. Similarly, whilst there are interventions that have yielded improvements in both group information exchange and decision quality, they are arguably not practicable or realistic in a 'real' group environment, for example, providing one group member with all of the information (as in Stewart & Stasser, 1998); visually highlighting unshared information (e.g. Schittekatte, 1996; Schittekatte & van Hiel, 1996) and reducing the amount of information given to group members (e.g. Stasser & Titus, 1987). Even were these interventions successful, particularly in today's data rich environment, I would argue that none of these approaches could generalise to an organizational setting. Today's decision makers seem to want *more* information, not less. With that in mind, I will now turn to a discussion of mental simulation and its role as one potential intervention worthy of further examination.

2.3 Mental simulations in group decision-making

In this research, I test a mental simulation intervention in a hiring paradigm in a series of laboratory-based face-to-face group and individual online studies. Particularly where interventions are concerned, establishing causality is critically important. Eden (2017) noted that “testing causal hypotheses rigorously is crucial for scientific purposes and indispensable for putting the very best, evidence-based tools in the hands of practitioners. . .Practical application of results without evidence of causality borders on malpractice” (p.94). Accordingly, I recognise the need to maintain experimental rigor and control, whilst simultaneously recognising the importance of the ability to generalize any laboratory-based devised and tested intervention to real organizational settings. As Eden stated, “practical application is the raison d’etre for much organizational research” (p.91).

As I have noted, for an intervention to be successful in this context, it needs to be effective for both individual and group level processes – perhaps most importantly at the individual group member level, since the foregoing review suggests the centrality of the individual group members. Mental simulation, defined as “imitative cognitive constructions of an event or series of events” (Gaglio, 2004. p.537), provides a potentially powerful solution to improving group decision-making under conditions of information asymmetry. It has been shown to have important psychological and behavioural effects across a wide range of domains in psychology. It is also something we all do: as Crisp, Birtel, and Meleady (2011) noted, “mental simulation is an essential element of the human experience and, as such, a correspondingly critical component of behavioural change strategies” (p.261). The use of mental simulation gained prominence in the sports fields (e.g. Feltz & Landers, 1983) and health domains (e.g. Greitemeyer & Würz, 2006) and it has proven effective across many psychological domains, for example, prejudice, (e.g. Crisp & Turner, 2012); helping behaviour (e.g. Garcia, Weaver, Moskowitz, & Darley, 2002); purchase intentions (e.g.

Escalas & Luce, 2004); and social judgments (e.g. Hopthrow, Hooper, Mahmood, Meier, & Weger, 2017).

Meleady, Hopthrow, and Crisp (2013) empirically tested a mental simulation technique in a scenario in which individuals were making a decision to cooperate or not in a virtual group context. They found that cooperation improved after participants were asked to mentally simulate a consensual decision-making scenario. This suggests that when individuals are making decisions as part of a virtual or simulated group, mental simulation can be an important tool in improving cooperation, which may, in turn, lead to greater information sharing. As noted previously, Toma and Butera (2009), found cooperative groups were more likely to share unique information versus competitive groups.

2.3.1 Counterfactual thinking

Mental simulations have had very little testing as the means of finding solutions to Hidden Profile group decision-making problems. More specifically, encouraging counterfactual thinking has achieved some positive results on decision quality in Hidden Profile groups.

Counterfactuals are thoughts of what might have been, invoked by an event that nearly occurred. For example, an individual who misses the train by a few minutes may go into a thought pattern of "what if" or "if only". Galinsky et al. (2000) contended that the idea of considering more than one possibility was primed by the perception of counterfactual alternatives (see also Galinsky & Kray, 2004). These results suggest that considerations of alternative outcomes may debias likelihood judgments, leading to more thorough evaluation of evidence during judgment (e.g. Hirt & Markman 1995, Study 2). A "what-if" scenario, wholly unconnected to the decision task the group and its members is faced with, is the mechanism through which a CFM has been induced in previous research. However, Hirt, Kardes, and Markman (2004) found that alternative generation tasks did not activate a counterfactual mindset (CFM) in individuals high in need for structure. Furthermore, Liljenquist, Galinsky, and Kray (2004) found that a CFM needed to be activated at a group level in order to facilitate information sharing, synergistic coordination and judgment accuracy, whereas activation at the individual level was actually detrimental to the group's judgment.

More recently, Ditrich, Landkammer, and Sassenberg (2019) noted the effect of counterfactual thinking may be more complicated than previously elucidated. Far from CFMs being a "one size fits all" de-biasing solution, the effect of being in a CFM on subsequent tasks may depend on what kind of CFM is induced, the level at which it has been activated and what focus has been induced (e.g. interpersonal versus intrapersonal). This recent work, whilst recognising limitations of low power (67%), suggests that in certain social situations, such as group decision-making, CFMs may even be detrimental and actually *increase* both biased communication and decision-making. These question marks over CFM highlight a continuing need to research more and effective mental simulation interventions in group decision-making.

2.4 Mental simulation and the Premortem

The Premortem intervention (Klein, 2003, p.98-101) is one form of mental simulation and has been identified as a way to overcome bias in organizational decision-making (Hunt, Layton, & Prince, 2015), although this has not, to my knowledge, been empirically tested. Klein (2003) notes that when people scrutinize their own plans, they are usually *not* looking to find any problems and are already biased in favour of the plan. Since a similar bias is one of the key reasons Hidden Profile group members struggle to overcome their initial suboptimal selection preference, I assert that one way a mental simulation task, based on the Premortem, could improve decision outcomes in HP tasks is by attenuating the IPE and the individual (and group) level processes which prevent decision-making groups from achieving optimal outcomes.

The Premortem has been deployed as an exercise for 'real-life' groups to challenge and refine implementation plans. Groups are asked to look into the future and imagine the plan they are about to implement has failed, resulting in poor outcomes. They are then asked to generate reasons for this failure. Through this, they undertake an effective critique of their own plan. Veinott, Klein, and Wiggins (2010) found the Premortem reduced confidence in an implementation plan more than other 'challenge' methods (e.g. critique, Pros/Cons generation, Cons only generation). However, resolving the problems identified during the Premortem *increased* confidence in the plan, more than the other techniques.

Borrowing from the approach of the Premortem, this thesis will test whether a mental simulation, based on a future imagined decision failure, can overcome group-level challenges to Hidden Profile decision tasks, including the challenges operating at the individual group-member level, specifically ownership bias, social validation, the preference consistency effect and the IPE.

2.4.1 Mental simulation and cognitive tasks

Mental simulation has previously been shown to have a positive effect on individual cognitive tasks. In their meta-analysis of the effects of mental practice simulation in 60 studies, Feltz and Landers (1983) found that studies employing cognitive tasks had a larger average effect size for the positive effect of mental simulation ($M = 1.44$) than studies employing motor ($M = .43$) or strength ($M = .20$) tasks. In addition, larger effects for cognitive tasks were achieved in relatively short practice sessions ($M = 3.17$ minutes) and with only a few practice trials ($N = 4.17$) compared to motor tasks ($M = 7.3$ minutes/17.97 trials) and strength tasks ($M = 7.5$ minutes/10.0 trials). Whilst the cognitive tasks examined in their meta-analysis differ significantly from those undertaken by individual group members during group decision-making under conditions of asymmetric information, I am nonetheless excited about the prospects for success that mental simulation may offer given these successes. In particular, the imagining of the failure of the group decision (in this case, based on the poor performance of the group's selected candidate) enables the group and, more specifically, the individual members to think about "what kinds of things might be tried, [and predict] the consequences of each action [so that] the learner can perhaps rule out inappropriate courses of action" (Schmidt, 1982, p.520, cited in Feltz & Landers, 1983). In sum, imagining decision failure may help to overcome that failure by allowing groups and their members to safely practice alternative decisions.

2.4.2 Mental simulation and information exchange

As previously noted, Lu et al. (2012) highlighted groups' ineffective exchange of unique versus shared information as a key factor in Hidden Profile decision task failures, so adding to the tool-kit available to assist decision-making groups achieve improved unique information exchange amongst group members is important.

Veinott et al. (2010) noted that a Premortem enables team members to demonstrate their ability by generating "novel and insightful criticisms" (p.3). This seems to present the perfect opportunity for group members to both introduce unique information into the group discussion and offer a means of overcoming Communication Apprehension (McCroskey, 1977). To properly test the mental simulation intervention as a means of improving information exchange and triggering the release of unique information, I determined not to tell participants in the face-to-face group studies that the information held on each candidate comprised both shared and unique. Specifically, my studies take a different approach from much extant Hidden Profile research by examining whether the intervention can bring about participants' awareness of the fact that they hold different, unique information from their fellow group members. I believe this is more generalisable to real life decision-making groups, where who knows what will not always be apparent. The focus on information sharing is also highly relevant when it comes to virtual teams. Cordes (2016) noted that information sharing may have the greatest effect on virtual teams.

(For completeness, I note that the online individual studies in this program of research included notification to individual participants that they may hold different information from their fellow group members and, in addition, that one candidate was more suited to the role than the others).

There is a further potential information exchange benefit which may derive from mental simulation. Wittenbaum (2000) noted that group members who communicated unshared information were considered less knowledgeable and competent on the group task, and less credible communicators, compared to group members of equivalent status who communicated shared information (Wittenbaum et al., 1999). This derives largely from the validating effect of shared information: group members who can validate the information contribution of a fellow group member are likely to regard that group member as more reliable and as someone who makes a valuable, accurate and relevant contribution to the group. This increases the view of their competence and knowledge. Inexperienced group members will be more likely to mention predominantly shared information as a means of improving and strengthening their position within the group. However, if the mental simulation based on the Premortem provides an environment where "novel and insightful criticisms" (Veinott et al., 2010, p.3) are welcomed, even prized, then this may increase the confidence of more junior individual group members to contribute unshared information, particularly if it means they may prevent their fellow (more senior) group members from reaching a poor decision. Introducing a face saving piece of unique information from 'left field' could bring significant kudos.

2.4.3 Mental simulation and biases

Russo and Schoemaker (1992) suggested a number of mechanisms to combat overconfidence: (i) *accelerated feedback*: using a known outcome to get immediate feedback on the decision; (ii) *counterargumentation*: thinking up reasons why initial beliefs might be wrong; (iii) *paths to trouble*: identification of all paths to a specific fault or problem, including listing additional causes of the problem; and (iv) *paths to the future*: explicit scenario analysis setting out how the future might play out in one or other specific direction.

These mechanisms lie at the heart of the mental simulation I am testing here. In the simulation, groups and their members are asked to look into the future and receive immediate feedback that the decision they have made has failed. They are then asked to generate reasons for this failure and potential solutions to the problem. Applying this to group decision-making, I anticipate that the mental simulation of failure will have a significant and positive effect on overconfidence in decision-making groups and their members. The outcome envisioned, (i.e. the failure of the plan or, as here in these studies, the failure of the preferred candidate – see below) is *not* the outcome group members want to achieve. Groups are confronted with this imagined outcome, but then asked to engage in mental simulation as the collaborative, problem-solving process through which group members can work together to change this outcome. In this way, I believe group members can improve their analytic and problem-solving processes, leading to better decision outcomes for the group. This also fits well with research on virtual teams, suggesting such teams can benefit from collaboration processes designed to increase team performance (Maznevski & Chudoba, 2000); together with research suggesting virtual teams need process methods for sharing and managing information (Dittman, Hawkes, Deokar, & Sarniker, 2010).

Unlike counterfactual thinking, the mental simulation tested in this research also has the advantage of focusing on the specific decision problem faced by the groups. It is therefore intended to increase information sharing and problem-solving with regard to the specific decision task in a way that counterfactual thinking does not. This is because a "what-if" scenario, wholly unconnected to the decision task the group and its members are faced with, is the mechanism through which a CFM has been induced in previous research. This is an essential difference between counterfactual thinking and the mental simulation under consideration here.

2.4.4 Mental simulation and the IPE

Finally, the online studies in this thesis focus on individual decision-making, within an online Hidden Profile paradigm. This enables me to investigate and test whether the mental simulation can attenuate the IPE (Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch and Schulz-Hardt, 2010) and the individual-level biases described above. I contend that overcoming these challenges operating at the level of the individual group members is a critical first step needed to overcome problems identified as operating at the group level. To fully elucidate this, the mental simulation also needs to be tested in real face-to-face group studies, in addition to an online environment, and this is where the face-to-face studies described in this program of research play an important part.

2.5 Interventions and the information asymmetries model

Let me now consider all of the foregoing in light of Brodbeck et al.'s (2007) information asymmetries model. To recap, the model stipulates that groups may outperform individuals and Social Voting Schemes on decision quality where: (i) information is distributed asymmetrically; and (ii) where information processing is symmetrical. The former cannot necessarily be controlled but I would argue the latter can be. However, in order for symmetrical information processing to be achieved, group and individual-level biases must be overcome. I argue that this must begin with the individual-level biases and challenges.

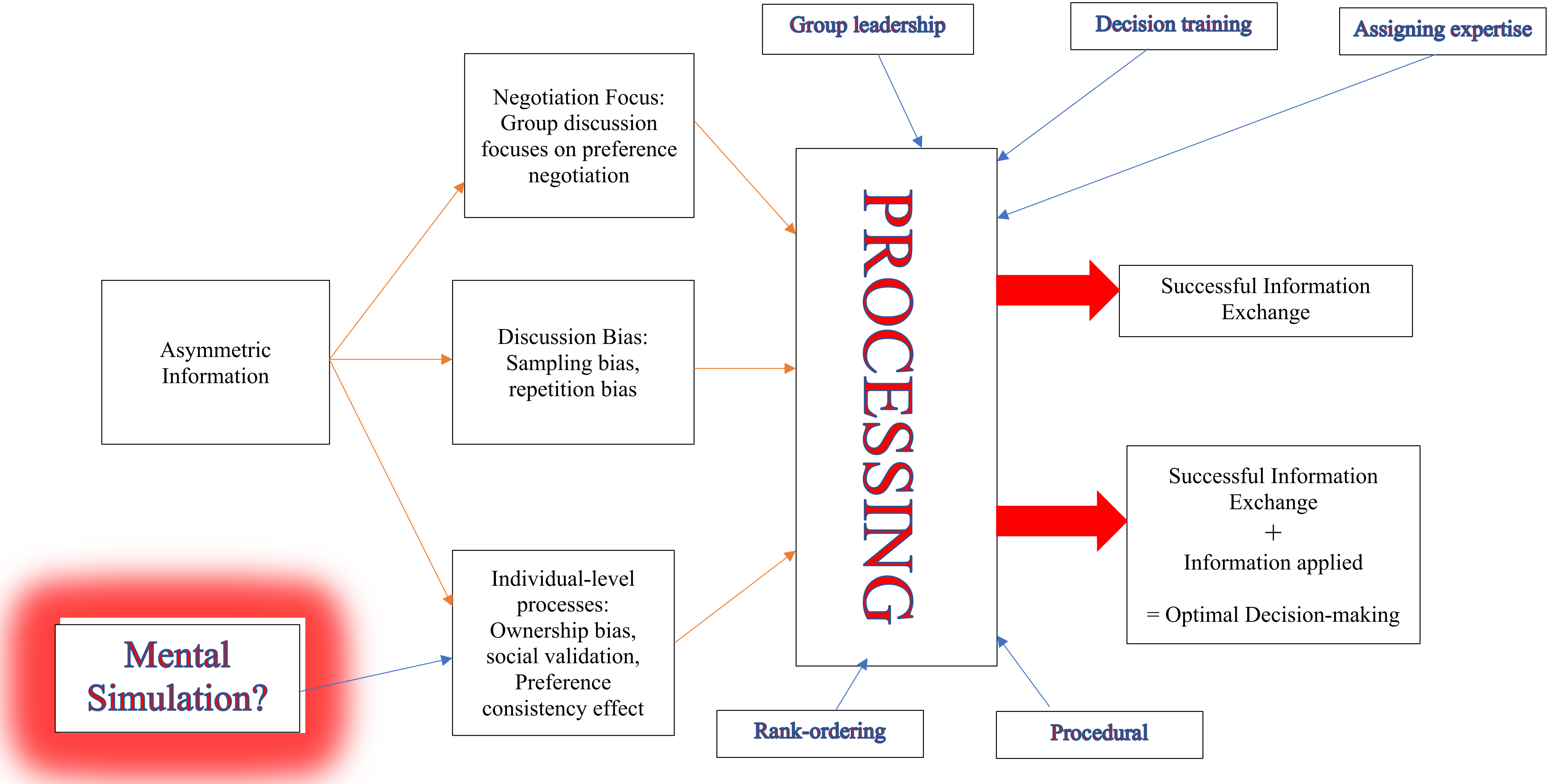
This Chapter has highlighted the success of certain types of interventions, whilst pointing out the failure of others. Central to this past research is the emerging key role of the individual group member. The examples discussed above seem to point to a strong need to focus research attention and scrutiny onto the individual group members. It is their actions, their (and others) perceptions of confidence in their ability, their preferences and their credibility within the group, which seems to determine information recall, information flow and information applicability. As I noted earlier, Vallaster and Koll's (2002) three key, interdependent factors jointly affecting the results of group decision-making were: (i) cognitive variables (information search, information processing, perception/interpretation of stimuli); (ii) affective variables (group identification/attachment, satisfaction and commitment, role ambiguity/conflict, group member relationship); and (iii) communicative variables (e.g. competence and style of communication). These are all factors impacting, first and foremost, at the level of the individual group member, rather than collectively, at the level of the group. Recall also that Dooley and Fryxell (1999) contended that the differing perspectives, specialized knowledge, values, priorities, and goals each decision-making team member brings, continually drives asymmetric information (and, by extension, Hidden Profiles). As I have already noted, group members themselves need to overcome challenges operating at the individual processing level, specifically: evaluation bias, which leads them to favour shared and preference consistent information (Brodbeck et al., 2007). Information shared is largely based on individual (suboptimal) preferences and opinions (Gigone & Hastie, 1997) and shared information supporting those preferences.

Given the significance attributed to the role of the Individual Preference Effect (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010) in explaining groups' failures to solve Hidden Profiles, I contend that insufficient attention has been paid thus far to examining interventions which can be successful in overcoming challenges operating at the level of the individual group member. I further posit that improvements at the group level need to begin with improvements at the individual group member level. This research will specifically examine whether mental simulation can achieve these improvements (Figure 1). Furthermore, testing the mental simulation both in face-to-face group decision-making settings, and online, in individual decision tasks, will help determine whether it is capable of operating successfully at both individual and group level. Finally, this thesis will also examine whether the mental simulation can trigger the positive aspects of dissent, whilst avoiding the negative aspects (see Chapter 6).

2.6 Conclusion

In the present Chapter, I have reviewed the history of research aimed at identifying interventions to improve group information exchange and decision outcomes in Hidden Profile tasks. The picture is mixed at best, suggesting that there is work yet to be done to identify further approaches and perhaps there is a need to focus these approaches more at the level of the individual group member than the group. I have set out an argument for the role of one such intervention: mental simulation, based on a Premortem, as a potential valuable addition to the [short] list of interventions which may improve *both* information exchange and decision-making performance in Hidden Profile decision tasks. Although previous group decision-making research has explored the possibilities of counterfactual thinking as a particular form of mental simulation, problems and complexities have been identified which perhaps make it less attractive and more difficult to implement in a 'real' group setting. Less attention has been paid to the role of mental simulation but, given the success it has achieved elsewhere, including improvement in individual cognitive outcomes, improvements in information exchange (in the case of the Premortem) and behavioural changes, including bias reduction, I believe it well worthy of further testing and consideration. Brodbeck et al. (2007) stipulated that the most effective interventions should aim to take a multi-faceted approach to overcome the individual-level biases operating at the group member level, as well as the negotiation and evaluation biases operating at the group level. It seems to me that the mental simulation framework offers this by simultaneously tackling the human factors, information exchange and applicability, and decision-making processes.

Figure 1. The Information Asymmetries Model and the role of Mental Simulation



Chapter 3: The Group Member Voice

3 Summary

Much group decision-making research has focused on quantitative analysis, searching for causal explanations of why things happen as they do in group processes. As a subset of this, extant Hidden Profile research (Stasser & Titus, 1985 - see Chapter 2 for a discussion) is centred in the quantitative domain. Yet Bolaños, Fotela, Nenclares and Pastor (2005) noted that qualitative research can improve the understanding of group phenomena, such as leadership and communication styles, which are both important in decision-making. This Chapter seeks to broaden and expand knowledge of what underlies group performance in Hidden Profile decision tasks by adopting a mixed method approach, with Thematic Analysis as my chosen qualitative methodology. The focus is on understanding and interpreting the motivations, actions and utterances of the individual group members, which I contend is key to better understanding the challenges operating at both individual and group level in Hidden Profile decision tasks. To my knowledge, no Hidden Profile research has taken a similar approach, so this Chapter makes a unique contribution.

3.1 Theoretical background

As I discussed in Chapter 2, a large body of quantitative research has examined the manifold reasons behind groups' failures to solve the Hidden Profile and identified biases and heuristics operating within the group, influencing both the selection of information to be shared and how it is shared. For example, groups may not discuss X and Y (i.e. discussion bias) or properly evaluate X and G (i.e. evaluation bias). They may also focus on the negotiation per se rather than on sharing important information (i.e. negotiation focus) (Brodbeck et al., 2007). There is an argument that these process are largely driven by the actions and motivations of the individual group members. Further significant challenges also exist at the individual group member level, specifically: evaluation bias, which leads group members to favour shared and preference consistent information (Brodbeck et al., 2007): information shared is largely based on individual (suboptimal) preferences and opinions (Gigone & Hastie, 1997) and shared information supporting those preferences. The Individual Preference Effect, whereby individuals are drawn to information consistent with their own pre-formed preferences (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003) has also been suggested as a further powerful individual-level explanation for Hidden Profiles failures.

Given the significance of these challenges at the level of the individual group member as explanations for groups' failures to solve Hidden Profiles, I contend that insufficient attention has been paid thus far to the voice of the individual group member. This qualitative Thematic Analysis seeks to fill that gap.

3.1.1 Optimising the analytic approach

Given the importance of unique information to solving Hidden Profiles, group discussions in a number of studies have been subject to audio and video recording, principally to determine differences between the amount of shared and unique information emerging during the group discussion and whether or how such information may or may not have been repeated and/or pooled and integrated during the group discussion (see Lu et al., 2012 and Mesmer-Magnus & DeChurch, 2009 for reviews). However, quantitatively analysing this data presents methodological problems: as Lu et al. (2012) noted, there are significant differences across studies in the conceptualisation of information pooling, which they note, has been categorised in two ways: (i) information coverage, that is, how much individual versus unique information is mentioned during the group discussion. This is typically a ratio of the unique/common information mentioned during the discussion out of the total pieces of unique/common information available to the group; and (ii) focus of discussion - how much of the group discussion is spent on unique or common information -

typically a ratio of the amount of unique or common information mentioned during the group discussion as a proportion of the total amount of actual discussion. The key distinction here is primarily differences between the denominators in these two measures. Lu et al. (2012) highlighted further differences in the numerators and denominators involving counting the pieces of items mentioned (excluding repetition) and counting the number of times the items are mentioned (including repetition). This makes it difficult to draw comparisons between information sharing and pooling measures in anything other than broad terms.

Adopting a wholly quantitative approach in trying to understand exactly how group decisions have been made, may also be problematic (Tinson & Nuttall, 2014). This is because, as Vallaster and Koll (2002) noted, most extant group decision-making theories focus on a static rather than dynamic analytic perspective, notwithstanding that the factors affecting group decision-making outcomes are themselves dynamic (e.g. cognitive, affective and communicative variables, principally operating at the individual group member level). Individual group members are not static. Accordingly, I concur with their view that a research approach which allows for a “richer understanding of the phenomena observed” (p.42) can add to our understanding of group performance in Hidden Profile tasks by allowing a deeper exploration of the impact of individual and social processes in Hidden Profile decision-making groups. Specifically, it allows for a greater focus on the voice of the individual group members, one that moves beyond simply quantitatively analysing the words or information pieces that they contribute, and which may offer valuable insights into their actions and motivations.

There are further benefits to incorporating qualitative analysis in this research program. Eden (2017) highlighted the value of a mixed methods approach, including both experimental and qualitative studies, noting that this approach is particularly common in organizational research, asserting that qualitative methods can help to bring “arid statistics to life, [enrich] understanding and [spice-up] research reports" (p.103). Molina-Azorin (2012) suggested that mixed methods research could lead to more comprehensive findings, as well as greater confidence in the results, an increase in the validity of conclusions and "more insightful understanding of the underlying phenomenon" (p.35). He listed several benefits of a mixed method approach, including triangulation - convergence and corroboration of findings from different methods examining the same phenomenon - and development – using results from one method to develop and/or inform the other method. Given I am testing a mental simulation intervention new to Hidden Profile research, including a qualitative analysis may be useful to inform my future research approach in testing and refining the intervention in this context. It can also add value by increasing validity in the findings, whilst adding to knowledge creation (Hurmerinta-Peltomaki & Nummela, 2006; O'Cathain, Murphy, & Nicholl, 2010).

Seekamp, Harris, Hall, and Craig (2010) used an interpretive qualitative coding scheme for analysing group discussions (which was then applied to quantitatively assess how group differences in information processing and social influences affected decision judgements) in naturally interacting, deliberative public involvement groups, where there was no experimental control. Arguably, even within a controlled laboratory environment, such as a Hidden Profile task, once the group discussion has begun, the experimenter is somewhat powerless. Of course, they have been actively involved in the manipulation of the group condition, the random assignment of participants, the material the group is required to discuss and the conditions under which that discussion takes place. But once the discussion is underway, the experimenter cannot control every utterance which emerges from the group members. I posit that this offers support for an additional interpretative research paradigm, which qualitative research methods can provide. Qualitative analysis allows for greater speculation on the motivation and actions of the group members. For example, we know

Communication Apprehension (CA: McCroskey, 1977) impacts individual group members performance – but how and to what extent? Better understanding the 'why' of an individual utterance or action may provide the means to alter or amend it.

3.1.2 Chapter overview and hypotheses

I am not aware of any qualitative research into the decision-making processes in Hidden Profile groups. The aim of this Chapter is to expand our understanding of group member interactions in Hidden Profile decision tasks, through a thematic analysis of the group exchanges during the task, incorporating a mental simulation intervention (based on a Premortem: Klein, 2003, described below). Accordingly, this Chapter seeks to shed more light on the dynamic operating within Hidden Profile decision-making groups - specifically between the group members - and the potential effect of mental simulation, as well as identifying themes I may wish to examine in future studies in this research program. For completeness, I also incorporate a quantitative analysis of the common versus unique information mentioned by group members, before and after the mental simulation intervention.

The Premortem

As noted in Chapter 2, a Premortem (Klein, 2003, p.98-101) has been identified as one way to overcome bias in decision-making (Hunt et al., 2015). Klein (2003) noted that when people critique their own plans, they are almost certainly *not* looking to find any problems and, indeed, are often biased in favour of the plan. The Premortem aims to overcome biases, including confidence biases, that may lead groups and their members to suboptimal decision-making. Groups are asked to look into the future and imagine that the plan they are about to implement has gone badly wrong, resulting in poor group and organizational outcomes. The Premortem occurs before the group finalises the plan and moves into implementation and the starting assumption is failure. The program of research described in this thesis borrows from the Premortem to design and test a mental simulation tool to improve group information exchange and decision quality, beginning by overcoming the challenges operating at the level of the individual group members.

Since this research is exploratory, I focus my qualitative examination on three key factors that have previously been identified as creating problems and challenges for the individual members of decision-making groups, including in a Hidden Profile context. Chapter 2 highlighted the importance of the individual group member, insofar as it is their actions and utterances that drive the individual-level challenges of ownership bias, social validation, preference consistency and the Individual Preference Effect (see Brodbeck et al., 2007). The challenges identified by Brodbeck et al. operating at the group level (i.e. negotiation focus and discussion bias) also arguably begin and end with the individual group members. Based on the theoretical discussion in Chapter 2, I contend that, whilst there are a number of key areas that determine individual group member responses and actions, three seem to stand out and I have determined to focus on these, specifically: (i) Communication Apprehension, which drives what and when individual group members say what they do; (ii) Dissent, which drives how individual group members interact and their relationship within the group; and (iii) Group Leadership/process, which determines which individual group members may be afforded special license or 'status' in the group and how they might bring this to bear in their interactions and discussion with their fellow group members. I will discuss these in more detail below.

3.1.3 Communication apprehension

As noted in Chapter 2, Communication apprehension (CA) is defined as the fear or anxiety associated with either real or anticipated communication with another person (or persons) (McCroskey, 1977). McCroskey differentiated between trait-CA, a fear of talking in *all* oral communication encounters, versus state-CA, which is specific to a given oral communication situation (Spielberger, 1966, cited in McCroskey, 1977). Both trait and state CA are, however, presumed to be learned (Jones & Murray, 1996).

CA, whether trait or state, can have behavioural consequences on individuals' abilities to communicate. Ho and McLeod (2008) found that as CA increased, participants were less likely to express their own opinion in face-to-face settings when discussing a sensitive issue. McCroskey and Richmond (1992) noted that research into CA suggests people who suffer from trait/state CA are more likely to adopt a "flight" rather than "fight" approach to avoid scenarios where they are likely to experience discomfort, which may be the case in Hidden Profiles when choosing to introduce unique information. For example, the person high in trait CA, or who experiences high state CA in a small group setting, tends to be much less effective as a member of the discussion group and generate far fewer ideas. This is because they are more likely to be focused on how to deal with the communication demands of the setting, rather than on the particular group problem. Blume, Dreher, and Baldwin (2010) found that in an assessment centre context, CA was negatively related to both critical thinking ($p < .05$) and oral communication ($p < .01$) in a leaderless group discussion (LGD) (but not in a presentation task). This finding is relevant to this research, since an LGD is the typical format of Hidden Profile decision-making groups.

I contend that Hidden Profile decision-making groups are contrived in such a way as to trigger state-CA, which may, of course, exacerbate trait-CA, where this is also in evidence. In order to solve a Hidden Profile decision task, individual group members need to both introduce and integrate unique information, which cannot be validated by other group members. However, the ability to introduce, recognise and even challenge unique information may provoke anxiety within individual group members, particularly if they are going against the group consensus or nervous about peer evaluation (but c.f. Henningsen &

Henningsen, 2004 for an alternative view). I believe mental simulation may offer a framework to overcome this.

3.1.4 Dissent

The reduction of biased information seeking in group decision-making is key to achieving a balanced and self-critical decision process (Schulz-Hardt, Jochims, & Frey, 2002). As Schulz-Hardt et al. noted, one way to achieve this is by forming groups comprised of individual group members who have heterogeneous decision preferences. But this may not always be practicable in a ‘real world’ setting: for example, it is not feasible to tell a member of the senior management team that they cannot participate in the decision-making process simply because their initial preferences happen to align with their colleagues. Brodbeck et al. (2002) found that: (i) the highest amount of unshared information new to individual group members recalled post-test was recorded amongst Hidden Profile groups with the greatest diversity in pre-discussion choices (three differing choices), followed by minority groups and then consensual groups; and (ii) this pattern was also repeated for decision quality. Thus, dissent is important to decision quality as it may help to block the unhelpful influence of consensual pre-discussion preferences and opinions on the group decision outcomes. However, dissent can also lead to many of the behaviours noted above, which are known to contribute to failures to solve Hidden Profile decision tasks. It can also trigger “Affective Conflict” (Amason, 1996), which can damage the relationship between individual group members, to such an extent that they may be unable to work together to implement their group’s decision, even if that decision is an optimal one.

Moreover, making pre-discussion choices may lead group members into behaviours defending or favouring those selections, for example, sharing and processing information that best aligns with those initial preferences, which could lead in turn to the exclusion of valuable unique information. This is known as the Individual Preference Effect (IPE:

Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003), a process by which an individual group member is unable to disconfirm their initial suboptimal preference, even when presented with all of the information which should enable them to do so. The IPE is an especially strong barrier because it operates at *both* individual and group level. Evidence suggests some dissent may therefore be necessary to initially trigger discussion and debate within groups, but that dissent needs to be positive, in order to achieve "dissent within cooperation" (Toma, Gilles, & Butera, 2013). I believe mental simulation may offer a medium through which this can be achieved.

3.1.5 Group leadership and process

Researchers have also identified a key role for leaders in improving group performance in a Hidden Profile decision task. Larson et al. (1996) found a team leader asked more questions than other team members, repeated more unshared than shared information and increased the emphasis on unshared information over the course of the group discussion. Larson, Foster-Fishman, and Franz (1998) also found that groups containing participative leaders versus directive leaders discussed more shared and unshared information, but directive leaders were likely to repeat more shared information. Contextual differences can, however, affect these outcomes: what works well for one team does not necessarily work well for another, since team composition and leader experience can be key factors. For example, Somech (2006) identified a critical role for a directive leader in a functionally homogeneous team, with strong pressures for conformity, as being the encouragement of team reflection, including criticism, questions and debate, whereas no such impact was found in high functional heterogeneity teams. Furthermore, Sauer (2011) found that groups rated low status leaders as more effective when they used a directive style. Conversely, high status leaders were rated as more effective when using a participative leadership style.

3.2 Study 1

3.2.1 Method

Participants and data collection

Following institutional ethical approval, the experiment took place in small group break out laboratories. The sample was an opportunity sample, comprising 224 first-year psychology undergraduate students from a university in Southeast England ($N = 224$, 30 males, 193 females, one undeclared; randomly assigned to groups of four $N = 56$) who participated in the experiment as part of the requirements of a First Year Psychology Research Class. No payment or course credit was given.

Procedure

Face-to-face groups of four undertook a Hidden Profile hiring decision task, adapted from Baker (2010). Participants received a job description, key selection criteria, and highlights from three candidates' CV's. Each candidate had 16 items of information drawn from interviews, references, personal observations, etc. (Roberts: eight positive, four neutral and four negative characteristics; Stevens/Jones: four positive, eight neutral and four negative characteristics, making Roberts the Optimal Candidate for the role), distributed among group members asymmetrically, in a Hidden Profile (Table 1). As can be seen from Table 1, negative information items for the Optimal Candidate were largely shared by all group members, whilst those for the Suboptimal Candidates were semi-unique (shared between two group members). Conversely, positive items for the Optimal Candidate were largely unique, known to only one group member, whilst those for the Suboptimal Candidates were shared by all group members. Thus, individual participants were oriented towards a Suboptimal Candidate selection, as is typical in Hidden Profile decision tasks.

Table 1.

Candidate Attributes for the Hidden Profile Group Decision Task and Distribution by Group Member (Study 1).

	Candidate		
Characteristic	Stevens	Roberts	Jones
CV	Provost (1,2,3,4)	Political leader (1,2,3,4)	Senior Manager (1,2,3,4)
	Former Dean (1,2,3,4)	Former Dean at 2 universities (1,2,3,4)	Steering Committee (1,2,3,4)
	Plans for money/donations (1,2,3,4)	Raised money (1,2,3,4)	Argued in High Court (1,2,3,4)
	Full professor (1,2,3,4)	Full professor (1,2,3,4)	Visiting Professor (1,2,3,4)
Unfavourable	Seen drinking heavily (3,4)	Aloof (1,2,3,4)	Temper (1,2)
	Left without raising funds (1,3)	4 years out of Higher Education (1,2,3,4)	Tension with provost (3,4)
	Discourages innovation (2,4)	Lacks campus/student life experience (1,2,3,4)	High turnover, abrasive leader (1,3)
	Not responsible for donations (1,2)	Accused of changing positions (1)	Reduced success rate in court (2,4)
Favourable	Nationally recognized researcher 1,2,3,4)	Volunteer (1,2)	Pleasant personality (1,2,3,4)
	Recognized by business leaders (1,2,3,4)	Influential contacts (1)	Strategic thinker (1,2,3,4)
	Emphasized collaboration (1,2,3,4)	Thoughtful leader/listener (2)	Active trustee (1,2,3,4)
	Oratory skills (1,2,3,4)	Collaborative decision-maker (2)	Students like as a teacher (1,2,3,4)
		Excellent teacher (1,2,3,4)	
		Faculty research productivity increased (3)	
		Diversity increased (4)	
		Secured grant (1,2,3,4)	
Neutral	Spouse teaches Spanish (1)	Apartment in Spain (1,2)	Lives in area (1)
	Teaches one module (1)	Divorced, remarried, 2 children (3,4)	Grown up child (1)
	Family nearby (2)	Plays golf and tennis (2,4)	2 dogs/2 cats (2)
	Married, 3 children (2)	Vegetarian (1,3)	Spouse is a physician (2)
	Enjoys sports (3)		Plays Bridge (3)
	Biking and running (3)		Likes travelling (3)
	Consulting work (4)		Enjoys mystery novels/biographies (4)
	Likes to garden (4)		Loves to cook (4)

Note: this distribution of favourable/unfavourable characteristics is designed to orientate participants towards the selection of a Suboptimal Candidate.

Participants were told they were recruiting for the position of president of a new campus of their own university (to increase relevance and reality) and asked to select their preferred candidate - Roberts, Stevens or Jones - for the role. Participants firstly indicated their individual candidate selection from the three job applicants (this was the pre-discussion decision), then, following a group discussion, made a group candidate selection decision (Time 1 (T1) decision). They then revisited the group decision following a mental simulation intervention (Time 2 (T2) decision). Geographic references were changed and minor language modifications made from the original Baker (2010) material, so as to be UK-specific.

All groups were required to complete the study tasks within certain time frames, otherwise the group discussions were free form and leaderless. The group discussions were audio recorded, and were spread across five separate data collection sessions, which ran back-to-back on one day. The audio recorders were fully visible to all participants and activated by experimenters, who entered the group laboratories to provide instructions to the groups, distribute and collect study material and, generally, to oversee the correct running of the group study to the required timings. No participant raised any objection to the audio recording. These recordings were then transcribed verbatim by a wholly independent transcription service. I checked a representative sample (approximately 20%) of the transcripts directly against the audio tapes through play back of the group discussion and found the transcripts to be valid and accurate across this sample.

Selecting the data corpus

I followed the sample size guidelines set out by Clarke, Braun, and Hayfield (2015). This suggested for focus groups in a PhD study with a sole data source (most closely aligned to the group study examined here) 10+ groups are a sufficient sample size. Groups were randomly selected using an online tool (Random-picker), organised in such a way as to ensure sufficient representation of homogeneous and moderate/high heterogeneous groups based on participant gender, which is of particular interest given the differences in processing and decision-making strategies highlighted in Chapter 1. For the purposes of my thematic analysis, this group demographic was defined as follows:

(i) Homogeneous: all four participants of identical gender (this gender was female, given research class gender composition, which was predominantly female) – eight groups.

(ii) Moderate Heterogeneity: one male participant and three female participants (or in the case of one group, one female participant and three male participants) – five groups.

(iii) High Heterogeneity: two male and two female participants – four groups.

Analytic procedure

Thematic analyses (Braun & Clarke, 2006) of the group discussion data was used to identify common themes and salient issues emerging across the dataset of the group discussions. Analysis followed these steps:

(i) Transcripts were firstly printed and repeatedly read by DHN, to identify initial themes and get a clear sense of the whole dataset.

(ii) Transcripts and audio files were then imported into NVivo software (version 11) for coding against an initial codebook, developed by DHN (Table 2). This allowed meaningful organization of the data, with a specific focus on data items pointing to emerging themes and patterns across the dataset.

(iii) DHN worked within NVivo to code the transcripts, searching for potential themes whilst collating the relevant coded extracts into these same themes. This allowed identification of the relationship between codes, themes and sub-themes to emerge.

(iv) DHN reviewed the themes for overall meaningful coherence and to ensure the themes were well distinguished. Themes were named in order to clearly identify what they encapsulated.

(v) Themes were discussed and agreed with the research team, who ensured objective challenge and oversight was applied.

Table 2.

Nodes and Thematic Coding Framework (Study 1).

Node Title	***Themes***
Confidence in Group Decision:	(i) Dissent:
High	Decision Choice
Low	Within the group
Different Information Realised	(ii) Group leadership/Group Structured Process
Not realized	
Realised	
Dissent	
Little Dissent	
Significant Dissent	
Group Member pretending to recognize unique	(iii) Unique Information:
information	Timing of emergence
	How handled
Individual Preference Effect	(iv) “Communication Apprehension” (CA):
	Group member(s) pretence levels re: unique
	information.
Leadership within the group	
Unique information emerging	
Pre Premortem	
During/Post Premortem	
Unique information ignored	
Unique information not applied to the decision	
Unique information supporting/refuting candidate selection	

3.2.2 Results: Thematic analysis

Overview

Of the 17 groups reviewed, 10 (58.82%) solved the HP at T1, correctly identifying the Optimal Candidate. Most group studies involving a Hidden Profile task achieve a correct result of only 20-30%, so this is an unusually high proportion of correct responses, suggesting a ceiling effect, in all likelihood due to the fact that the Hidden Profile was not particularly strong in this study. Of the remaining seven groups who chose incorrectly at T1, four switched to the optimal solution at T2 and the remaining three either maintained their initial incorrect choice or switched to another incorrect choice at T2. There was also no obvious effect of group demographic composition, so this variable was collapsed.

Analysis showed 14 of the 17 groups began their group discussion by directly asking each individual group member to state their pre-discussion choice, underscoring the significance of this initial, individual decision. One group actively chose not to do this (their initial group selection was suboptimal but switched to optimal following the intervention) and the remaining two groups did so less overtly, with one member rushing to identify their pre-discussion choice. Of these two groups, one selected and maintained a Suboptimal Candidate choice and the other initially selected the Optimal Candidate, then switched to a Suboptimal Candidate following the intervention.

Thematic Analysis

The Thematic Analysis in this subsection is focused around the key themes identified following my review, as set out in Table 2. These themes have been identified on the basis that they either add to extant evidence or provide deeper understanding for the reasons behind groups' failure to solve Hidden Profile decision tasks. The identified themes are: (i) "Communication Apprehension": individual group members' ability/willingness to acknowledge unique information; (ii) dissent amongst individual group members; (iii) group leadership/structured discussion process; and (iv) the emergence of items of unique information and their use (subjected to quantitative analysis). By examining these first three themes prior to and during or after the mental simulation intervention, I determined to investigate qualitatively the efficacy of the intervention as a potential tool to improve group performance in Hidden Profile decision tasks.

"Communication Apprehension": CA – group members' ability/willingness to acknowledge unique information

Several meta-analyses have highlighted the importance of pooling and applying unique information on the group's decision quality (Lu et al., 2012; Mesmer-Magnus & DeChurch, 2009) but the difficulties of achieving this are well documented. In the following exchanges, group members are exchanging a mix of shared, semi-unique and unique information. In excerpts one and two, we see group members moving from an incorrect to a correct decision, following the mental simulation. Excerpt one takes place prior to the intervention and displays a pattern that should, broadly be expected based on extant Hidden Profile research, i.e. the semi-unique/unique information *is* mentioned by group members, but it is not attended to, even when repeated. In fact, group members largely appear to ignore it.

Excerpt 1: Group 8(b) (Time 1)

F2: Basically, because I saw that Roberts hasn't been working in higher education for four years, so I don't know, maybe he could be a bit outdated about his knowledge about how it's run. ***And for Jones, it says tension between the Head and Jones, so maybe he's not that good relations-wise.***

. . .

F2: Yeah, and he has ***a harsh and arrogant leadership style***, so I don't know.

F1: I didn't pick Stevens because I thought the bit where it says '***Tends to discourage new innovative ideas,'*** is a bit of a negative, . . . which one did you go for?

M1: I put Jones.

. . .

F2: I chose Stevens. What do you guys think about Stevens?

F3: I think that he's assertive, ***but the fact that he discourages new ideas is kind of bad.***

F1: Yeah, I thought that was quite negative.

F3: ***And the fact that he gets drunk at university events isn't very good as well.*** Well, that's why I didn't pick him. I don't know about the rest of you.

F3: I picked Roberts. Did you pick Roberts?

. . .

F3: I agree with the point you're saying with that. I picked Roberts because I think the positives about her overshadowed the rest. The only thing that I don't really like was ***how there was tension between her and the Head,*** but I don't think that's such a big deal because it's probably because they're in competition.

F1: This is Jones, yeah?

. . .

F1: And they're well-liked as a teacher, which is good.

. . .

F1: A strategic thinker.

F3: And the students like her. And if you compare it to the qualifications that they want, I guess she does cover most of them, yeah.

F1: A strategic thinker, and she's been an active member is good as well.

F2: Yeah, let's go with Jones then.

F1: Everyone happy with Jones?

M1: Mm.

This excerpt suggests group members struggling with the Individual Preference Effect. The dialogue is focused on the group members' individual preferences, with the discussion emphasis placed on shared information. The selection of Jones (a Suboptimal Candidate) is based wholly on shared information, repeated more and more frequently as the group come to their decision. During the mental simulation intervention, excerpt two shows that the group members are forced into a deeper examination of the failures of Jones, their chosen candidate. It is this closer interrogation of the earlier group decision that leads to the critical recognition of the fact that the group members have different information (bold, italics):

Excerpt 2: Group 8(b) (Time 2)

F1: So, on here you've got '***A temper that flares suddenly***,' so that could have been an issue.

F3: Pardon?

F1: They've got a temper that flares suddenly.

M1: So he could have fallen out with his colleagues and stuff.

. . .

F1: On mine it says, '***Following a High Court appearance, Jones's success rate in employment law cases fell***.' Have you guys got that on yours?

M1: Yeah.

F1: So I don't know what caused that but it could have been the same issue again. It could be related to that.

F2: Or it could be the way that she leads people. It says here that she's ***arrogant and harsh in the way that this person leads people***.

F1: Yeah, so people aren't ...

F3: It doesn't say that he's harsh.

F1: I think we've all got different ones.

F2: Yeah, got different ones.

. . .

F3: I think I'd have picked Roberts after Jones.

F1 Yeah, I think I'd pick Roberts.

F3: I was thinking Stevens ***but the fact that he doesn't encourage new ideas does stand out.***

F1: Yeah, Roberts has got ***a collaborative decision-making style***, so yeah.

It is interesting to note that the semi-unique information regarding Jones emerged in part prior to the mental simulation but at that stage was completely ignored by the individual group members. The second excerpt suggests the intervention caused group members to return to this information and give it proper focus and attention, fully *integrating* it into their decision-making process. Coupled with the emergence of unique information regarding Roberts' decision-making style, this enabled Group 8b to convert their initially incorrect selection to the correct one. This is a very good example of the group members improving their performance in both the uncovering, recognition and integration of unique and semi-unique information as a result of engaging in the intervention.

But the mental simulation does not always translate into a correct answer, as we see with Group 8a. This Group had a 3:1 initial majority in individual pre-discussion decisions in favour of Jones. This led to a very quick consensus-driven first group selection decision, coupled with much self-congratulation amongst group members who thought they had successfully worked out that the underlying rationale of the study was "How we come to a decision and see how smart we all are!" (F3).

The mental simulation quickly changes this and offers a valuable insight as to why the unique/semi-unique information may have been allowed to pass unchallenged. One explanation suggested by the verbal exchanges is that Communication Apprehension (CA) amongst the group members played an important role as highlighted by the following group exchange, triggered by the mental simulation:

Excerpt 3: Group 8(a) (Time 2)

M1: And say the harsh, arrogant bit.
F3: Where does it say he's harsh and arrogant?
F1: 'Abrasive leadership style.'
F3: I actually can't see it. Wait, have you got a different one? Have you all got ...? Loves to cook. Why have we all got ...? Guys, I think I now see it!
F1: Yeah!
F3: I've just been pretending I can see this stuff!
F1: Me too! One of you guys said something about being an alcoholic and I was like, 'Yeah!'

The realization of the presence of unique information also triggers embarrassment in the group members:

F3: Oh for God's sake, it's going to be like, 'How long did it take them to figure out they've all got different sheets?' Right, 23 minutes and we're actually 'spastics'! Come on, read!

This group fails to correct their initial suboptimal decision, although there is a clear suggestion that at least some group members are not comfortable with this outcome, with F1 noting: “now I feel bad that we liked Jones” and “I’m so annoyed!”

The above analysis provides qualitative support for CA as one reason why group members struggle to bring out unique information during their discussions. Even when it did emerge, approximately 30% of the groups in this study failed to acknowledge the presence of unique information during their initial group discussion. The mental simulation provided a framework where realization – and, more importantly, acknowledgement and integration – of the existence of unique information could take place.

This finding is also interesting given the number of Hidden Profile group studies carried out using student samples. Byrne, Flood, and Shanahan (2012) noted that fear of peer evaluation is a driver of CA and this may be acute in student populations, particularly those at the early stages of their university career. As Byrne et al. (2012) noted, this fear is compounded by fear of humiliation if negative perceptions of peers are somehow made public. The need to create a ‘safe space’ in which group members can speak their views honestly is, therefore, important. Evidence from this study suggests that the mental simulation provided such a space, allowing unique information to emerge and/or be acknowledged, when its presence was ignored or not acknowledged earlier in the group discussion. Perhaps because group members felt comfortable acknowledging their fears and apprehension within the framework of the mental simulation? This fear of peer evaluation generalizes to a work environment, particularly where workgroups are comprised of members who do not know each other particularly well, suggesting that the mental simulation could also play a role within an organizational framework.

Group leadership/structured process

For groups that successfully identified the existence of unique information during their first discussion, the group member who correctly made the identification then often emerged as the group leader, or was somehow afforded special status as in excerpt 4 below:

Excerpt 4: Group 7 (Time 1)

F2: But he doesn't have the commitment of successful fundraising. And then it says, 'He tends to discourage new innovative ideas.'

F3: Who's that, sorry?

F2: Stevens.

. . .

F1: But then again, with Jones, 'He has a temper that flares suddenly and a somewhat abrasive, harsh, arrogant leadership style.' Would you really want to be working with someone like that?

F3: But it says he's well-liked as a teacher. ((general agreement))

F2: But then if he's got to be a leader, you don't really want ... Where's that thing about the temper then?

F1: Point three, 'Colleagues of the law firm report that Jones has a temper that flares suddenly.'

F2: And then the bottom point saying he's got tension with the current Head, the very last point.

F3: I don't have that point.

F4: Nor me.

F3: Do you not?

F4: No. What does it say? Feedback from ... I don't have that point.

F2: I think we've got different information.

This recognition seems to afford F2 special status, such that she is then given permission to influence and lead the group process and she becomes more directive with the group: "Shall we move on to the next one then? So Roberts, so does someone want to say what their positives and negatives are and then we'll add what we don't have?". Once the final first group decision is made, F2 sums up the position succinctly: "If we'd never have had different information we could have literally been like, 'Oh, you're the minority and let's go for Stevens."

This group made the correct selection decision during their first group discussion. They are then challenged, through the mental simulation process, to identify reasons why their chosen candidate failed. During this discussion, F2's views again prevail, even in the face of negativity about Roberts, the optimal candidate, and pressure from other group members to change the decision:

Excerpt 5: Group 7 (Time 2)

F2: ***I don't think there are that many reasons for him, because a lot of the points means that he should have succeeded with things like that.***

F1: I know. I was thinking if we were doing this about Stevens or the other one, we'd have a lot more.

F2: So many more points.

. . .

F2: So what was the next one? We had to decide whether we were going to change him?

F4: If we want to change him or just keep him.

F3: I feel we've got to change him after all that.

F1: And again, you could be doing this about Jones and have his temperament brought into it, or you could have Stevens, who is potentially an alcoholic. ((general agreement))

F2: I think you're right. ***You kind of feel like you have to change because all that stuff has gone wrong, but like you said, if we were writing the list about either of the other two, we would have had so many more points.*** ((some agreement)) So they could just potentially mark it up even more.

This is consistent with research findings discussed in the theoretical analysis in Chapter 2 regarding group member status. Wittenbaum (2000) found that "high-status members", with prior experience of the group decision-task, were rated as more task competent by their fellow group members: accordingly, when they contributed unshared information, it was given greater weight during the group discussion and accepted more readily than when offered by inexperienced group members. These excerpts reflect something similar, not necessarily in relation to the contribution of unique information, but more in the license afforded to the group member who first uncovered the Hidden Profile.

We see a similar pattern in Group 3(a) where F3 firstly identifies the unique information and then emerges as group leader, able to suggest the optimal process approach for the group:

Excerpt 6: Group 3(a) (Time 1)

F3: Shall we read them through?
F1: Yeah, let's do that.
F3: See each one, what's different about them.
F1: So, yeah, start with what you were saying about Stevens.
F4: He's an alcoholic.
F3: Yeah, I've got that too. So, that's bad. Do you not have that?
. . .

This very systematic, leader driven approach enables this group to uncover *all* of the unique positive attributes for the Optimal Candidate, so much so that, notwithstanding the challenges posed by the mental simulation, they retain the candidate as their (correct) choice after the intervention, largely driven by F3, who uses the intervention framework to continue to surface positive unique information about Roberts:

Excerpt 7: Group 3(a) (Time 2)

F3: I feel like that goes back to the, 'has not worked in Higher Education for four years' similar to that. ((Agreement)) Then we talked about his aloofness; we talked about the fact that he was divorced and remarried. ***The research productivity increased whilst serving as a Dean in Northumbria – so I think that's positive.***

These extracts provide qualitative support to add to previous quantitative studies regarding the positive effect of leadership in Hidden Profile groups. Larson et al., 1996 interpreted their results as evidence of leaders' information management role in problem-solving discussions and my data supports this: the leaders highlighted in these excerpts brought process and form to the group discussion, which, in turn, encouraged other group members to greater levels of involvement and engagement in the discussion. The mental simulation provided the opportunity to further cement their position and bring more process into the group discussion.

Notable in this analysis is the fact that the group member who firstly correctly identified the presence of unique information, emerges as the group leader and is afforded special status. This is consistent with leadership research findings that higher competence and influence ratings have been observed for emergent leaders making higher quality contributions (Jones & Kelly, 2007; Sorrentino & Boutillier, 1975). My qualitative data also suggests such leaders were given license to be more directive in their approach to other group members during the group process. Wittenbaum (2000) also found that “higher-status members” had more self-perception of their own increased task competence, compared to inexperienced members. Greater feelings of task competence were associated with greater confidence in contributing unshared information and were also associated with higher levels of unshared information contributions, for *both* experienced and inexperienced group members. It seems here that greater feelings of task competence in the group member who uncovered the Hidden Profile were associated with greater confidence in assuming a leadership role and *directing and driving* the other group members towards the group decision.

A final point to bring out in this element of the analysis is the use of structure in the group discussion. Stasser et al.’s (1989) original research found that groups in a structured rather than unstructured discussion did discuss more information, but predominantly information which had already been shared. The groups in Study 1 were free form and leaderless, so decisions regarding both leadership and the structure of the group discussion were left to the groups (aside from the specific task structures). Based on the excerpts I have highlighted, the presence of a leader, combined with a strong group process, led to the emergence of more unique information. Mesmer-Magnus and DeChurch's (2009) meta-analysis showed that information sharing could be enhanced by structuring team discussions. For example, Dennis (1996), found that groups who adopted a semi-structured approach, where one or two group members became the leader, then polled other members for their individual pre-discussion choices, uncovered more information – both shared *and* unique - by asking group members who were in the minority as regards the initial pre-discussion decision to provide reasons for their choices. This led to the emergence of more unique information.

Dissent

Of the 17 groups scrutinized, only one group had the same unanimous pre-discussion choice (all four members chose Stevens, a suboptimal candidate). The data for this group shows that the first group exchange is short, focused exclusively on shared information. It is also beset by over-confidence, as the highlighted comments of M1 in the excerpt below make clear. It perfectly illustrates the unhelpful influence of consensual pre-discussion preferences and opinions on the group decision and the over-confidence this can engender amongst the group members:

Excerpt 8: Group 9(a) (Time 1)

F1: Well I think we should pick Stevens.
F2: I put Stevens.
M1: The same.
F3: So did I.
M1: Okay, let's go with it? ((laughter))
F1: But why did we pick Stevens? I picked Stevens because he has experience in a medium-sized university and this one is…
M1: Only 2,500…
F1: Yes, so it's relatively small so… ((?)). So he obviously has experience as… he has experience in the Business Dean of a large Gloucestershire university and Chair of the Information Technology Department.
M1: Yes, he was into IT and all that, which helps.

. . .

M1: ((?)) already – ***the other [group]s are just not good***. So yeah, I think we go for it. That was a hard decision… Jeez… I think we just get up and leave…

F2: Do we stay?

. . .

M1: ***I'm 100% sure on Stevens but obviously it's a huge decision.***

The mental simulation changes all of this, enabling the group to recognize the presence of unique information, which emerges quickly once the discussion gets into full flow during the intervention phase:

Excerpt 9: Group 9(a) (Time 2)

F2: We all have different things on our sheets.

F3: Do we?

M1: ***Game changer…***

. . .

F1: Have we all got the same CV stuff but different feedback forms?

M1: Yeah. That's huge – that's huge, that's massive.

F1: I haven't got that he's a drinker.

M1: That's why I was going on about him drinking; I wasn't just saying it like, you know…

. . .

M1: And that he discourages new innovative ideas…

F1: It's just gone downhill.

M1: ***Yes, why did we hire this guy? What were we thinking?***

. . .

F1: So have we all got different things for the others as well?

M1: I guess so.

F1: We've all got the same CV for Roberts, it's just in terms of County Councillor for Kent…

M1: Raised a significant amount of money for the political party…

. . .

F2: ***Well Roberts might be good because he's had numerous influential contacts as Counsellor…***

F2: Yeah, I think… I'd go for Roberts.

M1: I'd go for Roberts as well.

F1: Okay. Why would you go for him?

F2: . . .Roberts has previous experience as Dean and he's raised significant amounts of campaign funds for political parties. ***He's made numerous influential contacts as Councillor*** and that's all in the required qualifications and experience for the job. Um, but… he hasn't worked in higher education for 4 years though.

F2: And fund-raising and ((?))

F1: But it does say Jones is kind of aggressive and harsh, abrasive, sorry…

F1: ***So I think Jones has a temper.*** Roberts would be better.

F2: I think Roberts because he has made ***numerous influential contacts*** and he's got… Jones has been on the Board for UKF but he hasn't really done anything like university ((?)) so he's not really experienced.

. . .

F1: So Roberts?

M1: Roberts it is.

It is also interesting to note that, within the mental simulation framework, the hiring discussion becomes more of a team effort. M1's language switches from "I" to "we". It is possible that this signals a transition point from the individual's choice to the group's choice. Conversely, there is also the possibility that M1 is seeking to distance himself from the initial group decision and preserving himself to some degree by pointing at the group as being responsible for the decision – perhaps seeking safety in numbers. There is positive challenge, for example, note F1's challenge against Jones (bold, italicized) – she is apologetic, but the challenge is there, nonetheless.

There is also a sense, however, that *too much* conflict-oriented dissent can be damaging. In the following excerpt, the group is split 50:50 Roberts/Stevens based on their initial pre-discussion decisions. M2 becomes aggressive in the T1 discussion in pushing his preferred selection (Roberts) and the group reacts badly to this, so much so that M2 is left isolated. Ultimately the group T1 selection is Stevens, a Suboptimal Candidate:

Excerpt 10: Group K(a) (Time 1)

M2: Okay, hello, would you rather have a leader who just goes out and gets pissed every night or…

F2: Oh no, you can't say that… no…

M2: I mean that's kind of what you have with that.

. . .

M2: But like… one of them is like kind of does – he's kind of off the rails and I think, I do think like Roberts could actually do the job as well but… and he's, he doesn't really have ((?)) going out and getting drunk…

M1: Yeah, for me that's kind of…

F1: ((laughing))

M1: Shall we do a quick like vote thing?

. . .

M1: I think I could sway to Stevens… which is not uber bad…

M2: I could sway but I would just pick Roberts…

. . .

F2: Yeah, was that… okay. So – so what are we doing? Well it's three on one so…

M1: I mean I'll change to Stevens to make a decision, which isn't very…

M2: All right, I guess it's Stevens.

The mental simulation gives M2 a chance to gather himself and make arguments to support the selection of Roberts in a more controlled and less aggressive way:

Excerpt 10: Group K(a) (Time 2)

M2: Right, so this is how I would defend Roberts… like I'd say he doesn't discourage new and innovative ideas so that's probably got him into trouble but it's most likely to get him out of trouble. Where unlike Stevens, he's probably going to stay in that, this kind of downward spiral and yeah, that was my major point.

M1: Because…

M2: Oh and well Roberts has actually been like instrumental in like raising money whereas Stevens hasn't – so if you give him the change he might still be able to raise like a lot of money if you did…

This suggests the mental simulation helps to diffuse the conflict, enabling M2 to take a calmer, more rational approach, combined with the opportunity to re-state the negative attributes of Stevens and unique positive attributes of Roberts. This enables M2 to achieve success and also enables the group to switch to the correct decision.

3.2.3 Results: quantitative analysis – unique, semi-unique and shared information

For the 17 groups included in the qualitative analysis, group discussion of shared and unshared information prior to and following the mental simulation was coded independently by two research assistants, blind to hypotheses. Each candidate attribute mentioned was matched to the full list of all candidate attributes as shown in Table 1, with all repetitions counted. DHN reviewed completed codings and arbitrated for major coding discrepancies, (e.g. around repetitions or interpreting group member responses). Averaged across all groups, coders were shown to be within a 92% identical range.

For the Suboptimal Candidates, items were counted at T1 and T2, based on three different categories: fully shared (favourable), semi-unique (unfavourable) or unique (neutral). Items coded for the two Suboptimal Candidates were then aggregated to form a mean proportion of the overall items mentioned. For the Optimal Candidate, items were identified based on six different categories: shared (unfavourable/favourable); semi-unique (neutral/favourable); and unique (unfavourable/favourable). The corresponding proportions (mean proportions in the case of the Suboptimal Candidate) at Time 1 and Time 2 are shown in Table 3 below.

Table 3.

Information Exchange During Group Discussion as a Function of Time (Pre/Post Intervention) (Study 1).

Proportion of information mentioned (%)	Optimal		Suboptimal	
	Time 1	Time 2	Time 1	Time 2
Fully shared (Favourable)	23.87	17.70	32.22	22.53
Fully shared (Unfavourable)	37.57	41.15	N/A	N/A
Semi-unique (Favourable)	2.74	4.87	N/A	N/A
Semi-unique (Unfavourable)	N/A	N/A	54.69	59.92
Semi-unique (Neutral)	19.77	25.22	N/A	N/A
Unique (Neutral)	N/A	N/A	12.08	17.55
Unique (Unfavourable)	6.85	6.64	N/A	N/A
Unique (Favourable)	9.20	4.42	N/A	N/A

To determine the effect of the mental simulation on the group discussion, I compared these proportions in a series of Chi-square tests. An examination of the aggregated data for the Suboptimal Candidate revealed a significant reduction in the proportion of fully shared favourable information mentioned after the mental simulation, $\chi^2(1) = 8.64$, $p = .003$. There was also an increase in the proportion of semi-unique unfavourable information mentioned after the intervention, although this was not significant, $\chi^2(1) = 1.76$, $p = .185$.

As regards the Optimal Candidate, the increase in the proportion of semi-unique favourable information discussed before and after the intervention was approaching significance, $\chi^2(1) = 3.02$, $p = .082$, although this was offset by a significant reduction in the proportion of unique favourable information mentioned at the same time points, $\chi^2(1) = 8.46$, $p = .004$. This result is discussed below.

3.3 Discussion

This Chapter added to the literature on group decision-making in Hidden Profile tasks by undertaking a qualitative thematic analysis, which allowed me to closely examine three key themes previously found to impact group performance in a Hidden Profile task: (i) Communication Apprehension; (ii) leadership and group process structure and (iii) dissent. My interpretative analysis of the group members' narrative exchanges brought these themes to life, demonstrating clearly how these factors impacted on the group discussion. The narratives also supported my hypothesis that the mental simulation intervention attenuated the adverse effects of Communication Apprehension and dissent, creating a more cooperative framework which allowed group members to be honest about their recognition of unique information and also in putting forth a strong rationale for their chosen candidate. The intervention also brought valuable process to the group discussion which, when combined with an emergent leader, helped groups maintain the initial optimal selection.

The accompanying quantitative analysis provides some statistical support for the hoped-for effect of the intervention on the unique/semi-unique versus shared information mentioned by group members: there was a significant reduction in the amount of fully shared favourable information relating to the Suboptimal Candidates mentioned by the group members. This decrease was not matched, however, by an increase in mentions of unique positive information regarding the Optimal Candidate: only a marginally significant increase in semi-unique positive information was noted. This is most likely attributable to the fact that over half of the groups selected the optimal candidate during their first group discussion, prior to the mental simulation and many of the positive items (unique and semi-unique) relating to the Optimal Candidate emerged *prior* to the intervention. I therefore interpret the results cautiously but, taken together with the qualitative analysis, I contend that they show support for my assertion that the mental simulation had a positive effect on group decision outcomes, when information was distributed asymmetrically, as in a Hidden Profile.

3.3.1 Limitations and future directions

To manage the demands of the qualitative thematic analysis, this was a relatively small sample (17 face-to-face groups of four), comprised of first year undergraduate psychology students. Consequently, their experience with tasks such as this, particularly involving hiring decisions, is limited. In addition, this exercise took place early in the new university semester, when students were forming new friendships and relationships, so at a point in time when state Communication Apprehension and fear of peer evaluation may have been particularly acute. These factors may also have contributed to a lack of confidence in both their group member interactions and their shared decision-making. In addition, the high proportion of groups who solved the Hidden Profile, selecting the Optimal Candidate during the first group discussion (over 50%) suggests that the distribution of the candidate attributes reduced the difficulty of solving the Hidden Profile. Decision quality results in previous group Hidden Profile studies show an average of 20-30% of groups achieving the correct solution, well below that achieved here.

These concerns limit the potential generalisability of the findings. Notwithstanding these limitations, I believe the additional interpretative license afforded by this qualitative approach provides valuable insights into group information exchange and processing in Hidden Profile decision tasks. Specifically, the qualitative analysis showed evidence for: (i) the existence of Communication Apprehension amongst group members and its adverse effect, as evidenced by their willingness to ignore unique information; (ii) preference consistency and the individual preference effect, with individual group members heavily influenced by their own individual pre-discussion decisions and sharing information in support of these; and (iii) social validation, with unanimity (or near unanimity) in pre-discussion decisions leading to over-confidence amongst group members, both in their belief in the quality of their group decision and their decision-making capability as a group. Both the qualitative and quantitative analysis also showed the mental simulation to be at least partially successful in overcoming these challenges. This thesis will build on these initial positive findings.

Chapter 4: Testing the Mental Simulation

4 Summary

Previous research has shown mixed success in creating and testing interventions which can improve *both* group information exchange *and* decision quality in Hidden Profile decision tasks. Mental simulation is relatively untested in Hidden Profile group research and, whilst counterfactual thinking has achieved limited positive results, recent research calls into question its efficacy as a 'one size fits all' de-biasing solution. This face-to-face group study (*N* participants = 232, working in *N* 4-person groups = 58) empirically examines for the first time the effectiveness of an alternative form of mental simulation, based on a Premortem (Klein, 2003) (Intervention *vs.* Control), in improving information exchange and group decision quality in a Hidden Profile hiring decision task, measuring outcomes prior to and after the intervention (T1, T2). The results show initial positive support for mental simulation as an important procedural intervention in Hidden Profile decision tasks, leading to an increase in group members' exchange of critical, unique information and a reduction in confidence in the Suboptimal Candidates. Results for group decision quality are, however, less clear.

4.1 Theoretical background

As Chapter 2 outlined, the Hidden Profile has proven remarkably robust to interventions designed to overcome it (see Lu et al., 2012 and Mesmer-Magnus & DeChurch, 2009 for reviews). As I have discussed, in large part these interventions have focused on ways to help groups and their members unlock and integrate unique information, for example, by making groups accountable to an audience (e.g. Stewart et al., 1988); manipulating the amount of information and group size (e.g. Stasser et al., 1989); or by forewarning group members they held different information (e.g. Stasser et al., 1995). Training in 'information vigilance' did yield some success (e.g. Larson et al., 1994), as did the introduction of 'high-status' group members with some experience of the task, (e.g. Wittenbaum, 2000). The introduction of dissent, for example, varying the group composition based on differing member choices (Greitemeyer et al., 2006) or imposing challenge through a devil's advocacy-type process (Schulz-Hardt et al., 2002) has also achieved some success, but may have downsides in the form of "Affective Conflict" (Amason, 1996; Waddell et al., 2013). Research suggests the principal challenge to the effectiveness of these interventions is the individual group member's initial (suboptimal) preference, which then manifests itself during the group discussion, through preference consistent evaluation of information (Faulmüller at al., 2010; Greitemeyer & Schulz-Hardt, 2003). Recall that Gigone and Hastie (1997) noted: "It was as if the group members exchanged and combined their opinions but paid little attention to anything else" (p.132). These individual preference biases are underscored by the manner in which the group members frame and present information in the group discussion, which almost certainly then amplifies these individual-level biases (Greitemeyer & Schulz-Hardt, 2003). A 'vicious circle' is thus created and the challenge is how to break this.

The findings from the qualitative thematic analysis in the previous Chapter showed initial support for my hypothesis that a mental simulation, based on a "Premortem" (Klein, 2003), may attenuate some of these potential causes of Hidden Profile groups' failures to share and integrate unique information. Specifically, initial examination of the mental simulation through my qualitative analysis in Chapter 3, suggested that it can enable group members to overcome their individual pre-discussion preferences, a key cause of Hidden Profile decision-task failures, as set out above, (Faulmüller et al., 2010; Gigone & Hastie, 1993; Greitemeyer & Schulz-Hardt, 2003). Furthermore, the intervention was also successful in attenuating group member Communication Apprehension (McCroskey, 1977). The very construct of a Hidden Profile works in such a way as to induce state-Communication

Apprehension, particularly amongst group members who may be anxious about their status in the group and who wish to be viewed as more competent and knowledgeable (Wittenbaum, 2000; Wittenbaum et al., 1999), thereby presenting a real hurdle in their ability to offer up unique information. However, as extant research has shown, it is essential to overcome group members' preference for shared, preference consistent information over the critical, unique information which they need to exchange, *and* apply, in order to solve Hidden Profile tasks (Stasser & Stewart, 1992; Stasser et al., 1989).

Following the first study, I resolved to examine the mental simulation again in a more robust study design, against a control condition. As well as empirically testing some of the positive effects noted in Chapter 3, I wanted to extend my research by examining the effect of mental simulation on confidence biases, which, as Arnott (2006) noted, have the doubly negative effect of curtailing the search for new information, whilst also increasing an individual's belief in their decision-making capability.

4.1.1 Mental simulation

Mental simulation can be defined as "the imitative representation of real or imagined events" (Rivkin & Taylor, 1999, p.1451). Unlike counterfactual thinking, which requires the specific induction of a counterfactual mindset, mental simulation is often spontaneously used by people in everyday life and, consequently, as Rivkin and Taylor (1999) noted, people are well-practised and well-versed in its usage. Thus, if effective in an experimental setting, mental simulation offers an approach which should easily generalise to organizational and other 'real life' settings.

Faude-Koivisto, Würz, and Gollwitzer (2009) noted that mental simulations can result in the generation and consideration of additional alternatives by enhancing open - mindedness. Students asked to visualise successful academic scenarios adopted a more explorative mind-set than students asked to develop implementation steps to achieve those outcomes (Würz, Gollwitzer, & Greitemeyer, 2007, cited in Faude-Koivisto et al.). Faude-Koivisto et al. attributed this to the ability of mental simulation to create an "exploratory mind set" (p.74).

Within the imagined intergroup contact literature, mental imagery has already achieved significant success as a new indirect contact strategy (see Crisp, Husnu, Meleady, Stathi, & Turner, 2010 for a review). Crisp and colleagues proposed that imagining positive intergroup contact brings forth the same conscious and unconscious thoughts that are involved in actual group contact but in a much safer, more secure, environment. The premise of the mental simulation, as applied in this thesis, is that group members are asked to imagine that the decision they have taken has gone badly wrong, resulting in poor group and organizational outcomes. This enables them to mentally simulate the failure of their decision, then work out how to overcome that failure. Of course, the failure is not real – the mental simulation offers a proxy for the decision failure.

Aside from creating an open and exploratory mindset, there are other reasons why mental simulation may assist with improving decision outcomes in Hidden Profile tasks. In the first instance, mental simulation may assist with cognitive processing of the experience, (in this case framed as the failure of the hiring decision), which may lead to a greater understanding of the problem (Rivkin & Taylor, 1999). Furthermore, thinking about and working through the experience may also result in the ability to reorganize and assimilate the experience.

There is also evidence that "prospective hindsight", defined as "generating an explanation for a future event as if it had already happened" (Mitchell, Russo, & Pennington, 1989, p.25) can lead participants to think differently when the future event is 'certain' rather than 'may be'. In Mitchell at el.'s study, certainty of an outcome was manipulated by giving participants differing scenarios, for example either: "the executive (i) *completed* the report by the deadline or, (ii) *may have completed* it". Furthermore, the temporality of the outcome was manipulated using future or past tense language, for example: "an executive (i) *will complete* a report by the deadline; versus (ii) the executive c*ompleted* the report by the deadline" (p.28). As I describe in the study procedure below, during the mental simulation tested in this thesis, group members are not asked what they might do *if* their chosen candidate failed but instead, asked to specifically imagine they have proceeded with the hiring of their first ranked candidate and to look forward 12-months. They are then presented with a picture of everything that has gone wrong during that time-frame and asked to write down all of the reasons why this might have happened. Mitchell et al. (1989) found that participants generated more reasons when asked to explain outcomes presented as certain, than for those outcomes presented as uncertain. Participants also reported greater difficulty in explaining uncertain outcomes. This led Mitchell et al. to conclude that participants also thought *differently* about such events, although they could not conclude that prospective hindsight led to the generation of *superior* explanations for the event. Nonetheless, this research offers strong support for the idea of mentally simulating *actual* failure of the group's decision.

How might the mental simulation of a decision failure lead to improvements in decision outcomes in a Hidden Profile task? Taylor, Pham, Rivkin, and Armor (1998) drew a critical distinction between *process* simulations, i.e. those envisioned to reach a goal; and *outcome* simulations, where an active focus on the outcome to be achieved will help to bring it about. Most mental simulation research has focused on the imagined outcome as positive (e.g. Crisp et al., 2010). As applied in this research, the mental simulation turns this approach on its head: the outcome simulated, that is, the failure of the [candidate selection] decision, is *not* the desired outcome. Asking group members to envisage this imagined outcome by engaging them in the mental simulation of their preferred candidate's failure, can, I believe, improve analytic and problem-solving processes, leading to increased information exchange and integration. This should, in turn, lead to improved decision outcomes. This is because the mental simulation offers a framework in which group members can speculate on, and identify, reasons for the failure and, importantly, in which they can apply that information to changing the outcome. I believe this distinguishes the form of this mental simulation from counterfactual thinking, whilst offering a further benefit of engaging the group directly in the decision-task, rather than an alternative, unconnected task, as in counterfactual thinking.

A further key point may be that, notwithstanding participants are mentally simulating a 'sure' outcome, solutions to the problem are still available to the group, up to and including the ability to change their decision and select an alternative candidate. Group members are made aware of this option in the task instructions for the mental simulation (see Appendix A). In that way the problem is still 'live', as are the means of solving it. Rivkin and Taylor (1999) noted the particular ability of mental simulation to have a positive effect on *ongoing* problems, as opposed to *past* problems, due to the fact that these problems are not yet 'set': opportunities still exist to control and resolve these problems. This is because the act of mentally simulating such problems can help individuals to realise what they can do to change the problem. This makes it all the more significant that the act of mental simulation in this series of studies takes place *prior* to the final group decision being reached, at such a time when the group has an opportunity to reach an alternative decision.

4.1.2 Procedural interventions

Hollingshead (1996) defined group decision procedure as "the manner in which group members process and consider decision alternatives" (p.182). Procedures can impact directly on group decision quality by affecting how groups process information. Hollingshead noted that whether or not the group achieves a high quality decision is predicated on their satisfying certain key requirements during their discussion. These requirements include: (a) whether the group has an accurate and thorough understanding of the problem it has been presented with;

(b) whether the group fully considers all realistic and acceptable alternatives; and (c) whether the group examines each alternative and thoroughly and accurately assesses the positive and negative consequences associated with each of them. The group decision procedure can directly impact this. Hollingshead's success in improving group discussion and decision through the introduction of three procedural changes (in particular, a 'rank order' rather than 'choose the best' decision procedure) led him to conclude that it is not only what people say to each other, but also the way in which the group discussion is *conducted*, which can impact on group decision outcomes.

Procedural interventions are important. Fisher (2017) noted that "many leaders, managers, and scholars" have been unable to alter flawed group decision-making processes (p.59) and are rarely able to correct such poor processes alone. Fisher's work highlighted a difference in effect between 'in-process' and 'pre-task' interventions. Fisher argued and found support for his assertion that the former are more likely to positively impact group decision outcomes in Hidden Profile tasks, because the group is more likely to be ready for an intervention once the discussion is underway and, importantly, in-process interventions can interrupt premature consensus and extend the discussion, a factor known to have negative effects in Hidden Profile tasks. This is specifically the case when in-process interventions can succeed in shifting the attention of group members away from their interactions and drive them towards a recapitulation of their process and group consensus. Supporting this, Fisher found that whilst pre-task interventions had no effect on preference negotiation, in-process interventions did. Accordingly, in Study 2, I position the intervention as an 'in-process' intervention, in an attempt to maximise its effect. To be specific, the intervention (or Control) task takes place following *both* the individual pre-discussion decision and the first group candidate ranking decision.

The key to in-process interventions, as Fisher (2017) noted, is that the group can observe the effect of any changes deriving from the intervention. Chapter 3 recorded this very effect amongst those groups whose members came to realise they held unique information during the course of the mental simulation. Furthermore, Fisher noted a positive effect of such interventions on group discussion in the form of "attention switches". The mental simulation I am now testing seems well placed to expand upon this work, particularly since groups are offered the opportunity to maintain or amend their candidate ranking decision after the intervention.

4.1.3 Chapter overview and hypotheses

Study 1 offered indicative positive outcomes for the ability of mental simulation to improve information exchange and decision quality in face-to-face groups engaged in Hidden Profile decision tasks. However, Study 1 lacked any form of valid control and saw a significant proportion of groups solve the Hidden Profile at T1 and correctly identify the optimal candidate (almost 60%), which could have potentially confounded the results. In addition, the work in Study 1 was largely exploratory. Study 2 builds on the results from Study 1, offering the first real test of mental simulation against a valid control condition and allowing me to elucidate a number of hypotheses.

Study 2 allows me to determine whether mental simulation prompts greater exchange of unique information amongst group members, something which was suggested by the narratives examined in Study 1 (Chapter 3). It also allows me to test the effect of mental simulation on group members' confidence in both the Optimal and Suboptimal Candidates, and also in the hiring ranking decision of their own group. Study 1 demonstrated that mental simulation significantly reduced the amount of fully shared favourable information relating to the Suboptimal Candidates mentioned by the groups, so examining participants' confidence in the candidates will enable me to elucidate how this reduction in shared, favourable information affects that confidence, if at all, and whether this translates into improved group decision quality. Accordingly, I expect:

H1. (a) Groups undergoing a mental simulation will record a greater mean proportion of group discussion time of the Optimal Candidate at T2 versus Control groups, and **(b)** a reduction in time spent by Control groups reaching their consensus decision at T2 versus T1.

H2. Participants in groups undergoing a mental simulation will be more likely to realise they hold different (unique) candidate information compared to Control group participants.

H3. Groups undergoing a mental simulation will demonstrate improved decision quality, 'ranking up' the Optimal Candidate more frequently than Control groups.

H4. Participants in groups undergoing a mental simulation will report significantly lower mean group confidence in the Suboptimal Candidates between T1 and T2 versus Control groups.

H5. Participants in groups undergoing a mental simulation will report significantly lower mean group confidence in their group's ranking decision between T1 and T2 versus Control groups.

Exploratory Hypothesis: I had no specific hypothesis regarding group cohesion but wanted to explore whether there was any difference in perceived group cohesion between participants in groups undergoing a mental simulation versus Control Groups.

4.2 Study 2

4.2.1 Method

Participants and design

Participants were first-year psychology undergraduate students from a university in Southeast England (N = 232, 43 men, 189 women; age range 16-38, M = 18.90, SD = 2.47) who were randomly assigned to four-person groups (N = 58) and to experimental conditions.

Participation was partial fulfilment of an introductory undergraduate psychology course research requirement.

A 2 (Intervention Condition (Between): Mental Simulation (MS) versus Control) X 2 (Time (Within): T1 vs T2) mixed factorial experimental design was conducted; participants were randomly allocated to condition.

Materials

The Hidden Profile material was adapted from Baker (2010). Participants were told they were recruiting for the position of president of a new campus of their own university (to increase relevance and reality) and (in a change from Study 1) asked to rank order their preference for hiring three candidates for the role – Roberts, Stevens or Jones - following Hollingshead (1996). Chazan (2017) noted that a rank order approach is often viewed as the best way to find a qualified candidate amongst a number of resumes, thus I would argue it is also more generalisable to real interview situations. Geographic references were changed, and minor language modifications made to be UK-specific.

Participants received a job description, key selection criteria, and highlights from each candidate's CV. Each candidate had 16 items of information drawn from interviews, references, personal observations, etc. These items were as Study 1 and distributed in such a way that participants were, again, oriented towards a Suboptimal Candidate selection. Following the ceiling effect in Study 1, I made an adjustment to the distribution of the attributes for the Optimal Candidate in order to increase the difficulty level of the Hidden Profile. Specifically, one positive attribute of the Optimal Candidate was switched from shared, known to all group members, to unique, known only to one group member (Table 4).

Table 4.

Candidate Attributes for the Hidden Profile Group Decision Task and Distribution by Group Member (Study 2).

	Candidate		
Characteristic	Stevens	Roberts	Jones
CV	Provost (1,2,3,4) Former Dean (1,2,3,4) Plans for money/donations (1,2,3,4) Full professor (1,2,3,4)	Political leader (1,2,3,4) Former Dean at 2 universities (1,2,3,4) Raised money (1,2,3,4) Full professor (1,2,3,4)	Senior Manager (1,2,3,4) Steering Committee (1,2,3,4) Argued in High Court (1,2,3,4) Visiting Professor (1,2,3,4)
Unfavourable	Seen drinking heavily (3,4) Left without raising funds (1,3) Discourages innovation (2,4) Not responsible for donations (1,2)	Aloof (1,2,3,4) 4 years out of Higher Education (1,2,3,4) Lacks campus/student life experience (1,2,3,4) Accused of changing positions (1)	Temper (1,2) Tension with provost (3,4) High turnover, abrasive leader (1,3) Reduced success rate in court (2,4)
Favourable	Nationally recognized researcher 1,2,3,4) Recognized by business leaders (1,2,3,4) Emphasized collaboration (1,2,3,4) Oratory skills (1,2,3,4)	Volunteer (1,2) Influential contacts (1) Thoughtful leader/listener (2) Collaborative decision-maker (2) Excellent teacher (3) Faculty research productivity increased (3) Diversity increased (4) Secured grant (1,2,3,4)	Pleasant personality (1,2,3,4) Strategic thinker (1,2,3,4) Active trustee (1,2,3,4) Students like as a teacher (1,2,3,4)
Neutral	Spouse teaches Spanish (1) Teaches one module (1) Family nearby (2) Married, 3 children (2) Enjoys sports (3) Biking and running (3) Consulting work (4) Likes to garden (4)	Apartment in Spain (1,2) Divorced, remarried, 2 children (3,4) Plays golf and tennis (2,4) Vegetarian (1,3)	Lives in area (1) Grown up child (1) 2 dogs/2 cats (2) Spouse is a physician (2) Plays Bridge (3) Likes travelling (3) Enjoys mystery novels/biographies (4) Loves to cook (4)

Procedure

Following random assignment to groups/conditions, participants were told they were participating in a study of group decision-making processes, then taken to small group laboratories. I did not to record the group discussions. Participants were also not told that they had different candidate information, nor that any one candidate was better than the others.

Task 1 – pre-group discussion individual measures.

Experimenters provided participants with candidate CVs and role descriptions, which were retained throughout the study. I believe this is more realistic to ‘real’ group scenarios, where group members can typically access the information rather than rely on recall. Participants read the material, working individually to complete the pre-discussion measures (for all measures, see below).

Task 2 – groups.

Participants discussed and agreed in their groups a T1 group candidate rank decision (1 = most preferred; 2 = second preference; 3 = least preferred) and then responded to the measures below.

Task 3 – groups.

Following the initial group candidate rank exercise, groups undertook a mental simulation (MS)/Control task. In the MS (Appendix A), groups were asked to imagine that they had proceeded with the hiring of the group’s first ranked candidate and that the next 12 months had gone badly, resulting in poor group and organizational outcomes. Groups were asked to discuss and generate reasons for these problems, which one group member, randomly designated by seat as ‘the Recorder’, documented in a free form list. This was designed to ensure the group members engaged fully with the MS. Control groups worked together on a word task describing their experiences in the School of Psychology. After the tasks, groups were asked whether they wanted to maintain or change their T1 candidate rank decision and recorded their T2 group rank decision and the other group and individual measures.

Task 4 – post-group discussion individual measures.

Participants completed the remaining post-discussion measures.

Measures

Pre-discussion: individual measures.

All individual participants firstly recorded their own preferred candidate rank decision (1 = most preferred; 2 = second preference; 3 = least preferred).

Information exchange.

The first dependent variable was information exchange. This was operationalised as group time spent in discussion, based on the approach of Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, and Frey (2006). Before and after the MS/Control task, each group recorded: (i) the proportion of time spent discussing each candidate (to sum to 100% of the group discussion time); (ii) the overall amount of time spent in group discussion to reach their consensus decision. Both measures were based on the groups' self-reported estimate.

Decision quality.

Decision quality was a dichotomous measure, based on the frequency with which groups 'ranked up' the Optimal Candidate at T2 following the MS or Control task. Given the difficulty of solving Hidden Profiles, examining the extent to which the ranking of the Optimal Candidate was improved by the MS seems a fair measure to test the efficacy of a new intervention.

Individual measure: confidence in suboptimal/optimal candidate

Group members were asked to record at T1 and T2 whether they thought that Roberts ("Optimal Candidate"), Stevens or Jones ("Suboptimal Candidate(s)") was the best person for the job, by responding to the statements "I think Stevens/Roberts/Jones would be the best person for this job", on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*).

Individual measure: confidence in group ranking decision.

Participants were asked to record their confidence levels with the hiring ranking decision made by their group, responding to the statement "I am confident in my group's ranking decision" at T1 and T2, on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*).

Post discussion measures.

All individual participants were asked to:

i) Confirm whether or not they realized they had different candidate information (a "Yes/No" response).

ii) Answer four questions assessing their view of their group: how much they liked the group they were in; how similar they felt to their group (both (1 = *very much* to 7 = *not at all*) ; whether they enjoyed being part of the group (1 = *agree* to 7 = *disagree*); how well group members had got on (1 = *very well* to 7 = *not at all*) adapted from the small group six-item Perceived Cohesion Scale (PCS) developed by Chin, Salisbury, Pearson, and Stollak (1999).

iii) Provide demographic information relating to their gender, age and perceived gender of the hiring candidates.

4.2.2 Results

Three groups were excluded due to missing responses, leaving 55 groups in the group data analysis. In order to safeguard against possible dependencies among the data provided by group members, I averaged scores across the members within each group and conducted the analyses on the basis of these averaged scores, except where noted (Reimer, Kuendig, Hoffrage, Park, & Hinsz, 2007; Schittekatte, 1996; Stasser & Titus, 1985).

Pre-discussion preferences

Initial individual participant hiring selections showed 77.60% of participants first ranked a Suboptimal Candidate, versus 22.40% the Optimal Candidate, χ^2 (1, N = 232) = 12.46, p <.001, confirming the successful Suboptimal Candidate manipulation. I also noted a significant between-groups difference: more participants in MS groups initially selected the Optimal Candidate versus those in Control groups, χ^2 (1, N = 232) = 5.01, p = .025, Φ = .15. When the data was analysed at the aggregated level, however, there was no significant difference in the proportion of MS versus Control groups first ranking the Optimal Candidate at T1, χ^2 (1, N = 55) = .26, p = .612, Φ = .07 (25.95% of Control groups first ranked the Optimal Candidate at T1 versus 32.14% of MS groups).

Information exchange

Mean proportion of group discussion time of optimal candidate.

Hypothesis 1a anticipated groups undergoing a mental simulation would record a greater mean proportion of group discussion time on the Optimal Candidate at T2 versus Control groups. The data supported this. An Intervention (MS *vs.* Control) X Optimal Candidate Group Discussion Time (T1, T2) mixed ANOVA revealed a significant Time X Intervention interaction, $F(1, 53) = 6.84$, p = .012, ηp^2 =.11. The main effects of Time and Intervention were not significant, (all p's > .239). Simple main effects analysis of the significant two-way interaction showed groups undergoing a MS reported greater time discussing the Optimal Candidate at T2 than Control groups, $F(1, 53) = 4.78$, p = .033, ηp^2 = .08. ($M_{\text{MSIMULATIONT2}}$ = 33.61, SD = 26.81 versus $M_{\text{CONTROLT2}}$ = 20.60, SD = 15.75). There was no difference in time spent discussing the Optimal Candidate between groups undergoing the MS and Control groups at T1, $F(1, 53) = .50$, p = .481, ηp^2 = .01 ($M_{\text{MSIMULATIONT1}}$ = 27.16, SD = 16.70 versus $M_{\text{CONTROLT1}}$ = 30.21, SD = 15.09).

Length of group discussion time.

Hypothesis 1b predicted a reduction in time spent by Control groups reaching their consensus decision at T2 versus T1. This was supported by the data. I analysed this in an Intervention (MS *vs.* Control) X Group Discussion Time (T1, T2) mixed ANOVA, which revealed a significant main effect of Time, $F(1, 53) = 13.80$, $p < .001$, $\eta p^2 = .21$. Control groups took significantly less time to reach their group rank consensus at T2 versus T1, $F(1, 53) = 13.64$, $p = .001$, $\eta p^2 = .20$ ($M_{\mathrm{CONTROLT1}} = 7.54$, $SD = 3.21$ versus $M_{\mathrm{CONTROLT2}} = 4.09$, $SD = 4.24$). Groups undergoing a MS did not differ significantly, $F(1, 53) = 2.37$, $p = .129$, $\eta p^2 = .04$ ($M_{\mathrm{MSIMULATIONT1}} = 7.64$, $SD = 3.78$ versus $M_{\mathrm{MSIMULATIONT2}} = 6.23$, $SD = 3.78$). Neither the main effect of Intervention nor the Time X Intervention interaction was significant (all p's > .126). Post hoc independent *t*-tests showed no significant difference in the length of group discussion time for Control groups versus groups undergoing a MS at T1, $t(53) = -.11$, $p = .912$, but the difference at T2 was marginally significant, $t(53) = -1.97$, $p = .053$.

Participant awareness of different information.

Hypothesis 2 postulated that participants in groups undergoing a MS would be more likely to realise they held different (unique) candidate information from Control group participants. This was analysed at the individual level and the data supported this: a chi-square test was significant, $\chi^2 (1, N = 232) = 7.65$, $p = .006$, $\Phi = .18$.

Decision quality

Hypothesis 3 anticipated groups undergoing a MS would demonstrate improved decision quality, 'ranking up' the Optimal Candidate more frequently than Control groups. This was only partially supported by the data. Amongst groups undergoing a MS, seven groups (25.00%, $N = 28$) ranked up the Optimal Candidate at T2. The Chi-square test revealed that the assumption that the value of the cells expected should be 5 or more in at least 80% of the cells was violated – two cells (50%) had an expected count of less than five. I therefore applied the maximum likelihood ratio (MLR) test (McHugh, 2013) which was significant, χ^2 (1, N = 55) = 10.44, p = .001, Φ = .37. For completeness, I also examined whether groups who had selected the Optimal Candidate at T1 subsequently ranked down that candidate following the MS. This result was also significant, χ^2 (1, N = 55) = 10.44, p = .001, Φ = .37. In summary, an identical number of groups both ranked up *and* ranked down the Optimal Candidate following the MS intervention.

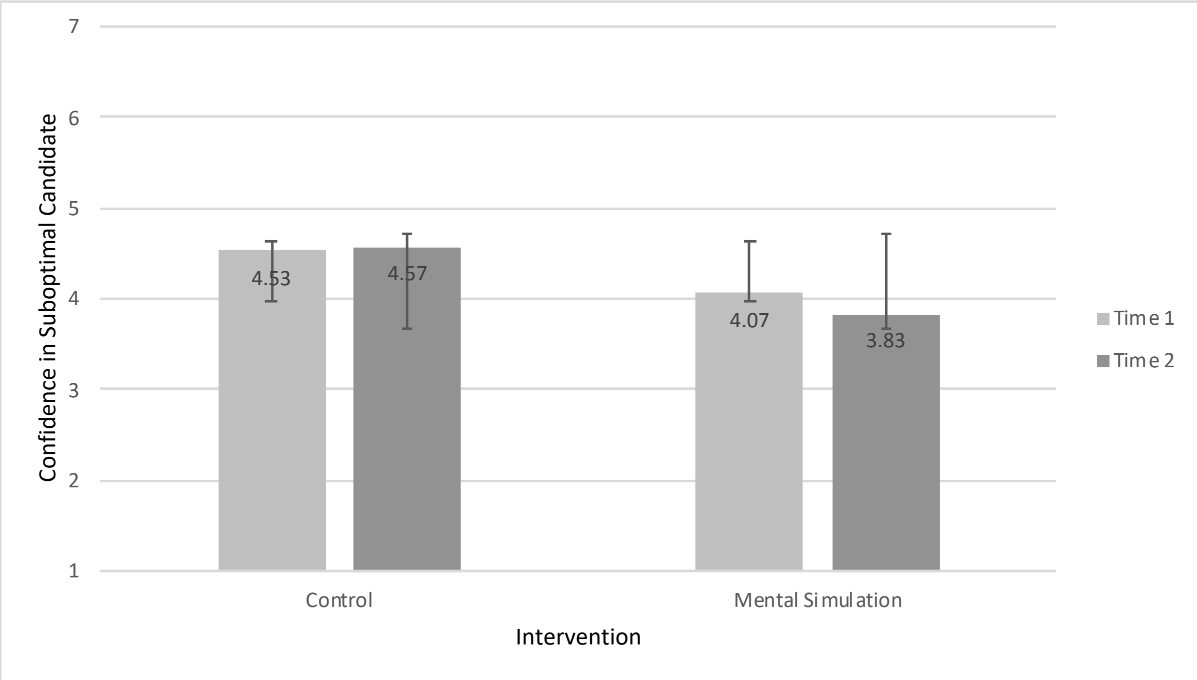
Confidence in suboptimal/optimal candidate

Hypothesis 4 expected participants in groups undergoing a MS to report significantly lower mean group confidence in the Suboptimal Candidates between T1 and T2 versus Control groups. Confidence scores for the Suboptimal Candidates were averaged for this analysis. A two (Suboptimal Candidate Confidence at T1, T2) by two (Intervention: MS *vs.* Control) mixed ANOVA yielded a significant main effect of intervention: confidence scores were significantly lower in the intervention versus Control condition, $F(1, 53) = 8.63$, p = .005, $\eta p^2 = .14$ ($M_{\text{CONTROL}} = 4.55$, $SD = 0.90$ versus $M_{\text{MSIMULATION}} = 3.95$, $SD = 0.80$). The main effect of Suboptimal Candidate Confidence and the Suboptimal Candidate Confidence X Intervention interaction were not significant, (all p's > .165). Post hoc independent t-tests, did, however, show that participants in MS groups were significantly less confident in the Suboptimal Candidate at T2 versus Control groups, $t(53) = 3.34$, $p = .002$ ($M_{\text{CONTROLT2}}$ = 4.57, $SD = 0.90$ versus $M_{\text{MSIMULATIONT2}} = 3.83$, $SD = 0.76$). The difference at T1 was not significant, $t(53) = 1.96$, $p = .055$, ($M_{\text{CONTROLT1}} = 4.53$, $SD = 0.90$ versus $M_{\text{MSIMULATIONT1}}$ = 4.07, $SD = 0.84$) (Figure 2).

This ANOVA analysis was repeated in order to assess the impact of the MS intervention on participant confidence in the Optimal Candidate. A two (Optimal Candidate Confidence at T1, T2) by two (Intervention: MS *vs.* Control) mixed ANOVA yielded no significant main or interaction effects (all *p*'s > .473). There was no significant change in confidence levels in the Optimal Candidate in either condition.

Figure 2.

Suboptimal Candidate Confidence by Time and Intervention (Study 2).



Confidence in group candidate rank decision

Hypothesis 5 expected participants in groups undergoing the MS to report significantly lower mean group confidence in their group's candidate rank decision between T1 and T2 versus Control groups. The data supported this. A two (Confidence in Group Hiring Ranking Decision at T1, T2) by two (Intervention: MS *vs.* Control) mixed ANOVA yielded a significant Confidence in Group Hiring Rank Decision X Intervention interaction: overall confidence with the group hiring rank decision was significantly lower in groups undergoing the MS versus Control groups at Time 2, $F(1, 53) = 12.17$, $p = .001$, $\eta p^2 = .19$. Simple effects analysis showed participants in MS groups were significantly less confident in the group hiring ranking decision at T2 versus Control groups, $F(1, 53) = 4.28$, $p = .043$, $\eta p^2 = .08$ ($M_{\mathrm{CONTROLT2}} = 6.04$, $SD = 0.68$ versus $M_{\mathrm{MSIMULATIONT2}} = 5.70$, $SD = 0.57$). There was no significant difference between the groups at T1, $F(1, 53) = .23$, $p = .631$, $\eta p^2 = .00$. Participants in groups undergoing the MS also recorded significantly lower confidence scores in their group hiring rank decision at T2 versus T1, $F(1, 53) = 13.49$, $p < .001$, $\eta p^2 = .20$ ($M_{MSIMULATION2} = 5.70$, $SD = 0.57$ versus $M_{MSIMULATIONT1} = 6.01$, $SD = 0.51$). Participants in Control Groups reported no significant difference in confidence in their group candidate rank decision across Time, $F(1, 53) = 1.64$, $p = .205$, $\eta p^2 = .03$. Confidence in the group rank decision increased, but not significantly so. The main effects of Confidence in Group Hiring Rank and the Intervention Condition were not significant, (all p's > .359).

Group Cohesion

I also wanted to explore whether the MS had any effect (positive or negative) on group cohesion. Following the two factors identified by Chin et al. (1999) the measures for 'liking', 'enjoyment' and 'how well group members got on' were averaged into a single 'Group Morale' scale (Cronbach's Alpha = .936). 'Similarity' was left as a single item measure, representing the 'Group Belonging' factor. Descriptive statistics for the 'Group Morale' scale and 'Similarity' measures are set out below (Table 5).

Table 5.

Means and Standard Deviations for Group Cohesion Measures (Study 2).

Measure	Intervention Condition	Mean	Standard Deviation
Group Morale	Control	2.46	0.87
	MS	2.96	1.27
Group Similarity	Control	2.93	0.66
	MS	3.11	0.88

The differences between participants in groups undergoing a MS and Control groups on these two measures was examined in two independent samples t-tests. The "Group Similarity' measures showed no significant difference between participants in the two groups, $t(53) = -.86$, $p = .394$. The between-groups difference in Group Morale was also not significant, $t(53) = -1.71$, $p = .094$, although the pattern of means did suggest that participants in groups undergoing a mental simulation intervention perceived lower group morale than those in Control groups.

4.3 Discussion

Study 2 tested a new application of a mental simulation intervention as a means of improving group information exchange and processing in a face-to-face Hidden Profile group decision task. The mental simulation prompted greater group information exchange regarding the Optimal versus Suboptimal Candidates. Groups undergoing a mental simulation also took longer than Control groups to reach their consensus decision at T2 versus T1, which, given all groups had equal opportunities to absorb candidate information, suggests those groups re-engaged with the material at a deeper processing level than participants in Control groups. Participants in groups undergoing a mental simulation also recorded greater recognition of the fact that they had different, unique candidate information from their fellow group members versus Control group participants, an effect I assert can only have arisen as a consequence of increased unique information exchange and recognition amongst participants in those groups.

Regarding decision quality, a significant proportion of groups undergoing the mental simulation intervention 'ranked up' the Optimal Candidate following the intervention, whilst Control groups showed no change. At the same time, however, a significant proportion of groups undergoing the mental simulation also 'ranked down' the Optimal Candidate. The evidence for the efficacy of mental simulation as an intervention to improve group decision quality in Study 2 is therefore somewhat equivocal and I cannot rule out the possibility that participants in those groups simply felt compelled to change their group ranking decision, given the failure frame of the mental simulation. This may also explain why participants in mental simulation groups reported lower confidence in their overall group ranking decision between T1 and T2. The mental simulation is based on a Premortem, which has demonstrated efficacy as a confidence reduction technique (Veinott et al., 2010), which may also have contributed to this effect. If lack of confidence in the overall group ranking can be construed as dissatisfaction with the group decision, this may also explain why my exploratory examination of Group Morale and Group Similarity yielded lower scores for participants in groups undergoing the mental simulation. Further research is clearly necessary to test the mental simulation's ability to improve group decision quality.

On a more positive note, groups undergoing the mental simulation did report a significant reduction in confidence in the Suboptimal Candidates at T2 compared to Control Groups, supporting my assertion that the mental simulation can attenuate confidence biases and successfully shift decision-makers away from their initial Suboptimal Candidate selection. This gives me some optimism that, with some modifications to the mental simulation procedure, this may translate into significant improvements in group decision quality.

4.3.1 Limitations and future directions

Research has shown that improvements in information exchange in Hidden Profile groups do not automatically lead to improvements in decision quality (Larson et al., 1994; Stasser et al., 2000). Xiao et al. (2013) found support for their assertion that it is information use, rather than information exchange, which is crucial for decision quality. There is little benefit to increasing unique information exchange if team members do not subsequently use the new information to improve decision outcomes.

As well as the inconclusive findings regarding the effect of the mental simulation on decision quality, an important limitation of Study 2 was the significant difference in the distribution of participants between the Intervention/Control groups who first ranked the Optimal Candidate. As I have noted (see 1.3.1), one reason previously advanced for decision quality failures in Hidden Profile decision-tasks is the Individual Preference Effect (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003), which suggests group members retain their initial suboptimal individual decision preferences due to preference-consistent evaluation of information. This may have impaired the group process and confounded information exchange and decision quality. Study 3 was designed to examine the Individual Preference Effect in more detail.

In conclusion, the present Chapter extends the Hidden Profile literature by empirically testing, for the first time, a mental simulation technique, based on a ‘failure’ prime, as a means of improving group information exchange and decision outcomes in such tasks. Support was found for the majority of my hypotheses, specifically: (i) groups undergoing a mental simulation reported greater time discussing the Optimal Candidate at T2 than Control groups; (ii) Control groups took significantly less time to reach their group rank consensus at T2 versus T1, whereas groups undergoing a mental simulation did not differ significantly; (iii) participants in groups undergoing a mental simulation were more likely to realise they held different (unique) candidate information from Control group participants; (iv) participants in mental simulation groups were significantly less confident in the Suboptimal Candidate at T2 versus Control groups; and (v) participants in mental simulation groups were significantly less confident in the group hiring ranking decision at T2 versus Control groups. Notwithstanding the limitations noted, these results lead me to be cautiously optimistic that mental simulation may be one way of overcoming the challenges operating at the individual group member level, leading to improved group decision outcomes in Hidden Profile tasks.

Chapter 5: The Individual Preference Effect

5 Summary

Group decision-making research has identified the "Individual Preference Effect" (IPE) as an important barrier to optimal decision outcomes in Hidden Profile tasks. Individuals are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct them, and even if the accompanying group processes are perfectly conducted. This implies interventions aimed at improving performance in Hidden Profile tasks must firstly operate successfully at the level of the individual group member. Yet remarkably few studies have examined specifically how to attenuate the IPE. Study 3 (*N* = 120), describes how I firstly created and tested an online paradigm to replicate the IPE in Hidden Profile tasks as a precursor to testing a mental simulation intervention as one approach to attenuate the IPE (further described in Chapter 7).

5.1 Theoretical background

As I noted in Chapters 1 and 2, beyond the group level challenges operating to hinder effective information exchange and processing in Hidden Profile tasks, specific challenges also operate at the individual group member level in the form of the Individual Preference Effect: (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010). The IPE is a supplementary, rather than contradictory, explanation for groups' failures in Hidden Profile tasks. Individuals find it difficult to amend their initial suboptimal selection decision, and remain committed to this, even when presented with full information enabling them to make the correction. This is particularly problematic, since a key challenge to solving Hidden Profiles is for individuals to integrate and process *alternative* information and viewpoints during the group discussion, *despite* their pre-formed opinions. Indeed, Faulmüller et al. (2010) attached major significance to the IPE, suggesting that, through a comparison against real interacting groups, almost half of all groups would fail to solve the Hidden Profile as a consequence of the IPE, even when all information was exchanged and no co-ordination losses occurred.

Faulmüller et al. (2010) suggested that the IPE is largely driven by preference consistent evaluation of information. Individual group members enter the group discussion with an initial (usually suboptimal) preference and this leads to biased evaluation of the information which emerges during the group discussion, that is to say, group members prefer information that is consistent with their initial preference. Faulmüller and colleagues speculated that one reason for this was due to differing amounts of cognitive resources being allocated to the processing of preference consistent versus inconsistent information: preference consistent information matches with prior beliefs, thus there is no need to challenge it and it can be accepted easily and quickly. Conversely, information which is not congruent with prior beliefs requires more cognitive resources to examine and, consequently, the acceptance process is much less straightforward.

A recent study of participant reaction times by Gilead et al. (2018) offers support for this idea from an alternative perspective. Gilead et al. found that the acceptance (rejection) of confirmatory (contradictory) opinions can occur rapidly and involuntarily. Participants made faster verifications of grammaticality of a statement when it matched their opinion: when a participant agreed with a stated opinion, it had a rapid and involuntary effect on how they cognitively processed it. Put simply, it seems we cannot help but reject opinions and information which contradicts our own – which may offer a further explanation for the IPE and individual's inability to shift from their initial preference in Hidden Profile tasks.

5.1.1 The Individual Preference Effect

Greitemeyer and Schulz-Hardt (2003) characterized the Individual Preference Effect (IPE) as a scenario where, notwithstanding that all group processes may work perfectly (e.g.

no premature negotiation of individual preferences; full exchange of all available information), individual group members remain wedded to their initial suboptimal individual preference, largely due to biased evaluation of the information they hear during the group discussion. Specifically, information which is not consistent with members' initial suboptimal preferences is devalued; information that is consistent, conversely, is perceived to be of higher quality. Greitemeyer and Schulz-Hardt's Study 2 showed that preference consistent evaluation of information (importance and valence) fully mediated maintenance of suboptimal individual preferences. In a Hidden Profile group decision-making situation, this scenario is exacerbated, since the majority of group members are likely to enter into the discussion with a suboptimal preference. Faulmüller et al.'s (2010) work extended this line of research. Findings in Study 2, where all vestiges of social validation were removed by providing participants with only a one page bullet-pointed item list, demonstrated that only 25% of HP condition participants, initially oriented towards a suboptimal candidate, identified the correct solution, compared to 87% of Manifest Profile condition participants who viewed all items simultaneously.

Group discussions may compound the IPE, making it *more* damaging to group decision-making outcomes. In premature preference negotiation, group members use the group discussion to exchange and negotiate on the basis of their (often) suboptimal preferences (Gigone & Hastie, 1993; 1997). Gigone and Hastie (1997) highlighted the significant impact of the group members' individual decisions: "It was as if the group members exchanged and combined their opinions but paid little attention to anything else" (p.132). As the group dialogue excerpts demonstrated in Chapter 3, the majority of group discussions began with group members volunteering their initial pre-discussion decisions, either voluntarily and unbidden, or if asked directly to do so by a fellow group member. The question "who did you choose" is often the opening gambit of the group discussion.

Virtual teams may also face similar challenges as face-to-face teams in Hidden Profile scenarios. Hao et al. (2019) highlighted the specific challenges of knowledge sharing in virtual teams, noting that, in the absence of effective knowledge sharing processes in such teams, decision-making quality will be impaired. In support of this, Jefferson et al. (2004) examined the effect of Hidden Profiles on knowledge transfer in distributed teams. The authors found that the presence of problem-critical unique information obstructed the performance of such teams, decreasing team cognition quality and impeding problem-solving ability. Since a recent survey found that 85% of 1,372 respondents, drawn from 80 countries, stated virtual teams were job critical (RW^3 Culture Wizard, 2016), examining the Hidden Profile through a newly constructed online paradigm is very relevant, given today's online world.

5.1.2 Chapter overview and hypotheses

Study 3 partially replicated Faulmüller et al.'s (2010) Study 2, in which I aimed to re-confirm the finding that participants with initial suboptimal preferences were less likely to choose the correct candidate than participants without such preferences, even after viewing all decision-relevant information. This finding re-affirmed the existence and importance of the IPE in Hidden Profile decision tasks. Study 3 deployed a mixed design, involving an individual candidate selection task, conducted online, with three information (between) conditions: (i) Manifest Profile (MP); (ii) Hidden Profile (HP); and (iii) No Preference (NP). Participants in the MP condition viewed a one page list setting out full candidate information in bullet-point form. HP and NP condition participants viewed the same information but spread across four separate lists. In addition, participants in the HP condition underwent an IPE manipulation. That is to say, they were initially oriented towards a Suboptimal Candidate selection by firstly seeing one list favouring a Suboptimal Candidate, prior to seeing all four lists. NP participants saw all four lists, presented simultaneously and thus were not oriented towards a Suboptimal Candidate (see Procedure below for a full description). Time was the within condition for candidates in the HP condition only, who had two decision points: Initial Decision Point – Partial Information (IDP-PI), based on viewing partial candidate information; and Final Decision Point (FDP-Full(4)), based on viewing full candidate information distributed across four separate lists (similar to participants in the NP condition). Participants in the MP Condition also had one Final Decision Point (FDP-Full(1)), based on viewing full candidate information, aggregated in one bullet-point list. This is summarized in Table 6 below::

Table 6.

Information and Decision Steps by Condition (Study 3).

Manifest Profile	Hidden Profile	No Preference
Full Information ↓ Final Decision Point (FDP-Full(1)	Partial Information ↓ Initial Decision Point-Partial Information (IDP-PI)	Full Information ↓ Final Decision Point (FDP-Full(4)
	Full Information ↓ Final Decision Point (FDP-Full(4)	
	Decision Comparison Point (FDP-Full (1/4))	

I hypothesized the following:

H1. (a) Participants in the HP condition will select the Optimal Candidate (A) significantly less frequently than those participants in the MP condition, even after full candidate information disclosure (comparison point = FDP-Full (1/4)).

H1. **(b)** Participants in the HP condition will select the Suboptimal Candidate (C) significantly more frequently than those participants in the MP or NP condition, even after full candidate information disclosure (comparison point = FDP-Full(1/4)).

H2. Participants in the HP condition will be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus participants in the MP condition, even following full candidate information disclosure (comparison point = FDP-Full(1/4)).

H3. Participants in the HP condition will be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus participants in the MP condition, even following full candidate information disclosure (comparison point = FDP-Full(1/4)).

Note that, whilst I am specifically interested in comparing participants in the MP/HP conditions, I also include participants in the NP condition in my analyses for completeness.

Exploratory Analysis 1: In addition to the above, I also determined to explore whether, and if, participants' confidence in their overall ranking differed between the three information conditions. I had no specific hypothesis with respect to this question.

Exploratory Analysis 2: I had no specific hypothesis with respect to gender differences in the impact of the IPE but wanted to test whether male and female participants might be affected differently, based on the differences in gender information and processing strategies discussed in Chapter 1.

5.2 Study 3

5.2.1 Method

Participants and design

One hundred and twenty participants recruited from Prolific Academic took part in the experiment in return for a small monetary payment (61 males, 58 females, one undeclared; age range 18-66, M = 30.74, SD = 9.96). The only stipulated criterion was that participants should be minimum age 18. Power analysis for a chi-square test was conducted in G-POWER and determined a sufficient sample size of 108 using an alpha of 0.05, power of 0.80, a medium effect size (*w* = 0.3) and 2 degrees of freedom (Faul, Erdfelder, Buchner, & Lang, 2013).

The design was a mixed 3 (Information Condition: Manifest Profile (MP) *vs.* Hidden Profile (HP) *vs.* No Preference (NP)) X 2 (Time: Initial Decision Point (IDP-PI: HP Only), Final Decision Point (FDP-Full(1/4))) experimental design, with Decision Point as the within factor, only in the HP Condition. These conditions replicated the individual conditions in Faulmüller et al. (2010, Study 2); my experimental goals did not require group conditions.

Materials

The HP decision task material was again adapted from Baker's (2010) group activity: participants were asked to choose between three candidates – (A), (B) and (C) - for the position of president of a new campus of a university. In a change from Study 2, for this online task (and those reported elsewhere in this thesis), the Candidates were identified only by these letters to avoid irrelevant assumptions about gender associated with surnames. All participants received a brief description of the job and key selection criteria. Each candidate had 16 items of information drawn from interviews, references, personal observations, etc., typical of a real hiring scenario. Full information described Candidate (A) as the optimal candidate for the role with eight favourable, four neutral and four unfavourable characteristics; Candidates (B) and (C) each had four favourable, eight neutral, and four unfavourable characteristics (Table 7). All participants received full information on each candidate before making their final choice, but the form of the initial information distribution varied by condition (see Procedure below).

Table 7.

Distribution of Candidate Characteristics Including Whether Shared or Unshared (Study 3).

	Candidate		
Characteristic	B	A	C
Unfavourable	Seen drinking heavily[1]	Aloof[1]	Temper[2]
	Left without raising funds[1]	4 years out of Higher Education[1]	Tension with provost[2]
	Discourages innovation[1]	Lacks campus/student life experience[1]	High turnover, abrasive leader[2]
	Not responsible for donations[1]	Accused of changing positions[1]	Reduced success rate in court[2]
Favourable	Nationally recognized researcher[1]	Volunteer[2]	Pleasant personality[1]
	Recognized by business leaders[1]	Influential contacts[2]	Strategic thinker[1]
	Emphasized collaboration[1]	Thoughtful leader/listener[2]	Active trustee[1]
	Oratory skills[1]	Collaborative decision-maker[2]	Students like as a teacher[1]
		Excellent teacher[2]	
		Faculty research productivity increased[2]	
		Diversity increased[2]	
		Secured grant[2]	
Neutral	Spouse teaches Spanish[2]	Apartment in Spain[1]	Lives in area[2]
	Teaches one module[2]	Divorced, remarried, 2 children[1]	Grown up child[2]
	Family nearby[2]	Plays golf and tennis[1]	2 dogs/2 cats[2]
	Married, 3 children[2]	Vegetarian[1]	Spouse is a physician[2]
	Enjoys sports[2]		Plays Bridge[2]
	Biking and running[2]		Likes travelling[2]
	Consulting work[2]		Enjoys mystery novels/biographies[2]
	Likes to garden[2]		Loves to cook[2]

Note: this distribution of favourable/unfavourable characteristics is designed to orientate participants towards the selection of a suboptimal candidate (C).

1 = fully shared – appearing on all four lists; 2 = unique (one 'group member' – appearing on only one list).

Procedure

The experiment was delivered online. The survey software randomly allocated participants to condition, who then indicated informed consent within the software and completed the items in their own time and in any location with internet access. Participants were told they were being asked to work on a personnel selection task and were required to choose their preferred candidate to be awarded the role from three shortlisted candidates. All participants were also told they were working as part of a four-person virtual group and that at some point they would see not only their own information but also that of their fellow group members (in reality there was no virtual group, but candidate information that was either presented on one page or distributed across four separate sheets was presented to participants in all conditions as information of their 'fellow group members' – adapted from Faulmüller et al., 2010, Study 2). Participants were also told that one candidate was better suited to the job than the others and that their own information was either identical, or not necessarily identical (depending on randomly allocated condition), to their fellow (fictitious) group members. Experimental conditions differed in the distribution of candidate information items between participants, as described below.

Manifest profile (MP).

Participants in the MP condition viewed a one page list setting out full candidate information in bullet form, beginning with information about Candidate (A), then (B), then (C) (Appendix B). This list contained every piece of information once, with no repetitions (as per Faulmüller et al., 2010). Participants were told their information was identical to their fellow, (fictitious) group members and asked to make one individual candidate selection decision based on the information held by them (FDP-Full(1)). Candidate (A) was shown as the Optimal Candidate, with the candidate attribute list reflecting eight positives, four negatives and four neutral attributes. There were no differences between Candidates (B) and (C) on this list (each had four positive, four negative and eight neutral attributes).

Hidden profile (HP).

Participants in the HP condition firstly made an Initial Decision Point-Partial Information (IDP-PI) selection, based on viewing partial candidate information on only one single list, either W, X, Y, Z (Appendix B: presentation of the lists was randomized). Each list began with information about Candidate (A), then (B), then (C). Presentation of an initial single list constituted the Suboptimal Candidate manipulation, since each single list oriented participants towards Candidate (C) as the 'best' candidate, with four positive, one negative and two neutral attributes. Candidate (B) was presented as the second-best candidate on each list, with four positive, four negative and two neutral attributes. Attributes for the Optimal Candidate (A) were presented in a Hidden Profile: each list presented two positive, four negative and one neutral attribute of Candidate (A). On the face of it, Candidate (A) therefore initially appeared to be the worst candidate to those participants in the HP condition. Some candidate information constituted 'shared', appearing on all lists; some was 'unique', appearing only once on the four lists (Appendix B). After making an IDP-PI selection, Hidden Profile participants then viewed their own information again, plus the information of their 'fellow group members' (they were told this information was not necessarily the same) – all lists W, X, Y Z (presentation was randomized) - and were asked to review their IDP-PI candidate selection, specifically whether they wanted to maintain or change that selection. This constituted their Final Decision Point (FDP-Full(4)). Participants in the HP condition therefore saw their own information repeated, plus the information of their fictitious group members. Taken together, the four lists comprised full information on each candidate: as in Faulmüller et al. (2010), this is the psychological equivalent of a group member experiencing perfect information exchange in a 'real' HP group: the individual participant firstly has their own pre-discussion information, which can then be paired with all candidate attributes held by other fictitious group members through viewing all four lists.

No preference induction (NP).

Participants in the NP condition made one individual candidate selection decision (FDP-Full(4)) based on information held by them and their fictitious group members. They were told this information was not necessarily the same. Participants viewed the same four lists as participants in the HP Condition but simultaneously; presentation of the four lists was rotated. Since there was no initial presentation of a single list and subsequent decision, as in the HP Condition, (therefore, no IDP-PI), there was no initial Suboptimal Candidate manipulation. Participants in both the NP/HP conditions would be able to identify Candidate (A) as the Optimal Candidate only by successfully integrating candidate attribute information from all four lists.

The NP condition sought to disentangle to what degree any difference in the frequency with which the Suboptimal Candidate (C) was selected in the NP/HP conditions was attributable to the IPE, rather than information supporting the participants' initial preferences appearing on all four information lists. I expected the initial presentation of a single list to participants in the HP condition would induce the Individual Preference Effect, leading to the Suboptimal Candidate (C) being more frequently selected at FDP-Full(4) by participants in the Hidden Profile condition versus either the MP/NP conditions.

Measures

Decision quality.

Decision quality was a dichotomous measure, based on whether participants selected the Optimal Candidate (A) (coded 1) or a Suboptimal Candidate (coded 0).

As I noted in Chapter 1, confidence biases can lead to an overinflated sense of our decision-making capabilities *and* curtail the search for new information (Arnott, 2006). This could be a significant factor contributing to the IPE. Accordingly, I included two additional measures of confidence not included in Faulmüller et al.'s (2010) study. I consider these important additions, to better understand how the IPE may affect participant confidence levels in the Optimal and Suboptimal Candidates, and in the own selection decision. These measures are set out below.

Participant confidence in suboptimal/optimal candidate.

The second dependent variable was participant confidence in the Candidates. Following their candidate selection, participants were asked to record their level of confidence in each candidate for the job by responding to the statement "*I think Candidate A/B/C would be the best person for the job*", on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*).

Participant confidence in selection decision.

The third dependent variable asked participants to measure the level of their overall confidence in their selection decision, by responding to the statement "I am confident in my selection decision" on a 7-point Likert scale (1 = *strongly agree* to 7 = *strongly disagree*).

Following completion, participants were thanked and debriefed in the survey software.

5.2.2 Results

I firstly examined whether the Hidden Profile manipulation had successfully oriented participants in the HP condition towards the Suboptimal Candidate (C) based on partial candidate information (IDP-PI). The Chi-square test was significant: 80.95% of HP participants initially preferred Candidate (C), χ^2 (2, N = 42) = 43.00, p <.001. Candidate (A) was preferred by 11.90% and Candidate (B) by 7.14%. This confirmed the Suboptimal Candidate (C) manipulation was successful.

I then examined the Final Decision Point Candidate Selection for Manifest Profile participants viewing one list (FDP-Full(1)). The Chi-square test was significant: 83.78% of MP participants preferred the Optimal Candidate (A), χ^2 (2, N = 37) = 42.54, p <.001. Candidate (B) was preferred by 5.41% and Candidate (C) by 10.81%. Participants in the MP Condition overwhelmingly selected the Optimal Candidate (A).

I also examined the Final Decision Point Candidate Selection for No Preference (NP) participants (FDP-Full(4)). The Chi-square test was significant in this condition, but in a different direction from the MP condition, χ^2 (2, N = 41) = 9.42, p =.009. Candidate (A), the Optimal Candidate, was preferred by 31.71% of NP participants, Candidate (B) by 14.63% and Candidate (C) by 53.65%. Thus, participants in the NP condition leaned towards the Suboptimal Candidate (C).

Finally, I examined the Final Decision Point Candidate Selection for Hidden Profile (HP) participants, that is, after they had viewed all candidate information across the four separate lists (FDP-Full(4)). The Chi-square test was significant, χ^2 (2, N = 42) = 24.57, p < .001. The Optimal Candidate (A) was preferred by 28.57% of HP participants following their viewing of all candidate attributes, Candidate (B) by 4.76% and Candidate (C) by 66.67%. Thus, although some Hidden Profile participants did switch their candidate selection having viewed full candidate information across lists W, X, Y Z, the Suboptimal Candidate (C) remained the preferred candidate of participants in the HP condition.

Following the analytic approach of Faulmüller et al. (2010) and Toma et al. (2009; 2013), eight participants in the HP Condition were then excluded from the individual analysis because they failed the HP Suboptimal Candidate manipulation at T1 (i.e. they did not select Candidate (C)). This left 112 participants in the analysis, split between the experimental conditions as follows: MP: $N = 37$; NP: $N = 41$, HP: $N = 34$. (For completeness, I note that five of these excluded HP participants selected the Optimal Candidate (A) at IDP-PI. Of these five, one switched to Candidate (C) at FDP-Full(4). Three HP participants chose Candidate (B at IDP-PI; of these, one switched to Candidate (C) at FDP-Full(4), whilst two retained Candidate (B) as their selection.)

Information processing: decision quality

Selection of optimal candidate (A).

Hypothesis 1a predicted that participants in the HP condition would select the Optimal Candidate (A) less frequently than participants in the MP condition, even after full candidate information disclosure at FDP-Full(1/4). The data supported this, replicating the finding of Faulmüller at al. (2010). I firstly compared all three conditions: 83.78% of MP participants selected the Optimal Candidate, compared to 31.71% and 23.53% in the NP and HP conditions respectively. The chi-square test was significant, χ^2 (2, $N = 112$) = 31.50, p <.001, $\Phi = .53$. To test the specific hypothesis 1a, I then compared only the MP and HP conditions: there was a significant difference in the number of participants selecting the Optimal Candidate between these two conditions, χ^2 (1, $N = 71$) = 25.98, p <.001, $\Phi = .60$.

For completeness, I also undertook comparisons of the differences between all of the conditions. The difference between the MP and NP conditions was also significant, χ^2 (1, N = 78) = 21.45, p <.001, $\Phi = .52$. However, the difference between the HP and NP conditions was not significant, χ^2 (1, $N = 75$) = .62, $p = .432$, $\Phi = .09$. This last result suggests that participants who needed to integrate candidate attribute information which was spread across four lists were much less likely to select the Optimal Candidate (A) than those who viewed a one page bullet list. These two results also differ from those of Faulmüller at al. (2010), who found that participants in the Hidden Profile condition found the correct solution significantly less frequently than individuals assigned to *both* the MP/NP conditions.

Selection of suboptimal candidate (C).

Hypothesis 1b anticipated participants in the HP condition would select the Suboptimal Candidate (C) more frequently than participants in either the NP or MP conditions. The data supported this. I firstly compared the proportion of participants selecting Candidate (C) in the NP versus HP conditions at T1 to test for the existence of the IPE. HP participants were significantly more likely to select Candidate (C) (76.47%), compared to NP participants (53.66%), χ^2 (1, N = 75) = 4.20, p = .040, Φ = .24. This confirmed the existence of the IPE in the HP condition: although NP participants saw the same information regarding Candidate (C) repeated, as did HP participants, they were still significantly less likely to select Candidate (C) compared to those participants in the HP condition who experienced the initial Suboptimal Candidate manipulation. As predicted, there was also a significant difference between the MP (10.81%) and HP conditions, χ^2 (1, N = 71) = 31.31, p < .001, Φ = .66 and between the MP and NP conditions, χ^2 (1, N = 78) = 16.07, p < .001, Φ = .45.

To summarise these results, participants in the Hidden Profile Condition were the most likely to select Candidate (C), even after viewing all candidate information. This difference was significant when compared to both the NP and HP conditions and confirms the existence of the Individual Preference Effect in my online paradigm. HP participants found it difficult to correct their initial suboptimal selection. (Note - given the small number of participants who selected Candidate (B) in all conditions (MP = 2, NP = 6, HP = 3(IDP-IP) and 2(FDP-Full) I will not further analyse data related to this Candidate).

Decision confidence

Participant confidence in optimal candidate (A).

Hypothesis 2 predicted HP participants would be significantly less confident in the Optimal Candidate (A) as ‘best for the job’ versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4)). This was supported by the data: a one-way ANOVA was significant, $F(2, 112) = 9.99$, $p < .001$, $\eta p^2 = .15$. A post hoc SNK test showed that participants in the MP condition were significantly more confident in Candidate (A) than the other two conditions at the .05 level of significance. All other comparisons were not significant (Table 8).

Participant confidence in suboptimal candidate (C).

Hypothesis 3 predicted HP participants would be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4)). This was also supported by the data: a one-way ANOVA was significant, $F(2, 112) = 11.18$, $p < .001$, $\eta p^2 = .17$. A further post hoc SNK test showed that participants in the HP Condition were significantly more confident in Candidate (C) than the other two conditions at the .05 level of significance. Participants in the NP Condition were also significantly more confident in Candidate (C) than those in the MP Condition at the same significance level (Table 8).

Table 8.

Means (Standard Deviations) for Participant Confidence by Information Condition and Candidate (Study 3).

Candidate	Manifest Profile (N = 37)	No Preference (N = 41)	Hidden Profile (N = 34)
Optimal Candidate (A)	5.43_a (1.62)	4.37_b (1.84)	3.65_b (1.59)
Suboptimal Candidate (C)	3.84_a (1.48)	4.61_b (1.72)	5.53_c (1.24)

Note: For Information Condition, marginal means without a shared subscript differ from each other by SNK at p < .05.

Exploratory Analysis 1

With respect to my exploratory analysis of participants' overall confidence in their selection decision at FDP-Full(1/4), no significant differences were found between the three conditions, $F(2, 112) = .20$, $p = .822$, $\eta p^2 = .004$.

Exploratory Analysis 2

With respect to my exploratory analysis of gender differences in the IPE, results from two McNemar tests suggested female participants in the HP condition demonstrated better improvement in decision quality than their male counterparts at FDP-Full(4), based on viewing full information, compared to decisions made at IDP-PI, based on partial information only: male participants – $p = .250$; female participants – $p = .063$. This suggests female participants were better able to correct their initial Suboptimal Candidate (C) selection decision and, potentially, were less affected by the IPE.

For completeness, I note that in the MP condition, no gender differences were noted at the single decision point FDP-Full(1), χ^2 (1, $N = 37$) = 2.70, $p = .100$, (MLR)). In the NP condition, male participants demonstrated better decision quality than their female counterparts at FDP-Full(4), χ^2 (1, $N = 41$) = 4.01, $p = .045$. (Although, as noted previously, neither of these two conditions were found to have induced the IPE).

5.3 Discussion

Study 3 extended previous literature by successfully creating and testing a new online paradigm of an individual HP candidate selection task, based on a comparison of decision quality between MP, NP and HP participants. In a partial replication of Faulmüller et al. (2010, Study 2), results supported the existence of the IPE in an online HP paradigm: HP participants selected the Optimal Candidate (A) significantly less often than MP participants, confirming my hypothesis and replicating Faulmüller et al's. findings.

Extending Faulmüller et al's. work, I also examined participants' confidence levels in the Optimal versus Suboptimal Candidates. As I noted earlier, Arnott (2006) identified *confidence biases* as particularly problematic in decision-making since, not only can they lead to an overinflated sense of our decision-making capabilities, but they can also curtail the search for new information. This could be a significant factor contributing to the IPE. My results suggest participant decision confidence also appears to play a key role in the IPE: The IPE prevailed in such a way as to undermine HP participants' confidence in Optimal Candidate (A) as the best person for the job, whilst inflating their confidence levels in the Suboptimal Candidate (C). Participants in the HP condition were significantly less confident in Candidate (A), even after they viewed all candidate information at FDP-Full. Conversely, they maintained high levels of confidence in Candidate C, significantly higher than participants in both the NP and MP conditions. Given the high levels of confidence in the initial (Suboptimal) Candidate selection reported by participants in the Hidden Profile condition, it seems that dislodging and reducing that confidence must, I believe, be one key to attenuating the IPE. The mental simulation I am testing in this research is based on a Premortem (Klein, 2003). Given the success of the Premortem elsewhere as a confidence reduction technique (Veinott et al., 2010), this makes it worthy of further investigation.

Translating this into a group setting, these findings underscore research suggesting that participants' hunger for preference consistent information may be a major driver of the IPE. This has been shown even in non-biased information distributions, for example, Faulmüller, Mojzisch, Kerschreiter, and Schulz-Hardt (2012) found that participants communicated more information that supported their individually preferred decision alternative in both written and face-to-face communication. This was despite each participant possessing equal amounts of preference consistent and inconsistent information, being placed in an experimental scenario requiring open information exchange, and participants having no incentive to do anything other than this.

5.3.1 Limitations and future directions

These studies reflect individual decision-making outcomes and, of course, it is possible that a face-to-face group discussion may yield different decision outcomes. Nonetheless, extant research has shown the significance of the individual decision outcome and its ability to impact both the group discussion and group decision outcomes, so a closer examination of the IPE in an individual decision-making paradigm is entirely appropriate. Future studies should further test the online paradigm, with larger samples drawn from different populations.

The finding on gender is also of interest and worthy of further examination. Whilst gender differences in information processing and decision-making strategies have been examined elsewhere, to my knowledge, no research has examined whether the IPE may have differential effects based on gender.

In conclusion, the present Chapter adds to and extends the literature on the IPE. Support was found for my three primary hypotheses, specifically: (i) the existence of the IPE was confirmed in the online paradigm: participants in the HP condition were significantly more likely to select the Suboptimal Candidate (C) compared to those in the MP/NP conditions, thus confirming the effect of the Suboptimal Candidate manipulation; (ii) they were also significantly less likely to select the Optimal Candidate (A) compared to participants in the MP condition; (iii) participants in the Hidden Profile condition were also significantly *less* confident in the Optimal Candidate (A) and *more* confident in the Suboptimal Candidate (C) as the best person for the job compared to participants in the MP condition. They also maintained this high level of confidence even after viewing all candidate attributes.

Russo and Schoemaker (1992) noted that although group judgements may force a compromise or even encourage open-mindedness, problems may still arise in groups if individuals remain too strongly anchored to their initial view and return to it given the chance. High levels of confidence in the Suboptimal Candidate (C) would undoubtedly increase this anchoring effect. I therefore assert that examining individual decision-making and confidence levels to improve understanding of the IPE is integral to improving group decision outcomes in Hidden Profile tasks, as well as examining mental simulation as a means to achieve this. Developing a new online paradigm to facilitate this is also essential given today's increasing trend for online working. Furthermore, these findings bring the *process* of making the decision back into the spotlight. In Chapter 6, I therefore determined to examine whether removing the requirement from participants to make an initial candidate selection could be a helpful step in reducing the anchoring effect noted above.

Chapter 6: Making Better Decisions

6 Summary

Chapter 6 presents two face-to-face group studies, continuing my examination of the effectiveness of a mental simulation intervention in improving information exchange and group decision quality in a Hidden Profile hiring decision task, measuring outcomes prior to and after the intervention.

Study 4 (*N* participants = 232, working in *N* 4-person groups =54) , investigates the potential confounding effect of the Individual Preference Effect (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003) and begins to explore whether the mental simulation intervention may trigger the presence of “Affective Conflict” in groups undergoing the intervention. To examine this, I removed the requirement to make an initial individual candidate selection decision, so participants entered the group discussion having read the role description and their individual candidate packs but *were not* required to make an initial candidate selection. This first change in process was designed to test whether the removal of this single step, standard in much Hidden Profile research, was sufficient to improve group decision outcomes by attenuating the IPE. Kelly and Karau (1999) found that group discussions were focused on supporting the members’ initial preferences and that these biased discussions led to final decisions largely in line with the initial preferences of group members. This suggests that the need for individual participants to defend and maintain their initial preferences is a strong barrier to good group decision-making and removing this step may be one way to overcome this.

Study 4 also incorporates the mental simulation but introduces a variation in the design of the intervention. This ‘New’ intervention format is designed to help understand whether giving groups the opportunity to remediate their first ranked candidate’s failings, for example, by extending the mental simulation to consider opportunities for training or other personal development suggestions for their candidate, has a differential effect on group decision quality and information exchange from that noted in Study 2. In Study 2, a large number of groups not only ranked up, but *ranked down* the Optimal Candidate, which is clearly not the desired outcome in terms of decision quality.

Finally, extant research has demonstrated the benefits of dissent in group decision-making (e.g. Brodbeck et al., 2002). Schulz-Hardt et al. (2006) found that groups with contrived pre-discussion dissent had higher decision quality and levels of discussion intensity than homogenous groups. However, some methods of introducing contrived dissent, such as Devil's Advocacy (DA) have considerable downsides, (e.g. Waddell et al., 2013) including increasing levels of "Affective Conflict" (Amason, 1996). Study 4 examines how the mental simulation intervention affects the group dynamic, operationalising "Affective Conflict" through two single-item measures of anger and friction in the group (following the approach of Waddell et al., 2013)

Study 5 (*N* participants = 280, working in *N* 4-person groups = 70) builds on this preliminary examination of "Affective Conflict", comparing the effect on the perceived levels of anger and friction in members of groups undergoing the mental simulation against perceived levels of anger and friction amongst members of groups experiencing a: (i) Control; and (ii) Devil's Advocacy procedure. This is an extension of Waddell et al.'s (2013) work, which compared levels of "Affective Conflict" in Devil's Advocacy versus free discussion groups. Study 5 reintroduces the initial individual pre-discussion decision step, to assess whether this impacts the efficacy of the mental simulation intervention and group decision outcomes and, additionally, introduces some further modifications to the mental simulation design, described below.

Results from Studies 4 and 5 show further positive support for mental simulation as an important procedural intervention in Hidden Profile decision tasks, leading to an increase in group members' exchange of critical, unique information (Study 4), a reduction in confidence in the Suboptimal Candidates, and improved group decision quality. In Study 5, levels of perceived friction amongst participants in groups undergoing a Devil's Advocacy procedure (but not those undergoing the mental simulation) are shown to be higher and significantly different from Control groups and this, in turn, is related to increased levels of Communication Apprehension in these groups.

6.1 Theoretical background

Study 2 provided initial positive support for mental simulation as a potentially important procedural intervention in Hidden Profile decision tasks. Groups who mentally simulated the failure of their initially first-ranked candidate exchanged more critical, unique information and recorded a reduction in confidence in the Suboptimal Candidates, when compared to groups in the Control condition. Results for decision quality were, however, equivocal, with an equal number of groups ranking down the Optimal Candidate following the intervention as ranking up.

The effect of pre-discussion preferences on group discussion outcomes has been well documented (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003). Extending this, Study 3 examined and replicated the IPE in a new online paradigm and demonstrated that, even when given additional information enabling them to disconfirm their initial, Suboptimal Candidate selection, individual participants in the Hidden Profile condition failed to do so. These findings are important, particularly given the number of real group studies that have examined the adverse effects of the initial individual group member decision ("pre-discussion preference") on group information search, exchange and decision outcomes, which I will now review in more detail.

6.1.1 Pre-discussion preferences

Research suggests a major factor in poor decision quality outcomes amongst Hidden Profile groups is the adverse effect of learning other group members' preferences on information exchange. Mojzisch and Schulz-Hardt (2010) gave participants bogus information about (fictitious) fellow group members preferences. Participants who received no preference information were more likely to solve Hidden Profiles (61%) than those who were made aware of other group members' preferences (28%), even when one of those preferences favoured the optimal solution. This was replicated in face-to-face groups: Hidden Profile groups in the 'no-preference exchange' condition (instructed to firstly exchange *attributes of the alternatives* prior to exchanging their preferences) were more likely to solve the Hidden Profile than groups who *firstly* exchanged their preferences, *followed by* attributes of the alternatives (40% versus 7%).

Prior research has also shown that unhelpful behaviours arise when group members believe their initial preferences align. For example, research conducted with pseudo dyads, consisting of a naïve participant and a bogus partner, showed group members evaluated each other more positively when they mentioned information *confirming* rather than *disconfirming* the recipient's preference (Mojzisch, Kerschreiter, Faulmüller, Vogelgesang, & Schulz-Hardt, 2014). Furthermore, higher quality was ascribed to lists communicated by the partner when they were predominantly preference consistent. Recipients of preference consistent feedback also evaluated themselves and their partners as more competent than recipients of non-consistent feedback. Compounding this, Mojzisch et al. found that positive feedback for preference consistent information also led to the discussion of *more* preference consistent information. Similarly, van Swol (2007) found participants perceived information supporting their individual position to be more important than information opposed to their opinion.

In summary, there is a body of evidence which strongly suggests that the presence of an initial individual decision has adverse effects on group processes and outcomes in Hidden Profile decision tasks. There is also evidence that changing the structured discussion procedure, at least to delay preference expression in groups, may increase both shared and unshared information exchange (Mennecke, 1997; Stasser et al., 1989). Results are mixed, however, and did not improve group decision outcomes. I therefore wanted to test whether the removal of the initial individual candidate selection, combined with the mental simulation intervention, affected group information exchange *and* decision outcomes.

6.1.2 Affective conflict

The qualitative analysis in Chapter 3 described 'sharp' exchanges between group members, particularly when they were defending their own individual candidate selection or during the mental simulation intervention, when discussing the candidates' failings. Dissent can be beneficial in group decision-making, for example, Brodbeck et al. (2002) and Schulz-Hardt et al. (2006) found groups where pre-discussion dissent existed had higher decision quality and levels of discussion intensity than homogenous groups. However, as noted in Chapter 3, too much dissent amongst group members may trigger "Affective Conflict" (Amason, 1996), which can damage the relationship between the individual group members, to such an extent that they may be unable to work together to implement their group's decision. Waddell et al. (2013) found Hidden Profile groups who undertook a Devil's Advocacy (DA) procedure showed improved decision quality compared to free discussion groups, but individual participants in DA groups reported higher levels of "Affective Conflict", specifically personal friction and more personality clashes, than those participants in free discussion groups. Accordingly, I determined to explore whether the mental simulation might also have the same effect on group members, by asking them to privately record levels of perceived anger and friction in their groups, replicating Waddell et al.'s approach.

6.1.3 Chapter overview and hypotheses

A significant proportion of groups in Study 2 ranked down the Optimal Candidate following the intervention: evidence for the efficacy of mental simulation on improving group decision outcomes was equivocal. I therefore need to balance the intervention between, on the one hand, encouraging group members to engage fully with the task material and interrogate their selection decision, in order to improve decision quality, versus simply making them feel compelled to change their decision, particularly if they have made the optimal choice. Study 4 builds on the results from Study 2, offering a further test of the mental simulation in group decision-making and an opportunity to test a refinement in the intervention.

Study 4 allows me to examine further whether the mental simulation intervention prompts greater exchange of unique information amongst group members, as well as allowing me to again test the effect of mental simulation on group members' confidence in both the Optimal and Suboptimal Candidates and in the hiring rank decision of their group. My aim is to replicate the results achieved in Study 2 and improve on the decision quality result. Finally, as I have outlined above, it is also important to understand whether the mental simulation may trigger "Affective Conflict" amongst members of those groups undertaking the intervention. Accordingly, I hypothesise:

H1: Groups undertaking the mental simulation will demonstrate improved decision quality, 'ranking up' the Optimal Candidate more frequently than Control groups.

H2. (a): Groups undertaking the mental simulation will report reduced confidence in the Suboptimal Candidates at T2 compared to T1 and identical or increased confidence in the Optimal Candidate at the same time points, versus Control groups.

H2. (b): Groups undertaking the mental simulation will report lower confidence in their overall candidate ranking at T2 versus Control groups.

H3: Group members undertaking the mental simulation will be more likely to realise they hold different (unique) candidate information compared to Control group members.

H4: Members of Intervention groups will perceive more anger and friction in their groups compared to those in Control groups.

6.2 Study 4

6.2.1 Method

Participants and Design

Participants were first-year psychology undergraduate students from a university in Southeast England (*N* = 232, 38 men, 194 women; age range 17-33, *M* = 18.81, *SD* = 1.97) randomly assigned to four-person groups (*N* = 58) and to experimental conditions. Participation was partial fulfilment of an introductory undergraduate psychology course research requirement.

A 3 Intervention Condition (Between): Mental Simulation (MS) 'Old' versus 'New versus Control X 2 Time (Within): T1 vs T2 mixed factorial experimental design was conducted.

Materials and Procedure

The Hidden Profile material was as Study 2 but the format of the mental simulation was varied. Specifically, groups in the MS 'Old' Condition followed the same procedure as Study 2. Groups in the MS 'New' Condition initially completed the same task, then were asked to complete an additional step: as well as identifying reasons for the failure of their preferred candidate, groups were asked to extend the mental simulation to identify solutions to mitigate or remediate the situation caused by the failure of their preferred candidate (e.g. to provide the candidate with management, communications or presentation training).

The procedure was as Study 2, except in Study 4 participants were first asked to read through the role description and candidate attributes individually, then moved *directly* to group discussion. They were *not* asked to make an individual decision. Note: I did not instruct participants to refrain from discussing any individual preference they may have formed on reading the material, once the group discussion commenced.

Working in groups, participants were asked to discuss and agree a T1 group candidate rank decision **(**1 = most preferred; 2 = second preference; 3 = least preferred**)** and then responded to the measures below. A designated participant (the "Recorder", identified randomly by seat, as in Study 2) documented the group's decisions and outputs. Group members then worked individually to record the measures detailed below.

In the MS or Control task, the Recorder read the instructions to the group and group members worked together to complete the tasks as noted above. Following the MS/Control tasks, group members worked together to review their T1 group hiring rank decision and were asked whether they wanted to maintain their original candidate ranking decision or switch it. They recorded their T2 group rank decision and the other group measures as before. Group members worked individually to re-record the measures detailed below and complete the additional individual measures.

Measures

Group measure: decision quality.

As Study 2. Decision quality was a dichotomous measure, based on the frequency with which groups 'ranked up' the Optimal Candidate at T2 following the MS or Control task.

Group measure: confidence in candidate/group rank decision.

Groups were asked to: (i) record at T1 and T2 whether they thought that Roberts ("Optimal Candidate"), Stevens or Jones ("Suboptimal Candidate(s)") was the best person for the job, by responding to the statement “As a group we are confident Stevens/Roberts/Jones would be the best person for this job”, on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*); and (ii) record confidence levels with the group candidate rank decision at T1 and T2, by responding to the statement “As a group we are confident in the group’s rank decision”, on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*).

Anger and friction in the group.

Individual participants were asked to privately record levels of perceived anger and friction within their groups at T1 and T2, responding to two items from the Intergroup Conflict Scale (ICS: Jehn 1992, 1994): (i) how much anger was there among the group members over this decision, and: (ii) how much friction was there in the group during the decision-making processes (following the approach of Waddell et al., 2013) on a 7-point Likert scale (1 = *none* to 7 = *a great deal*).

Individual measure: participant recall of initially preferred candidate.

Participants were asked to recall who their preferred candidate was prior to the commencement of the first group discussion (1 = most preferred; 2 = second preference; 3 = least preferred). This was designed to examine the extent to which individual group members recalled forming an initial candidate preference prior to the group discussion, although not explicitly asked to do so.

Individual measure: participant awareness of different information.

Participants were asked whether they realized they had different candidate information from their other group members. Responses were scored on a 7-point Likert scale (1 = *not at all* to 7 = *absolutely yes*).

Finally, Participants provided demographic data on gender and age and the perceived gender of each candidate.

6.2.2 Results

Four participants and their groups were excluded from the analysis as they failed to meet the minimum age criteria specified for Study 2 (age 18-years or older), leaving 38 males and 190 females ($N = 228$) for the individual analysis and $N = 54$ groups of four. The 'Old' and 'New' intervention conditions were collapsed into a single Intervention condition, as initial analysis showed only non-significant/random differences in these conditions. As in Study 2, I averaged scores across group members where appropriate and conducted the analyses on the basis of the averaged scores, except where noted (Reimer et al., 2007; Schittekatte, 1996; Stasser & Titus, 1985).

Decision quality

Hypothesis 1 predicted improved decision quality in groups undertaking the MS: this was supported by the data. As before, I dummy coded incidences of ranking up at T2 as "1" versus "0" for any other ranking decision. Amongst Control groups *(*$N = 19$), two groups ranked up the Optimal Candidate (10.53%). Twelve MS groups (34.29%, $N = 35$) ranked up the Optimal Candidate. The Chi-square test assumptions were violated - one cell (25%) had an expected count of less than five – so I applied the MLR test (McHugh, 2013), which was significant, χ^2 (1, $N = 54$) = 4.02, $p = .045$, $\Phi = .26$. I also examined whether groups who selected the Optimal Candidate at T1 *ranked down* that candidate following the intervention. This result was not significant, χ^2 (1, $N = 54$) = .60, $p = .437$, $\Phi = .10$.

Group confidence in suboptimal/optimal candidate

Hypothesis 2a expected MS groups to report significantly lower mean group confidence in the Suboptimal Candidates at T2 versus Control groups. The data supported this. Scores for confidence in the two Suboptimal Candidates were averaged into one overall Suboptimal Candidate Confidence score. A two (Suboptimal Candidate Confidence at T1, T2) by two (Intervention vs. Control) mixed ANOVA yielded a significant main effect of

Time: confidence scores were significantly lower at T2 versus T1, $F(1, 50) = 4.97$, $p = .030$, $\eta p^2 = .09$ ($M_{T1} = 4.37$, $SD = 0.90$ versus $M_{T2} = 4.05$, $SD = 0.72$). The main effect of Condition was marginally significant, $F(1, 50) = 3.64$, $p = .062$, $\eta p^2 = .07$. ($M_{CONTROL} = 4.45$, $SD = 0.68$ versus $M_{MSIMULATION} = 4.08$, $SD = 0.85$): MS groups were marginally less confident than Control groups. The Suboptimal Candidate Confidence X Intervention interaction was not significant, $p = .345$. A post hoc independent *t*-test confirmed that Intervention Groups were significantly less confident in the Suboptimal Candidate at T2 compared to Control groups, $t(52) = 3.28$, $p = .002$, with no significant differences at T1. Paired samples *t*-tests also confirmed MS Groups were significantly less confident in the Suboptimal Candidates at T2 compared to T1, $t(34) = 3.83$, $p = .001$, with no differences in Control Groups.

This analysis was repeated to assess the impact of the Intervention on group confidence in the Optimal Candidate. A two (Optimal Candidate Confidence at T1, T2) by two (Intervention *vs.* Control) mixed ANOVA yielded no significant main or interaction effects (all *p*'s > .261). The pattern of means suggested Intervention groups were more confident in the Optimal Candidate at T2, but not significantly so. (All descriptive statistics are reported in Table 9).

Table 9.

Means (Standard Deviations) for Group Confidence by Intervention Condition and Candidate (Study 4).

Candidate	Control (N = 19)	Intervention (N = 33)
Optimal Candidate (T1)	3.16 (1.42)	3.09 (1.81)
Optimal Candidate (T2)	3.21 (1.51)	3.48 (1.46)
Suboptimal Candidate (T1)	4.53 (0.77)	4.27 (0.97)
Suboptimal Candidate (T2)	4.37 (0.60)	3.88 (0.73)

Group confidence in group candidate rank decision

Hypothesis 2b anticipated Intervention groups would report lower confidence in their overall candidate rank decision across time, versus Control groups. This was not supported by the data. A two (Group Confidence in Candidate Rank Decision at T1, T2) by two (Intervention, Control) repeated measures ANOVA yielded no significant main effects or interactions (all p's > .179).

Participant awareness of different information

Hypothesis 3 predicted members of MS groups would self-report higher levels of realisation of differing candidate information versus Control group participants. The ANOVA was significant, $F(1, 54) = 7.75$, $p = .007$, $\eta p^2 = .13$. ($M_{\text{CONTROL}} = 4.09$, $SD = 2.39$ versus $M_{\text{MSIMULATION}} = 5.64$, $SD = 1.68$). Hypothesis 3 was supported by the data.

Group anger and friction

Hypothesis 4 anticipated members of MS groups would perceive higher levels of anger and friction in those groups. This was partially supported by the data. I firstly tested the measure of anger in the groups over time and based on intervention condition. A two (Group Anger at

T1, T2) by two (Intervention vs. Control) mixed ANOVA yielded no significant main effects or interactions (all p's > .283).

I then tested the measure of friction in the groups. The main effects of Time and Intervention were not significant, but the Time X Intervention interaction was marginally significant, $F(1, 52) = 3.41$, $p = .070$, $\eta p^2 = .06$. Simple main effects analysis confirmed that members of Intervention groups perceived marginally greater friction in the groups at T2 compared to T1, $F(1, 52) = 3.25$, $p = .077$, $\eta p^2 = .06$ ($M_{\text{MSIMULATIONT1}} = 1.52$, $SD = 0.57$ versus $M_{\text{MSIMULATIONT2}} = 1.80$, $SD = 1.09$). There was also a difference between Control and Intervention groups at T2: members of Intervention groups perceived marginally significant higher levels of friction in their groups compared to those in Control Groups, $F(1, 52) = 3.24$, $p = .078$, $\eta p^2 = .06$ ($M_{\text{MSIMULATIONT2}} = 1.80$, $SD = 1.09$ versus $M_{\text{CONTROLT2}} = 1.25$, $SD = 0.25$).

Individual measure: participant recall of initially preferred candidate

Participants were asked to recall their preferred candidate prior to the first group discussion (1 = most preferred; 2 = second preference; 3 = least preferred). In the Control condition, 7.59% of participants recalled first ranking the Optimal Candidate, versus 15.44% in the Intervention Condition. The between-groups difference in participant recall for preferring the Optimal Candidate was not significant, $\chi^2 (1, N = 228) = 2.86$, $p = .091$, $\Phi = .11$, suggesting that initial participant candidate preferences (based on participant recall) for the Optimal Candidate did not play a significant role in the group candidate rank decisions. This lends further support to the efficacy of the MS intervention in improving group decision quality.

6.2.3 Discussion

Study 4 further tested the application of a mental simulation as a means of improving decision quality and information exchange in a Hidden Profile group decision task. I also examined how removing the initial individual candidate rank step from the decision-making procedure impacted group performance.

Mental simulation groups were significantly more likely to rank up the Optimal Candidate compared to Control groups, supporting my hypothesis that the mental simulation had a positive effect on group decision quality. The concerns in Study 2 regarding decision quality were not replicated here. There may be two reasons for this: firstly, the removal of the requirement for participants to record an initial individual preference may have improved group decision outcomes. That said, there is little evidence from previous research to support this as the sole factor in decision quality improvement. Schittekatte (1996) found that when participants were given all decision-relevant information, but not asked which subject they preferred (an identical procedure to Study 4) they used fewer decision-supporting items in their discussion but also an equal proportion - or less - of decision-opposing items. Therefore, participants still tended towards a preference, even when not asked to state which subject they preferred. In Study 4, groups in the Control condition made poorer quality decisions at T2 compared to those in the mental simulation condition. Improvements in group decision quality can therefore only be ascribed to the intervention.

I also replicated the Study 2 result confirming a significant reduction in confidence in the Suboptimal Candidates in mental simulation groups, although there were only non-significant increases in confidence in the Optimal Candidate.

Analysis of individual participants' responses also showed that members of mental simulation groups recognised they held different candidate information, more so than Control group members, again suggesting the Intervention increased the exchange of unique information. This replicated the Study 2 result on information exchange.

A comparison of the measure of friction in the groups did suggest members of Intervention groups perceived more friction in their groups compared to those in Control groups, although the result was only marginally significant and therefore no equivocal conclusions can be drawn. Study 5 was designed to further test the effect of the mental simulation on anger and friction amongst group members, directly comparing it with members of groups who undertook a Devil's Advocacy (DA) Procedure.

6.3 Study 5

6.3.1 Overview and hypotheses

Study 5 investigates whether the mental simulation intervention I am testing in this research triggers "Affective Conflict" (Amason, 1996) amongst participants in groups undertaking the intervention, directly comparing it with members of groups undergoing a Devil's Advocacy procedure. Although there were no significant differences between participants in the mental simulation and Control groups in Study 4 on the measure of anger, the pattern of means suggested members of mental simulation groups perceived more friction in their groups, compared to those in Control groups. Perhaps this result is unsurprising, since the mental simulation failure frame of the Intervention presents a direct challenge to the group, its members, and to their preferred selection.

Extant research has demonstrated the benefits of dissent in group decision-making (e.g. Brodbeck et al., 2002; Schulz-Hardt et al., 2006). However, some methods of introducing contrived dissent, such as Devil's Advocacy (DA) have produced negative outcomes, including increasing levels of "Affective Conflict" (e.g. Waddell et al., 2013). In Study 5, I therefore wanted to: (i) directly compare the effectiveness of the mental simulation intervention on decision quality against DA, whilst assessing the effect of both interventions on "Affective Conflict" amongst group participants; and (ii) examine whether there was any relationship between "Affective Conflict" and Communication Apprehension (McCroskey, 1977). I also aimed to replicate the results of Study 4 with respect to decision quality, reductions of confidence in the Suboptimal Candidate(s) and the recognition of different (unique) candidate information.

6.3.2 Dissent in decision-making

The Premortem, on which my mental simulation is based, was developed as a tool to enable teams to critique their own plans prior to implementation. Veinott et al. (2010) noted that one problem in such critiques may be team members lacking the ability to speak out in case they disrupt harmony and marginalise themselves. Dissent can, however, be beneficial in group decision-making (e.g. Brodbeck et al., 2002). Schulz-Hardt et al. (2006) found that groups where pre-discussion dissent existed had higher decision quality and levels of discussion intensity than homogenous groups. However, group composition was manipulated in these studies to ensure divergence of pre-discussion preferences and this may not always be possible in 'real' decision-making groups. Although, in one example of how this may operate in an applied context, NICE guideline development groups are structured with the aim of achieving higher quality decision making by ensuring: (i) diversity of opinion in the group; and (ii) a range of differing expertise in the group, both achieved through careful selection of the group members (Hopthrow et al., 2012).

Others have extended this line of research, directly stimulating contrived dissent and debate through various techniques, e.g. Dialectical Inquiry (DI: Mason & Mitroff, 1981). DI involves the division of group members into subgroups, to discuss and debate alternative solutions to a task. DI improved decision quality where information was distributed symmetrically (Schweiger, Sandberg, & Ragan, 1986) but not when distributed asymmetrically, although it did increase information exchange between group members, (Greitemeyer et al., 2006). Devil's Advocacy (DA) is another technique utilising contrived dissent. DA has proven effective in groups with symmetric information (Schulz-Hardt et al., 2002) but effects are less convincing in Hidden Profiles with asymmetric information distribution, where DA has been shown to have downsides in the form of "Affective Conflict" (Amason, 1996 (see 6.3.3)).

Both DI and DA aim to engender constructive conflict in decision-making groups through formally structuring debate and argument (Schweiger et al., 1986) but differ in approach. In DI, there are two diametrically opposed sets of assumptions and recommendations, which are set against each other. The group debates both sets of assumptions – this is the conflict element - and the assumptions that survive are retained. By contrast, DA involves only one set of recommendations. Unlike the intervention I am testing in this program of research, there is no element of mental simulation in DA. Instead, the focus of DA is in identifying everything that is problematic with the assumptions and recommendations, through the process of a formal critique by an appointed person or subgroup (generally, with a vested interest in the outcome). Furthermore, DA does not focus on identifying potential solutions to the problems highlighted in the critique, nor on identifying suitable alternatives, both of which are key components of the mental simulation tested in my research. Schweiger et al.'s (1986) instructions make this difference clear in describing DA, which ". . . attempts to uncover all that is wrong with the recommendations, assumptions, facts, and data and to expound the reasons why the recommendations should not be adopted." (p.59).

6.3.3 "Affective conflict"

Waddell et al. (2013) found that DA groups showed improvement in decision quality against free discussion groups in a Hidden Profile task, but individual participants in DA groups reported higher levels of "Affective Conflict", specifically personal friction and more personality clashes, than those in free discussion groups. Affective Conflict is dysfunctional conflict of an emotional nature, focused on personal incompatibilities and disputes (Amason, 1996). Amason found "Cognitive Conflict", which is task-oriented and focused on judgmental differences around how best to achieve common objectives, to be positively (non-significantly) correlated with decision quality and positively and significantly correlated with understanding and ‘affective acceptance’ (i.e. the affective relationships allowing group members to work together effectively). Conversely, “Affective Conflict” was significantly and negatively correlated with decision quality and ‘affective acceptance’, but not understanding. As Waddell et al.’s research highlighted: whilst groups undergoing a DA intervention showed improved decision quality, the presence of “Affective Conflict” generated lower satisfaction with the group process, which, in turn, may lead to problems implementing the team’s decision (Amason, 1996; Waddell et al., 2013).

Veinott et al. (2010) proposed the Premortem, on which the mental simulation in this program of research is based, as a tool to identify actions teams may need to take in emergencies, when being candid about problems and plan weaknesses is critical. In such scenarios, teams need to “offer blunt criticisms without damaging relationships. . .[or] harming morale” (p.2). Teams and groups need to understand what they might be doing wrong – hence the need for “blunt criticism” – but they also need to be able to work *together* to fix the problems. If group morale, or the relationship between group members, is damaged (which could be the case if “Affective Conflict” is present), then the group’s ability to work together may be seriously compromised. Study 5 therefore constitutes a partial replication of Waddell et al. (2013), comparing the effect of a DA procedure on group members’ perceptions of levels of anger and friction, compared to levels in Control groups. Given the suggestion of increased levels of perceived friction amongst participants in mental simulation groups in Study 4, I extend Waddell et al.’s study, by including a comparison of perceived anger and friction levels in participants in mental simulation groups against those in DA and Control groups.

6.3.4 Communication apprehension

One finding from the qualitative analysis undertaken in Study 1 was the suggestion that the mental simulation might provide a framework to attenuate Communication Apprehension (CA: McCroskey, 1977). As discussed in Chapter 3 (see 3.1.3), CA, whether trait or state, can seriously constrain individuals' abilities to communicate (Blume et al., 2010; Ho & McLeod, 2008).

This is echoed in Hidden Profile research examining the effect of group member status on willingness to contribute shared and unshared information. Wittenbaum (2000) found higher status group members mentioned shared and unshared information equally often, speculating that group members with higher status were less concerned about potential downsides from contributing unique information, principally as a result of higher confidence in their own established levels of competence. A similar explanation may also be offered for Communication Apprehension: group members with greater state CA may be less willing to contribute unique information, for fear of appearing incompetent in the eyes of their fellow group members. However, Veinott et al. (2010) noted that a Premortem enabled team members to demonstrate their ability by generating "novel and insightful criticisms" (p.3). This seems to present the perfect enabling framework allowing group members to introduce unique information into the group discussion, irrespective of state CA levels. Study 5 will examine this further by incorporating a measure of Communication Apprehension across the three experimental conditions. Previous research found participants in DA groups reported higher levels of friction in their groups compared to participants in free form groups (Waddell et al., 2013), so including Communication Apprehension as a variable in this study also enables me to test for any relationship between "Affective Conflict" and Communication Apprehension, specifically, whether the presence of "Affective Conflict" may increase Communication Apprehension.

In summary, Study 5 seeks to replicate the results of Studies 2 and 4, providing support for mental simulation as a means of improving decision quality in a Hidden Profile decision task, evidenced through: (i) the frequency with which groups rank up the Optimal Candidate; and (ii) reduced confidence in the Suboptimal Candidate. Study 5 also extends the previous group studies in this program of research through the addition of a further factor: a comparison of the mental simulation against *both* a Control *and* a DA Condition. I am specifically interested in examining how the mental simulation intervention compares with DA in triggering "Affective Conflict", as DA has been shown to do (Waddell et al., 2013). Accordingly, I hypothesise the following:

H5: MS groups will demonstrate improved decision quality, 'ranking up' the Optimal Candidate more frequently than Control groups.

H6. (a): Groups undertaking the mental simulation will report reduced confidence in the Suboptimal Candidates at T2 compared to T1 and identical or increased confidence in the Optimal Candidate at the same time points, versus Control groups.

H6. (b): Groups undertaking the mental simulation will report lower confidence in their overall candidate ranking at T2 versus Control groups.

H7: Group members undertaking the mental simulation will be more likely to realise they hold different (unique) candidate information compared to Control group members.

H8: DA group members will record higher levels of "Affective Conflict" compared to those in mental simulation and Control groups.

H9: Higher levels of "Affective Conflict" will be associated with higher levels of Communication Apprehension.

6.3.5 Method

Participants and Design

Participants were first-year psychology undergraduate students from a university in Southeast England (*N* = 280, 37 men, 243 women; age range 17-54, *M* = 18.91, *SD* = 2.72) who were randomly assigned to four-person groups (*N* = 70) and to experimental conditions. Participation was partial fulfilment of an introductory undergraduate psychology course research requirement.

A 3 (Intervention Condition (Between): Mental Simulation (MS) *vs* Devil's Advocacy (DA) *vs* Control) X 2 (Time (Within): T1 vs T2) mixed factor experimental design was conducted.

Procedure and Materials

As Study 4 (Table 4). An additional experimental condition: Devil's Advocacy (DA) was added, described below.

Experimental manipulation.

Following the initial group candidate rank exercise, groups were asked to undertake a MS/DA/Control task. Groups in the MS condition followed the "New" intervention procedure, as in Study 4. In DA groups, the procedure was based on that of Schultz-Hardt et al. (2002), as this procedure seemed easier to communicate to participants, compared to some alternative, more complex, procedures outlined in the literature (e.g. Schweiger at al., 1986). One group member, randomly assigned by seat, was selected to be the Devil's Advocate (DA) and made known as such to their group. The DA was asked to highlight all disadvantages of the Group's T1 ranking and check the group's proposal for possible mistakes and false assumptions, then present their critique to their fellow group members. The group was then asked to work together to analyse all additional pieces of information identified by the DA that could be important for the group's final decision. In the Control condition, groups worked together on a word task.

Following the Intervention/Control tasks, all groups were asked whether they wanted to maintain or change their T1 candidate rank decision. In a further variation from Studies 2 and 4, all groups were expressly told that they did not need to change their candidate ranking if they decided their first decision was correct. This was intended to further safeguard against the possibility that groups simply felt compelled to change their hiring rank decision. Groups recorded their T2 group rank decision and the other group and individual measures (described below).

Measures

Pre-discussion: individual measures.

As Study 2.

Decision quality.

As Study 2 and 4.

Group measure: confidence in candidate.

As Study 2 and 4.

Group measure: confidence in the group's candidate rank decision.

As Study 2 and 4.

Individual measure: anger and friction in the group ("Affective Conflict").

As Study 4

Individual measure: participant awareness of different information.

As Study 4

Individual measure: communication apprehension.

Participants answered four items assessing their levels of Communication Apprehension (CA: McCroskey, 1977). This focused on situational/state CA, with items adapted from the Situational Communication Apprehension Measure (SCAM: Richmond, 2013). Participants indicated their level of agreement to four different items: "I was apprehensive about being a part of my decision-making group"; "I was afraid to talk in my decision-making group"; "my body felt tense when I spoke out in my decision-making group" and "I just went along with the views of the other members of my decision-making group". Responses were scored on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*).

Finally, Participants provided demographic data on gender and age and the perceived gender of each candidate.

6.3.6 Results

For the group level analysis, data were aggregated except where noted below (Reimer et al., 2007; Schittekatte, 1996; Stasser & Titus, 1985).

Pre-discussion preferences

Initial individual participant hiring selections showed 76.79% of participants first ranked a Suboptimal Candidate, versus 23.21% the Optimal Candidate, χ^2 (1, N = 280) = 12.99, p <.001. This confirmed the successful Suboptimal Candidate manipulation: the correct solution was obscured by the Hidden Profile information distribution. I also checked the individual-level data for any significant between-groups difference: I firstly dummy coded all instances of individual participants ranking the Optimal Candidate first as "1" versus "0" if ranked second or third. A Chi-Square analysis yielded no significant between-groups differences, χ^2 (2, N = 280) = .539, p = .764, Φ = .44.

Decision quality

Hypothesis 5 anticipated that MS groups would demonstrate improved decision quality, ranking up' the Optimal Candidate more frequently than Control groups. The data supported this. Amongst Control groups, one group (4.35%, N = 23) ranked up the Optimal

Candidate. Amongst MS groups, seven groups (32.82%, $N = 22$) ranked up the Optimal Candidate and amongst DA groups, five groups (20%, $N = 25$) ranked up the Optimal Candidate. The Chi-square test revealed that the assumption that the value of the cells expected should be 5 or more in at least 80% of the cells was violated - three cells (50%) had an expected count of less than five. I therefore tested this hypothesis using the maximum likelihood ratio (MLR) Chi-square test (McHugh, 2013) which was significant, χ^2 (2, $N = 70$) = 6.42, $p = .040$, $\Phi = .28$. Post hoc tests were conducted using Bonferroni adjusted alpha levels of .0166 per test. Results indicated a significant difference between the MS and Control Groups, tested using the MLR, χ^2 (1, $N = 45$) = 6.37, $p = .012$, $\Phi = .36$ but no significant difference between DA and Control Groups, χ^2 (1, $N = 48$) = 2.92, $p = .087$, Φ = .24. A Pearson Chi-square also revealed no significant differences between MS and DA Groups, χ^2 (1, $N = 47$) = .86, $p = .354$, $\Phi = -.13$. The data therefore supported Hypothesis 5.

For completeness, I examined the frequency with which groups ranked *down* the Optimal Candidate. Amongst all groups, there were two incidences of downward ranking, both occurring in a MS group. The MLR test was not, however, significant, χ^2 (2, $N = 70$) = 4.76, $p = .093$, $\Phi = .25$.

Group confidence in suboptimal/optimal candidates

Hypothesis 6a expected Intervention groups to report significantly lower mean group confidence in the Suboptimal Candidates at T2 versus Control groups. This was supported by the data. Confidence scores for the Suboptimal Candidates were averaged for this analysis. I tested this by conducting an Intervention Condition (MS vs. DA vs. Control) X Confidence in Suboptimal Candidate (T1, T2) mixed ANOVA. The main effect of Intervention condition was not significant, $F(2, 67) = .65$, $p = .527$, $\eta p^2 = .02$ but there was a significant main effect of Time, $F(1, 67) = 20.74$, $p < .001$, $\eta p^2 = .24$, qualified by a significant Time X Intervention Condition interaction, $F(2, 67) = 4.81$, $p = .011$, $\eta p^2 = .13$.

Planned simple main effects analysis of the significant Time X Intervention Condition interaction showed MS groups reported significantly lower confidence in the Suboptimal Candidate at Time 2 versus Time 1, $F(1, 67) = 18.33$, $p < .001$, $\eta p^2 = .21$. ($M_{\text{MENTALSIMULATIONT1}} = 4.18$, $SD = 1.04$ versus $M_{\text{MENTALSIMULATIONT2}} = 3.52$, $SD = 1.17$). DA group participants also reported significantly lower confidence in the Suboptimal Candidate at Time 2 versus Time 1, $F(1, 67) = 11.98$, $p = .001$, $\eta p^2 = .15$. ($M_{\text{DAT1}} = 3.90$, $SD = 1.43$ versus $M_{\text{DAT2}} = 3.40$, $SD = 1.34$). Control groups did not differ significantly between the two time points ($p = .886$). There were also no significant between group differences at T1 ($p = .739$) or T2 ($p = .180$).

This analysis was repeated to assess the impact of the Intervention on group confidence in the Optimal Candidate. A two (Optimal Candidate Confidence at T1, T2) by two (Intervention *vs.* Control) mixed ANOVA yielded no significant main or interaction effects (all *p*'s > .072). Thus, hypothesis 6a was partially supported.

Group confidence in group's candidate rank decision

Hypothesis 6b anticipated that MS groups would report significantly lower confidence in their group rank decision at T2 versus T1, with no change for Control or DA groups. This was tested in an Intervention Condition (MS vs. DA vs. Control) X Confidence in Group Rank Decision (T1, T2) mixed ANOVA. There were no significant main or interaction effects (all *p*'s > .204). Hypothesis 6b was not, therefore, supported by the data.

Participant awareness of different information

Hypothesis 7 anticipated that members of MS groups would self-report higher levels of realisation of differing candidate information versus Control group participants. The data did not support this. Scores were averaged across the members within each group for this analysis. The one-way ANOVA was not significant, $F(2, 70) = .90$, $p = .410$, $\eta p^2 = .03$, (all $M > 6.12$). For completeness, I repeated this analysis excluding groups who had correctly selected the optimal candidate at T1. The result remained non-significant, $F(2, 47) = .70$, $p = .503$, $\eta p^2 = .03$. ($M_{CONTROL} = 6.08$, $SD = 1.53$ versus $M_{MENTALSIMULATION} = 6.54$, $SD = .61$ versus $M_{DA} = 6.13$, $SD = 1.47$).

"Affective Conflict"

Hypothesis 8 posited that DA group participants would record higher levels of "Affective Conflict" than those in MS and Control groups at T2. Following the approach of Waddell, et al. (2013), this was analysed at the level of the individual participants, based on their private responses to the two single items surveying perceptions of anger and personal friction in the group.

There were no significant differences in self-reported anger at T2, following the Control Task/Interventions, $F(2, 277) = 2.15$, $p = .118$, $\eta p^2 = .02$. I repeated this analysis to check for any differences in self-reported friction following the Control Task/Interventions: the one-way ANOVA was significant, $F(2, 277) = 4.03$, $p = .019$, $\eta p^2 = .03$. Sidak adjusted pairwise comparisons revealed a significant difference between participants in the DA and Control condition, $M_{CONTROLT2} = 1.43$, $SD = 0.88$ versus $M_{DAT2} = 1.86$, $SD = 1.25$, $p = .026$. There were no significant differences between the MS and Control Condition, ($M_{CONTROLT2} = 1.43$, $SD = 0.88$ versus $M_{MENTALSIMULATIONT2} = 1.81$, $SD = 1.17$), $p = .076$. The difference between the MS and DA condition was also not significant, $p = .983$. Hypothesis 8 was therefore supported.

Communication Apprehension

Hypothesis 9 predicted a positive association between higher levels of "Affective Conflict" and Communication Apprehension. Factor analysis of the four items in the Communication Apprehension Scale revealed one factor accounting for 53.45% of the Communication Apprehension Scale's total variance. This factor (ANXIETY) comprised two items: (i) that the participant was afraid to talk in their decision-making group; and (ii) that the participant's body felt tense when they spoke out in their decision making group. The scale computed for this factor showed good reliability: α =.76. Participant scores for the two items were averaged into one overall score for "ANXIETY" and I tested the relationship with the levels of friction, as reported by group members. The overall correlation was significant, $r(280) = .130, p = .035$. I then tested the relationship separately in each experimental condition. Correlations in the Control and MS group conditions were not significant (all p's > .268), but in the DA groups, the relationship was positive and significant, $r(88) = .220, p = .035$. Hypothesis 9 was therefore supported.

6.4 Discussion

Study 5 further tested the application of a mental simulation as a means of improving decision quality in face-to-face Hidden Profile groups. In an extension to Study 4, I also directly compared the levels of perceived anger and friction ("Affective Conflict") amongst individual group members in MS, Devil's Advocacy and Control groups, in a partial replication of Waddell et al. (2013).

Data from Study 5 further supported my hypothesis: decision quality was improved in groups undertaking the mental simulation; these groups were significantly more likely to rank up the Optimal Candidate compared to Control groups. Decision quality in MS groups did not differ significantly from DA groups, consistent with Waddell et al.'s (2013) research showing the positive effect of DA techniques on decision quality in Hidden Profiles. I also replicated results from Study 2 and 4, confirming a significant reduction in confidence in the Suboptimal Candidates in MS groups, although there was no increase in confidence in the Optimal Candidate.

With respect to the recognition of unique information, in Study 5, I was unable to replicate the result from Studies 2 and 4 suggesting that the mental simulation facilitated the exchange of unique information amongst participants in those groups. Participants in the MS groups reported the highest levels of recognition of differing candidate information, providing some directional support for my hypothesis, but there were no significant differences between the three conditions. In fact, the pattern of means in my results suggest a possible ceiling effect.

A key goal of Study 5 was to replicate Waddell et al.'s (2013) finding in relation to increased "Affective Conflict" in Devil's Advocacy groups compared to free discussion (Control) groups and my findings supported this: participants in DA groups perceived the highest levels of personal friction within their group. This finding is a concern given the potential negative effects of "Affective Conflict" on the group dynamic. Schweiger et al. (1986) found that individuals in consensus groups were more satisfied with the group process and expressed greater desire to work together in the future when compared with DA (and DI) groups. I also noted a significant, positive relationship in DA groups (but not Control or MS groups) between perceived friction levels and Communication Apprehension: higher levels of friction were positively and significantly associated with increased levels of Communication Apprehension, which has been shown to have adverse behavioural effects, for example, participants become less likely to express their own opinions in face-to-face settings (Ho & McLeod, 2008). Communication Apprehension has also been negatively related to critical thinking and oral communication (Blume et al., 2010). These challenges all need to be overcome if groups are to be successful in solving Hidden Profile decision tasks.

DA clearly offers a potential solution to improving decision outcomes in Hidden Profile decision tasks but, as Waddell et al. (2013) noted, perhaps the optimal solution is to pair DA with another technique to achieve two key objectives: (i) improving the likelihood that groups will uncover the Hidden Profile; and (ii) maintaining group harmony in order to better implement a superior solution. The mental simulation tested in this research may offer one such technique.

6.4.1 Limitations and future directions

Greitemeyer and Schulz-Hardt (2003) noted that the formation of initial preferences had an adverse impact on individuals' subsequent information search and evaluation: individuals ascribed lower value to information not congruent with their initial preference. Using a simulated discussion protocol, they determined that this was the case irrespective of whether the participant was firstly made aware of the preferences of their fictitious group members, then followed by a discussion of information or whether this procedure was reversed. Group members stuck largely to their initial suboptimal preferences, with *97%* of participants maintaining their initial preference, even after reading a group discussion profile in which all information was available to enable them to disconfirm their initial preference. Greitemeyer and Schulz-Hardt concluded that "interventions should not exclusively focus on correcting dysfunctional group-level processes; instead, they should also be directed at debiasing the group members' individual information processing" (p.337). Studies 6 and 7 aim to achieve precisely this. Using the online paradigm developed and described in Study 3, I will test whether the mental simulation can attenuate the Individual Preference Effect and improve individual decision outcomes. This seems key to optimising group performance in Hidden Profile decision tasks.

To conclude, the two face-to-face group studies presented in this Chapter, whilst recognizing potential limitations of low power, extend the Hidden Profile literature by empirically evidencing, for the first time, that a mental simulation technique can improve information exchange *and* decision outcomes in Hidden Profile tasks, irrespective of whether participants made an initial individual selection decision or not. Results confirmed that: (i) groups undergoing the mental simulation demonstrated improved decision quality compared to Control groups; (ii) groups undergoing the mental simulation recorded reductions in confidence in the Suboptimal Candidate; (iii) participants in groups undergoing a mental simulation were more likely to realise they held different (unique) candidate information from Control group participants, (although this results was not replicated in Study 5); and (iv) in Study 5, decision quality was improved in groups who underwent the mental simulation, but without the adverse consequences of a Devil's Advocacy procedure previously identified (Waddell et al., 2013). Consistent with the findings of Waddell and colleagues, participants in DA groups perceived the highest levels of personal friction, significantly higher than those in the Control condition. Future research could consider combining Devil's Advocacy and mental simulation techniques to achieve improved decision outcomes in Hidden Profile groups, without the negative effect on group harmony which DA appears to have.

Chapter 7: Attenuating the Individual Preference Effect

7 Summary

As I discussed in Chapter 5, the "Individual Preference Effect" (IPE: Faulmüller, et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch and Schulz-Hardt, 2010) has been identified as an important barrier to overcome to improve group decision-making outcomes in Hidden Profile tasks. Because of the strength of their individual preferences, group members are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct these and even if the accompanying group processes are perfectly conducted.

Using the individual online paradigm developed and tested in Chapter 5, Chapter 7 reports two online studies (Study 6: *N* = 160 and Study 7: *N* = 280) which test whether a mental simulation can successfully attenuate the IPE, measuring individual decision outcomes prior to and after the intervention (at FDP-Full(Pre), FDP-Full(Post)). The results from Study 6 show positive outcomes towards attenuation of the IPE. Study 7 (*N* = 280) replicates the result of Study 6 with a larger sample size, drawn from an organizational population, one required to be working in full-time employment. In sum, both studies provide further positive support for mental simulation as an important procedural intervention in Hidden Profile decision tasks, specifically with respect to attenuation of the IPE. Individuals who were exposed to an online version of the mental simulation reported a reduction in confidence in the Suboptimal Candidates, increases in confidence in the Optimal Candidate, and improved individual decision quality. As I noted in Chapter 5, participant confidence in their initial suboptimal decision seems to play a major role in the IPE and its related outcomes. The studies reported in this Chapter underscore that finding and, through my examination of the mental simulation intervention, extend this theoretically by offering support for Russo and Schoemaker's (1992) work, suggesting counterargumentation, which sits at the heart of the mental simulation intervention, as one way to combat overconfidence.

7.1 Theoretical background

Greitemeyer and Schulz-Hardt (2003) demonstrated that the IPE was at least partially mediated by the biased evaluation of the importance and valence of information supporting the individual group members' initial suboptimal candidate selection. As they noted, this suggests that even though negative attributes of the initially preferred (suboptimal) solution emerge during the group discussion, these are often discounted. Instead, individual group members remain focused on the *advantages* of the suboptimal solution, making the task of solving the Hidden Profile much more difficult. Whilst most Hidden Profile interventions have focused on attenuating the problems and challenges operating at the group level, I concur with Greitemeyer & Schulz-Hardt that "interventions should not exclusively focus on correcting dysfunctional group-level processes; instead, they should also be directed as debiasing the group members' individual information processing" (p.337).

7.1.1 Individual group member preferences

Russo and Schoemaker (1992) noted that, although group judgements may force a compromise or even encourage open-mindedness, problems may still arise in groups if individual group members remain too strongly anchored to their initial view and return to it given the chance. This is particularly important given the construct of most Hidden Profile research: individual participants make an individual selection decision and then are asked to discuss and agree a group decision. Most Hidden Profile tasks initially orient the individual towards a suboptimal solution. This means that the majority of group members enter the group discussion favouring a suboptimal solution, which then biases the group discussion in an unfavourable direction. They are also very confident, albeit mistakenly so, in the accuracy of that suboptimal solution.

The significance of these initial individual decisions is supported elsewhere in the research. Klocke (2007) compared the effects of different individual and group level processes on group decision quality amongst individuals and in face-to-face groups, analysing both the bias for shared information (sharedness bias) and bias for initial preferences (preference bias) at both the group and individual level. Results showed that groups able to identify the correct candidate in a Hidden Profile task were those groups whose members "individually appreciated their own and others' unique information and preference-inconsistent information" (p.463). Interestingly, it was the effect of individual-level processes, based on the information processing of each single group member, which seemed to have the most influence on decision quality. The motive for sharedness bias and the preference bias, as manifested in information evaluation at the individual level, correlated negatively and significantly with decision quality (r = -.40 and r = -.36 respectively, one-tailed $p < .05$). Conversely, group-level processes showed only non-significant correlations with decision quality. These results led Klocke to note that any intervention "should have a stronger emphasis on the individual appreciation of unique and preference-consistent information because individual-level processes are crucial for high decision quality". (p.464)

These findings of the importance of the individual-level processes are consistent with earlier work by Dennis (1996), which emphasized that it is the group member who must first decide to contribute the information to the group, assuming the opportunity exists for them to do so. The decision whether or not to contribute that information may be impacted by a range of factors, including the motivation to support or defend an initial preference. In his examination of the effectiveness of a Group Support System (GSS) on outcomes in Hidden Profile tasks, Dennis found that, irrespective of condition (GSS versus no-GSS), participants were more likely to exchange information that *supported* their pre-discussion preferences, rather than neutral or disconfirming information ($p < .001$). Furthermore, the pre-discussion information held by the individual, together with their choices made on the basis of that information, can also affect how new information is processed. In the study conducted by Dennis, both GSS and non-GSS groups failed to use new, unique information in their decision-making process. This is consistent with Faulmüller at al.'s (2010) later work on the IPE, discussed in Chapter 5. Information which is not consistent with members' initial suboptimal preferences is devalued; information that is consistent, conversely, is perceived to be of higher quality (see also Greitemeyer and Schulz-Hardt, 2003).

To overcome this, one approach examined in previous research was to change the structured discussion procedure to at least *delay* preference expression in groups, with a view to increasing information exchange, (e.g. Mennecke, 1997; Stasser et al., 1989). Results from these studies were mixed, however, and did not yield any improvement in group decision outcomes. Schittekatte (1996) found that when participants were given all decision-relevant information, but not asked which subject they preferred, they used fewer *decision-supporting* items during the discussion but also an equal proportion - or less - of *decision-opposing* items. This suggests that, even when not expressly asked to formulate or articulate a choice, participants tend towards a preference. My results from Study 4, where participants in face-to-face groups recalled their starting preference for a Suboptimal Candidate, although they were not expressly asked for their pre-discussion preference, support this. Once that preference exists, then extant research suggests it will affect how individual group members evaluate the information they hold, including what they choose to contribute and how they processes that information. The challenge taken up in these studies is to test whether the mental simulation can overcome the individual pre-discussion preferences. Reducing individuals' confidence levels in their initial (generally0 suboptimal preference may be a way of achieving this.

7.1.2 Individual group member confidence

As I noted in Chapter 5, participants' confidence in their initial suboptimal decision seems to play a role in the IPE and its related outcomes. Hidden Profile participants in Study 3 reported such high levels of confidence in their initial (Suboptimal) candidate selection, that, even when presented with all of the decision-relevant information to correct their selection, they were unable to do so and remained significantly more confident in the Suboptimal Candidate (C) than participants in either the Manifest or No Preference condition. Block and Harper (1991) noted that "cognitive conceit", including overconfidence in ones decision-making abilities, could lead to a decrease in the likelihood of an individual seeking out potentially important information. This offers support for my suggestion that reducing that confidence may be one key to attenuating the IPE, if it can lead to improvements in the way individuals seek out and apply new, unique information.

Russo and Schoemaker (1992) suggested a number of mechanisms to combat overconfidence: (i) *accelerated feedback*: using a known outcome to get immediate feedback on the decision; (ii) *counterargumentation*: thinking up reasons why initial beliefs might be wrong; (iii) *paths to trouble*: identification of all paths to a specific fault or problem, including listing additional causes of the problem; and (iv) *paths to the future*: explicit scenario analysis setting out how the future might play out in one or other specific direction. The mental simulation I am testing asks decision makers look into the future: they are given immediate feedback that their anticipated decision (here, the selection of their initially chosen candidate) has failed. They are then asked to generate reasons for this failure and potential solutions to the problems. Applying this to individual decision-making, I anticipate that the mental simulation will have a significant and positive effect on overconfidence in individual decision-makers, leading them to scrutinise and reconsider their initial suboptimal candidate selection. Specifically, the aim of the studies reported in this Chapter is to test whether the mental simulation attenuates the IPE by: (i) leading to a reduction in confidence in the individual participants' initial Suboptimal Candidate selections; and (ii) improving individual decision quality, such that participants subsequently switch their selection to the Optimal Candidate.

7.1.3 Gender differences and decision-making

As I discussed in Chapter 1 (see 1.3.2) gender differences in decision-making have been researched elsewhere in the literature and received wide support from a variety of sources, including in biological and cognitive psychology (e.g. Cahill, 2006; Evans & Hampson, 2015; Reavis & Overman, 2001). These differences have been identified not only in information processing (e.g. Byrne & Worthy, 2015; Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991) but also in how genders differ in the way they approach and utilise information (e.g. Chung & Monroe, 1998).

Despite these differences, the Hidden Profile literature does not seem to contemplate the possibility that the IPE may vary by gender. The results from my exploratory analysis of gender differences in Study 3, however, provided some initial, directional support for this possibility. Results from two McNemar tests suggested female participants in the HP condition demonstrated better improvement in decision quality than their male counterparts, based on viewing full information, compared to candidate selection decisions made based on partial information only: male participants – p = .250; female participants – p = .063. This suggested female participants might be more able to correct their initial Suboptimal Candidate (C) selection decision and, potentially, were less affected by the IPE. A further aim of this study is to continue the examination of whether the IPE may vary by gender.

7.1.4 Chapter overview and hypotheses

Study 6 partially replicated Faulmüller et al.'s (2010) Study 2, firstly aiming to replicate the finding (together with my own finding from Study 3) that participants with initial suboptimal preferences were less likely to choose the correct candidate than participants without such preferences, even after viewing all decision-relevant information. Study 6 extends this research, adding an examination of whether the mental simulation intervention can attenuate the IPE. Study 6 deployed a mixed design, involving a candidate selection task, with two information (between) conditions: (i) Manifest Profile (MP); (ii) Hidden Profile (HP); and two intervention (between) conditions: (i) Mental Simulation (MS); and (ii) Control (see Procedure below for a full description). Time was the within condition, for candidates in both the MP and HP conditions. Participants in the MP condition had two decision points: Final Decision Point (FDP-Full(1-Pre)), based on viewing full candidate information, aggregated in one bullet-point list, *prior* to the MS or Control task; and Final Decision Point (FDP-Full(1-Post)), f*ollowing* the MS or Control task. Participants in the Hidden Profile Condition had three decision points: Initial Decision Point – Partial Information (IDP-PI), based on viewing partial candidate information; Final Decision Point (FDP-Full(4-Pre)), based on viewing full candidate information distributed across four separate lists *prior* to the MS or Control task; and Final Decision Point (FDP-Full(4-Post)) *following* the MS or Control task. This is summarised in Table 10 below.

Table 10.

Information and Decision Steps by Condition (Study 6/7).

Manifest Profile	Hidden Profile
Full Information ↓ Final Decision Point (FDP-Full(1-Pre)	Partial Information ↓ Initial Decision Point (IDP-PI)
	Full Information ↓ Final Decision Point (FDP-Full(4-Pre)
FIRST COMPARISON POINT	
Intervention/Control Task	
Full Information ↓ Final Decision Point (FDP-Full(1-Post)	Full Information ↓ Final Decision Point (FDP-Full(4-Post)
SECOND COMPARISON POINT	

As noted, my first three hypotheses sought to replicate the results of Study 3 and further investigate the possibility of gender differences in the IPE. The additional hypotheses were determined by the anticipated effects of the mental simulation intervention. Accordingly, I hypothesized the following, which I have split into Pre and Post Intervention/Control Task for clarity:

Pre-Intervention/Control Task:

H1: HP participants will select the Optimal Candidate (A) significantly less frequently than those in the MP condition, even after full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).

H2: HP participants will be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).

H3: HP participants will be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).

H4: Female participants in the HP condition will demonstrate better improvement in decision quality than their male counterparts between viewing partial information (at IDP-PI) and viewing full information (FDP-Full(4-pre)).

Exploratory Analysis 1: In addition to the above, as in Study 3, I again determined to explore whether, and if, participants' confidence in their overall ranking differed between the two information conditions (MP versus HP) at FDP-Full (1/4 Pre) (i.e. after all participants viewed full information). I had no specific hypothesis with respect to this question.

Post-Intervention/Control Task:

H5: HP participants in the mental simulation condition making an initial suboptimal candidate selection will evidence significantly better decision quality by selecting the Optimal Candidate (A) following a mental simulation intervention (comparison points = FDP-Full(4-Pre) compared to FDP-Full(4-Post)). There will be no significant difference between these two measurement points for HP Control participants.

H6: HP participants in the mental simulation condition will be significantly less confident in the Suboptimal Candidate (C) as 'best for the job' measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). I expect no difference for HP Control Participants.

H7: HP participants in the mental simulation condition will be significantly more confident in the Optimal Candidate (A) measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). I expect no significant difference for HP Control Participants.

Exploratory Analysis 2: Although I had no specific hypothesis, I wanted to explore HP participants' overall confidence in their selection decision at FDP-Full(1/4 Pre) compared to FDP-Full(Post) and whether this was affected by the mental simulation intervention or control task.

7.2 Study 6

7.2.1 Method

Participants and Design

One hundred and sixty participants recruited from Prolific Academic took part in the experiment in return for a small monetary payment (78 males, 81 females, one undeclared; age range 18-63, M_{age} = 34.14, *SD* = 10.22). The only stipulated criterion was that participants should be minimum age 18. Power analysis for a one-tailed chi-square test was conducted in G-POWER and determined a sufficient sample size of 36 using an alpha of 0.05, power of 0.80 and a medium effect size (*w* = 0.3) (Faul, Erdfelder, Buchner, & Lang, 2013). Note that I recruited for a much larger participant sample to allow for the expected number of exclusions of participants in the Hidden Profile condition who failed the manipulation check (i.e. by not selecting (or maintaining their selection of) the Suboptimal Candidate ©).

The design was a mixed 2 (Information Condition: Manifest Profile (MP) *vs.* Hidden Profile (HP)) X 2 (Intervention Condition: Mental Simulation (MS) *vs*. Control) X (2) (Time:

Final Decision Point (FDP-Full-Pre), Final Decision Point (FDP-Full-Post)) experimental design, with Decision Point as the within participants factor. For the purposes of Study 6 and 7, I was interested only in the Manifest versus Hidden Profile Conditions. Accordingly, the No Preference Condition, which was examined in Chapter 5, was removed for these studies.

Materials

The HP decision task material was adapted from Baker's (2010) group activity and was as described in Study 3 (Chapter 5).

Procedure

The experiment was delivered online and was as described in Study 3 with the following variations.

Manifest profile (MP).

As Study 3. Participants in the MP condition viewed a one page list setting out full candidate information in bullet form, beginning with information about Candidate (A), then (B), then (C) (Appendix B). Participants were told their information was identical to their fellow, (fictitious) group members and asked to make one individual candidate selection decision based on the information held by them (FDP-Full(1-Pre)).

Hidden profile (HP).

As Study 3. Participants in the HP condition firstly made an Initial Decision Point - Partial Information (IDP-PI) selection, based on viewing partial candidate information on only one single list, either W, X, Y, Z (Appendix B: presentation of the lists was randomized). After making an IDP-PI selection, HP participants then viewed their own information again, plus the information of their 'fellow group members' (they were told this information was not necessarily the same) – all lists W, X, Y Z (presentation was randomized) - and were asked to review their IDP-PI candidate selection, specifically whether they wanted to maintain or change that selection. This constituted their Final Decision Point (FDP-Full(4-Pre)).

Intervention/Control task.

Following their FDP-Full(1/4-Pre) decision, individual participants undertook an online MS or Control task. In the MS condition, participants were firstly asked to imagine that they had proceeded with the hiring of their chosen candidate and that we were “fast-forwarding” to the 12-month probationary review. They were told that the last year had gone badly, resulting in poor group and organizational outcomes. Participants were asked to identify all of the reasons they could think of as to why the last year has gone so badly, based on the candidate information they held. They were asked to note these (in brief format), typing their responses directly into the online paradigm. Following this, participants were then asked to briefly note any potential solutions to the situation they could derive from the candidate information (again, they were asked to type their responses directly into the online paradigm). They were told that these solutions could be based on the attributes of their chosen candidate, for example, management training, presentation training, etc. or that they could also consider attributes which the other two candidates (who, they were told, were both still available for hire) might better bring to bear on the problems identified (Appendix E).

Participants in the Control condition undertook a word task and were asked to think of and type into the online paradigm as many different words as possible to summarise their experiences of providing data as a participant in psychological studies. They were told there were no right or wrong answers and only the number of words mattered (Appendix E).

After the tasks, participants were asked to consider carefully whether they wished to approve and retain their candidate post probation, or whether they believed the other two candidates (both still available) could have done a better job and they now wished to amend their selection.

Measures

Decision quality.

Decision quality was a dichotomous measure, based on whether participants selected the Optimal Candidate (A) (coded 1) or a Suboptimal Candidate (coded 0).

Participant confidence in suboptimal/optimal candidate.

The second dependent variable was participant confidence in the Candidates. Following FDP(1/4-Pre) and FDP(1/4-Post), participants were asked to record their level of confidence in each candidate for the job by responding to the statement "*I think Candidate A/B/C would be the best person for the job*", on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). As in Study 3, I included this measure to understand how (i) the IPE and; (ii) the MS intervention, might affect participant confidence levels in the Optimal and Suboptimal Candidates.

Participant confidence in selection decision.

The third dependent variable asked participants to measure the level of their overall confidence in their selection decision, by responding to the statement "I am confident in my selection decision" on a 7-point Likert scale (1 = *strongly agree* to 7 = *strongly disagree*). This was also measured at FDP(1/4-Pre) and FDP(1/4-Post).

Following completion, participants were thanked and debriefed in the survey software.

7.2.2 Results

Pre-Intervention/Control Task

As in Study 3, I firstly examined whether the Hidden Profile manipulation had successfully oriented participants in that (HP) condition towards the Suboptimal Candidate (C) based on partial candidate information viewed at the Initial Decision Point-Partial Information (IDP-PI). The Chi-square test was significant: 80.95% of HP participants initially preferred Candidate (C), χ^2 (2, N = 84) = 86.86, p <.001. Candidate (A) was preferred by 4.76% and Candidate (B) by 14.29%. This confirmed the Suboptimal Candidate (C) manipulation was successful for participants in the HP condition.

I then examined the Final Decision Point Candidate Selection for Manifest Profile participants viewing one list (FDP-Full(1-Pre)). The Chi-square test was significant: 82.89% of MP participants preferred the Optimal Candidate (A), χ^2 (2, N = 76) = 84.94, p <.001. Candidate (B) was preferred by 3.95% and Candidate (C) by 13.16%. As anticipated, participants in the Manifest Profile Condition overwhelmingly selected the Optimal Candidate (A).

Finally, I examined the Final Decision Point Candidate Selection for Hidden Profile (HP) participants, that is, after they had viewed all candidate information across the four separate lists (FDP-Full(4-Pre)). Although a number of participants in the HP condition did correct their initial sub-optimal decision having viewed full candidate information across lists W, X, Y Z, the Chi-square test remained significant at FDP-Full(4-Pre), χ^2 (2, N = 84) = 16.36, p < .001. The Optimal Candidate (A) was preferred by 39.29% of HP participants following their viewing of all candidate attributes, Candidate (B) by 13.10% and Candidate (C) by 47.62%. Thus, although several HP participants switched their candidate selection, the Suboptimal Candidate (C) remained the preferred candidate of participants in the HP condition.

These findings replicated those of Study 3: the majority of participants in the Manifest Profile condition selected the Optimal Candidate (A), whereas most participants in the Hidden Profile condition selected the Suboptimal Candidate (C) they were oriented to by the initial presentation of information. They then maintained that suboptimal selection, even after viewing full information.

Following the analytic approach of Faulmüller et al. (2010) and Toma et al. (2009; 2013), 16 participants in the HP Condition were then excluded from the individual analysis because they failed the HP Suboptimal Candidate manipulation at IDP-PI, (i.e. they did not select Candidate (C)). This left 144 participants in the analysis, split between the experimental conditions as follows: MP: $N = 76$; HP: $N = 68$.[1]

Information processing: decision quality

Selection of optimal candidate (A).

Hypothesis 1 predicted that participants in the HP condition would select the Optimal Candidate (A) less frequently than participants in the MP condition, even after full candidate information disclosure at FDP-Full. This was supported by the data. 82.89% of MP participants selected the Optimal Candidate, compared to 39.71% in the HP condition: the Chi-square test was significant, $\chi^2\,(1, N = 144) = 31.42, p < .001, \Phi = .47$. This replicated the results of Study 3: participants who were exposed to an initial Suboptimal Candidate manipulation were significantly less likely to select the Optimal Candidate (A) than those who viewed a one page bullet list, even after viewing full candidate information.

Selection of suboptimal candidate (C).

Turning to the Suboptimal Candidate (C), as expected, there was also a significant difference between participants in the MP (13.16%) and HP (57.35%) conditions who selected this candidate, $\chi^2\,(1, N = 144) = 31.23, p < .001, \Phi = .47$. Taken together, these results again confirm that participants in the HP condition who viewed candidate attributes across four lists at FDP-Full(4-Pre) were significantly less able to distinguish Candidate (C) as the Suboptimal Candidate than those in the Manifest Profile condition at FDP-Full(1-Pre).

---

[1] For completeness, I note that of the excluded HP participants, four selected the Optimal Candidate (A) at IDP-PI and maintained that selection at FDP-Full(4-Pre). Two HP participants chose Candidate (B) at IDP-PI and switched to Candidate (A) at FDP-Full(4); one chose Candidate (B) and switched to Candidate (C) whilst nine chose Candidate (B) at IDP-PI and retained Candidate (B) as their selection at FDP-Full(4-Pre).

Specifically, participants in the Hidden Profile Condition remained significantly more likely to select Candidate (C), even after viewing all candidate information, thus confirming the existence of the IPE in my online paradigm, replicating the result of Study 3: Hidden Profile participants were unable to correct their initial suboptimal selection. (Note – as in Study 3, given the relatively small number of participants who selected Candidate B in all conditions (MP = 3, HP = 12(IDP-IP) and 9(FDP-Full(4-Pre)), I will not further analyse data related to this Candidate).

Decision Confidence

Participant confidence in optimal candidate (A).

Hypothesis 2 predicted HP participants would be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)). This was supported by the data: an independent t-test was significant, $t(136.92) = 5.16$, $p < .001$.

Participant confidence in suboptimal candidate (C).

Hypothesis 3 predicted HP participants would be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre). This was supported by the data: an independent t-test was significant, $t(138.41) = -6.79$, $p < .001$ (See Table 11 for all descriptive statistics).

Table 11.

Means (Standard Deviations) for Participant Confidence by Information Condition and Candidate (Study 6).

Candidate	Manifest Profile ($N = 76$)	Hidden Profile ($N = 68$)
Optimal Candidate (A)	5.55 (1.45)	4.25 (1.57)
Suboptimal Candidate (C)	3.45 (1.57)	5.01 (1.19)

Gender Differences in the IPE

Hypothesis 4 predicted female participants in the HP condition would be better able to overcome the IPE and demonstrate greater improvement in decision quality after viewing full information (compared to initially viewing partial information at IDP-PI). This was partially supported by the data. Results from two McNemar tests suggested female participants in the HP condition demonstrated better improvement in decision quality than their male counterparts at FDP-Full(4-pre), based on viewing full information, compared to their decisions made at IDP-PI only: 30.30% of male participants corrected their selection from the Suboptimal Candidate (C) to the Optimal Candidate (A) – $p = .002$; however, 50% of female participants corrected their selection from the Suboptimal Candidate (C) to the Optimal Candidate (A)– $p < .001$. Although both male and female participants in the HP condition achieved a significant improvement in decision quality, this result again suggests female participants were better able to correct their initial Suboptimal Candidate (C) selection decision and, potentially, were less affected by the IPE, consistent with the exploratory finding of Study 3.

I again tested for any gender differences in decision quality in the MP condition at the single decision point, based on viewing full information presented on 1-page (FDP-Full(1-pre)). Amongst male participants, 86.11% selected the Optimal Candidate (A) compared to 80% female participants. The chi-square showed no significant difference, χ^2 (1, N = 76) = .50, p = .480, Φ = -.08.

Exploratory Analysis 1

With respect to my exploratory analysis of participants' overall confidence in their selection decision at FDP-Full(1-4 Pre), no significant differences were found between the two information conditions, t(139.85) = -.72, p = .474 (M_{MP} =2.63, SD = 1.24 versus M_{HP} =2.76, SD = 0.98).

In summary, the results of the first three hypotheses, together with the exploratory analysis, replicated the results of Study 3 described in Chapter 5. This supports my premise that this new online paradigm can induce the IPE and is a suitable task to test the efficacy of the mental simulation intervention. The result for Hypothesis 4, examining gender differences, is consistent with the exploratory analysis in Study 3 and again underscores the possibility that the IPE may have differing effects based on participant gender. I will now move on to consider the Post-intervention/Control task findings.

Post-Intervention/Control Task

I tested my specific directional hypothesis regarding improvements in decision quality for participants in the Hidden Profile condition following the MS, isolating the effect to participants who initially preselected and maintained their Suboptimal Candidate (C) selection at FDP-Full(4-Pre), even after viewing full candidate information. Since I am interested in testing the ability of the intervention to attenuate the IPE, I would argue that this seems a reasonable approach: participants who made the correct selection at FDP-Full(4-Pre) cannot be operating under the influence of the IPE. Nor are participants in the Manifest

Profile condition, who have seen all candidate attribute information presented on one page, impacted by the IPE in this context. This left 39 participants for analysis: 20 and 19 in the Control condition and MS condition respectively. This subset of the data was used to test H5-H7.

Information processing: decision quality

Hypothesis 5 predicted that participants in the MS condition making an initial Suboptimal Candidate selection would evidence significantly better decision quality by selecting the Optimal Candidate (A) following a MS intervention (comparison points = FDP-Full(4-Pre) compared to FDP-Full(4-Post)). This was supported by the data: 31.57% of HP Intervention participants switched from the Suboptimal Candidate (C) to select the Optimal Candidate (A), solving the Hidden Profile, compared to 0% in the HP Control condition. I analysed the difference between FDP-Full(4-Pre) and (4-Post) in a McNemar's test. There was no difference in the Control condition, but there was a significant difference in the MS condition, p = .031, confirming that the MS intervention attenuated the IPE, evidencing a positive effect on decision quality. (I note that 21.05% of HP Intervention participants switched from Candidate (C) to Candidate (B) and the remainder (47.37%) maintained their initial Suboptimal Candidate (C) selection. In the Control condition, one participant switched from Candidate (C) to Candidate (B); the remainder maintained their initial Suboptimal Candidate (C) selection).

Decision quality – manifest profile condition.

For completeness, I examined the effect of the MS on decision quality in the MP condition, comparing the number of participants who selected the Optimal Candidate (A) at FDP-Full(4-Pre) and (4-Post) in the MP/MS and MP/Control conditions. Neither produced a significant McNemar's result: in the MP/MS condition, 31 participants solved the HP at

FDP-Full(1-Pre) and 26 at FDP-Full(1-Post), a non-significant reduction, $p = .125$. In the MP/Control condition, 32 participants solved the HP at T1 and 34 at T2, $p = .500$.

Decision Confidence

Participant confidence in suboptimal candidate (C) – HP condition.

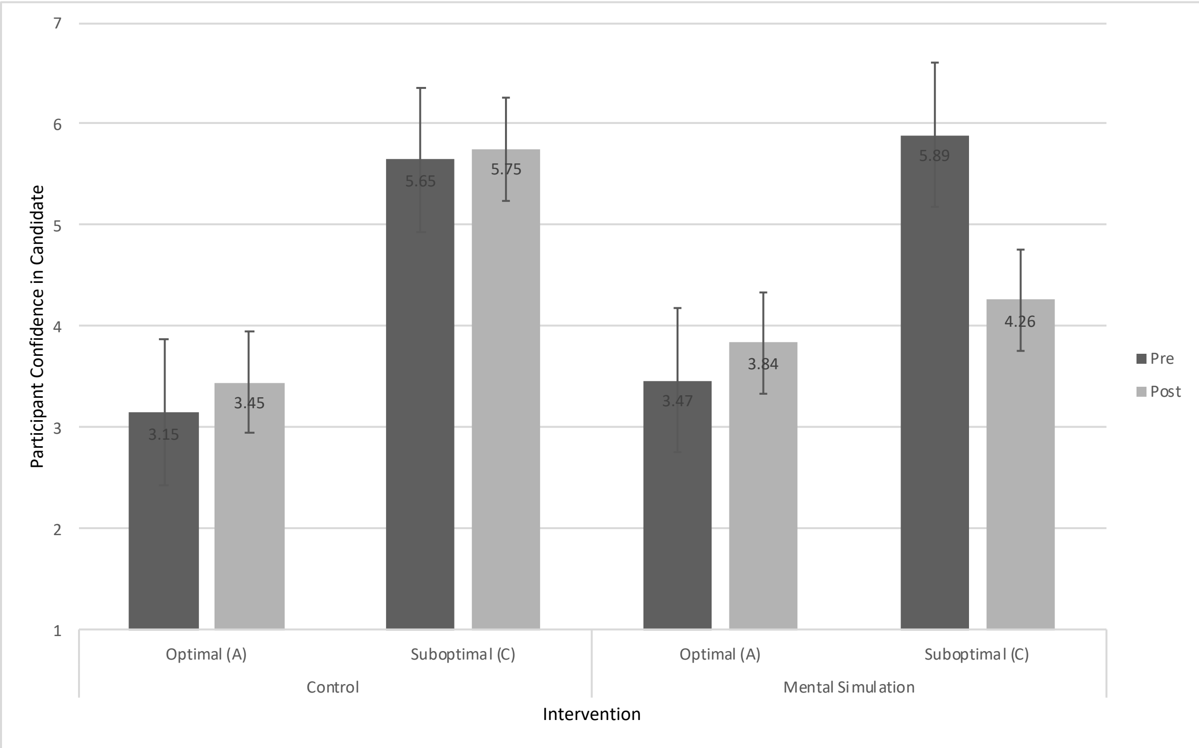
Hypothesis 6 anticipated that HP participants in the MS condition would be significantly less confident in the Suboptimal Candidate (C) as ‘best for the job’ measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). The data supported this. A paired samples t-test was significant, $t(18) = 5.14$, $p < .001$. There was no significant difference in the HP Control condition, $t(19) = -.70$, $p = .494$.

Participant confidence in optimal candidate (A) – HP condition.

Hypothesis 7 expected HP participants in the MS condition to be significantly more confident in the Optimal Candidate (A) measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). There was only weak support for this in the data: HP participants who underwent the MS intervention were more confident in the Optimal Candidate (A) as ‘best for the job’ measured at FDP-Full(Post) compared to FDP-Full(Pre). A paired samples t-test was marginally significant, $t(18) = -1.79$, $p = .090$. There was also a marginally significant difference in the HP Control condition, $t(19) = -2.04$ $p = .055$. (Figure 3).

Figure 3.

Means (Standard Deviations) for HP Participant Confidence in Optimal/Suboptimal Candidate by Intervention and Candidate (Study 6).



For completeness, I also analysed and report below the results for the MP condition for the same measures:

Participant confidence in suboptimal candidate (C) – MP condition.

A paired samples t-test confirmed there was no significant difference in confidence in the Suboptimal Candidate (C) as ‘best for the job’ between FDP-Full(Post) compared to FDP-Full(Pre) for participants in the MP condition, irrespective of whether they underwent a MS or Control task. Paired samples t-tests results for the two conditions were: Intervention, $t(37) = -1.26$, $p = .214$ and in the MP Control condition, $t(37) = .63$ $p = .534$.

Participant confidence in optimal candidate (A) – MP condition.

A paired samples t-test confirmed there *was* a significant difference in confidence in the Optimal Candidate (A) as ‘best for the job’ between FDP-Full(Post) compared to FDP-Full(Pre) for participants in the MP/MS condition, but not for those who undertook the

Control task. Paired samples t-tests for the two conditions were: MS, $t(37) = 2.35$, $p = .024$ ($M_{\text{HPFDP-FULL(POST)}} = 4.82$, $SD = 1.50$ versus $M_{\text{HPFDP-FULL(PRE)}} = 5.66$, $SD = 1.29$) and in the MP Control condition, $t(37) = -.35$ $p = .729$. Participants in the MP Condition were significantly less confident in the Optimal Candidate (A) following the intervention.

Exploratory Analysis

Although I had no specific hypothesis, I explored participants' overall confidence in their selection decision at FDP-Full(1-4 Pre) compared to FDP-Full(Post) and whether this was affected by the MS or Control task. I firstly examined participants in the HP Condition. There was a significant difference in participants' confidence: HP participants who underwent the MS did report a significant reduction in confidence between the two measurement points, $t(18) = -2.96$, $p = .008$ ($M_{\text{HPFDP-FULL(POST)}} = 3.00$, $SD = 0.82$ versus $M_{\text{HPFDP-FULL(PRE)}} = 2.53$, $SD = 1.12$). There was no Pre-Post difference in the HP Control condition, $t(19) = -1.23$, $p = .234$.

The picture differed in the MP condition, however, where participants reported no significant differences in confidence, irrespective of whether they underwent the MS or Control task. Paired samples t-test results for the two conditions were: MP/MS, $t(37) = -0.90$, $p = .376$ and in the MP/Control condition, $t(37) = -.90$, $p = .373$.

7.2.3 Discussion

Study 6 supported my hypotheses: the mental simulation attenuated the IPE. However, although the primary aim of this Study was to test the intervention against the IPE in the Hidden Profile condition, further analysis of results in the MP condition suggested an unintended consequence of the mental simulation intervention: specifically, MP participant confidence in the Optimal Candidate was significantly reduced and several MP participants, albeit a non-significant number, switched their selection from the Optimal to the Suboptimal Candidate following the intervention. Given that the intervention borrows from the

Premortem (Klein, 2003) which has achieved success as a confidence reduction technique (Veinott at al., 2010), this result is, perhaps unsurprising. Nonetheless, overall, decision quality was improved for participants in the Hidden Profile condition who undertook the mental simulation. Study 7 aimed to replicate the decision quality result with an organizational sample, where participants were required to be in full-time employment. I also wanted to test this organizational population for any gender differences in the IPE. The rationale for selecting an organizational sample is discussed further below (see 7.3.1)

7.3 Study 7

7.3.1 Overview and hypotheses

In Study 7, I wanted to test whether the effect of the mental simulation intervention could generalize to an organizational population. Mitchell (2012) meta-analysed the external validity of laboratory versus field-conducted psychological research and noted that laboratory and field effects from Industrial-Organizational psychology correlated highly (r = .89, n = 72, 95% CI [.83, .93]. However, when this was broken down by research topic, a mixed picture emerged. For example, ‘Personnel Management & Selection & Training’ correlated at r = .92, SD (of effect size) = .12, whilst, for ‘Group Processes and Interpersonal Processes’, the correlation was lower, at r = .58, SD = .18. Given that the studies reported in this Chapter are conducted online, one way to undertake an examination of the generalizability of these results is to specify a requirement for participants in the sample to be in full-time employment. Study 7 included this stipulation.

Mitchell (2012) also noted that relative effect sizes varied between the laboratory and the field, with smaller effect sizes in the laboratory being less likely to replicate in the field. Given the relatively small effect sizes in Study 6, I also determined to increase the sample size, and to allow for the expected number of exclusions of participants in the Hidden Profile condition who failed the manipulation check (i.e. by not selecting (or maintaining) the Suboptimal Candidate (C)).

Previous research on the IPE was primarily conducted using student samples (e.g. Faulmüller, et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch and Schulz-Hardt, 2010). A further rationale for adding the full-time employment criteria was to test whether more experienced decision-makers (a reasonable assumption to make about a sample engaged in full-time employment) came to different decision outcomes than (potentially) less experienced decision-makers. Specifically, I wanted to test whether a more experienced participant sample might be affected differently; firstly, by the IPE, and secondly by the mental simulation intervention.

Mitchell's (2012) meta-analytic findings would suggest the results from Study 6 should replicate in Study 7, so this was my expectation. My hypotheses were identical, as set out below, with differences derived from the Exploratory Analysis in Study 6 (**H12/H16**) :

H8: HP participants will select the Optimal Candidate (A) significantly less frequently than those in the MP condition, even after full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).

H9: HP participants will be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).

H10: HP participants will be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre))

H11: Female participants in the HP condition will demonstrate better improvement in decision quality than their male counterparts between viewing partial information (at IDP-PI) and viewing full information (FDP-Full(4-pre)).

H12: There will be no significant differences between information conditions (HP versus MP) in participants' overall confidence in their selection decision at FDP-Full(1/4 Pre).

Post-Intervention/Control Task:

H13: HP participants in the mental simulation condition making an initial suboptimal candidate selection will evidence significantly better decision quality by selecting the Optimal Candidate (A) following a mental simulation intervention (comparison point = FDP-Full(1/4-Pre) compared to FDP-Full(1/4-Post)). There will be no significant difference between these two measurement points for HP Control participants.

H14: HP participants in the mental simulation condition will be significantly less confident in the Suboptimal Candidate (C) as 'best for the job' measured at FDP-Full(Post) compared to FDP-Full(Pre). I expect no difference for HP Control Participants.

H15: HP participants in the mental simulation condition will be significantly more confident in the Optimal Candidate (A) measured at FDP-Full(Post) compared to FDP-Full(Pre). I expect no difference for HP Control Participants.

H16: HP Participants undertaking the mental simulation will be significantly less confident in their selection decision at FDP-Full(Post) compared to FDP-Full(Pre). There will be no difference for HP participants in the Control condition.

7.3.2 Method

Participants and Design

Two hundred and eighty participants recruited from Prolific Academic took part in the experiment in return for a small monetary payment (142 males, 133 females, five undeclared; age range 20-64, M_{age} = 34.29, SD = 9.26, one undeclared). Minimum age was stipulated as 18; exclusions were participants who undertook the previous studies and, as noted above, I specified that eligible participants must be in full-time employment. In Study

7, I recruited for a much larger participant sample than suggested by the power analysis to allow for the expected number of exclusions of participants in the Hidden Profile condition who failed the manipulation check (i.e. by not selecting (or maintaining) the Suboptimal Candidate (C)) and to try to achieve replicability of effect sizes (following Mitchell, 2012).

Design, materials, procedure and measures were all as Study 6.

7.3.3 Results

Pre-Intervention/Control Task

I firstly examined whether the Hidden Profile manipulation had successfully oriented participants in that (HP) condition towards the Suboptimal Candidate (C) based on partial candidate information viewed at the Initial Decision Point (IDP-PI). The Chi-square test was significant: 76.87% of HP participants initially preferred Candidate C, χ^2 (2, N = 147) = 125.43, p <.001. Candidate (A) was preferred by 12.24% and Candidate B by 10.88%. This confirmed the Suboptimal Candidate (C) manipulation was successful for participants in the HP condition.

I then examined the Final Decision Point Candidate Selection for Manifest Profile participants viewing one list (FDP-Full(1-Pre)). The Chi-square test was significant: 80.45% of MP participants preferred the Optimal Candidate (A), χ^2 (2, N = 133) = 132.92, p <.001. Candidate (B) was preferred by 9.02% and Candidate (C) by 10.53%. As anticipated, participants in the Manifest Profile Condition again overwhelmingly selected the Optimal Candidate (A).

Finally, I examined the Final Decision Point Candidate Selection for Hidden Profile (HP) participants, that is, after they had viewed all candidate information across the four separate lists (FDP-Full(4-Pre)). As in Study 6, a number of participants did correct their initial sub-optimal decision having viewed full candidate information across lists W, X, Y Z, the Chi-square test did, however, remain significant at FDP-Full(4-Pre), χ^2 (2, N = 147) =

34.16, $p < .001$. The Optimal Candidate (A) was preferred by 41.50% of HP participants following their viewing of all candidate attributes, Candidate (B) by 10.88% and Candidate (C) by 47.62% (by chance, this figure was identical to Study 6). Although a number of Hidden Profile participants did switch their candidate selection, Suboptimal Candidate (C) remained the preferred candidate of participants in the HP condition.

These findings replicated those of Studies 3 and 6: the majority of participants in the Manifest Profile condition selected the Optimal Candidate (A), whereas most participants in the Hidden Profile condition selected the Suboptimal Candidate (C) they were oriented to by their initial information, and maintained that suboptimal selection, even after viewing full information.

Following the identical analytic approach of Study 6 (see also Faulmüller et al., 2010; Toma et al., 2009, 2013), 34 participants in the HP Condition were excluded from the individual analysis because they failed the HP suboptimal candidate manipulation at IDP-PI, i.e. they did not select Candidate C. This left 246 participants in the analysis, split between the experimental conditions as follows: MP: $N = 133$; HP: $N = 113$.[2]

Information processing: decision quality

Selection of optimal candidate (A).

Hypothesis 8 was again supported by the data: HP participants selected the Optimal Candidate less frequently than participants in the MP condition, even after full candidate information disclosure at FDP-Full(1/4-Pre). 80.45% of MP participants selected the Optimal Candidate, compared to 34.51% in the HP condition. The chi-square test was significant, $\chi^2(1, N = 246) = 53.44$, $p < .001$, $\Phi = -.47$. This replicated the results of Studies 3 and 6:

[2] For completeness, I note that of the excluded HP participants, 16 selected the Optimal Candidate (A) at IDP-PI and maintained that selection at FDP-Full(4-Pre); two chose Candidate (A) and switched to Candidate (C). Six HP participants chose Candidate (B) at IDP-PI and switched to Candidate (A) at FDP-Full(4); two chose Candidate (B) and switched to Candidate (C), whilst eight chose Candidate (B) at IDP-PI and retained Candidate (B) as their selection at FDP-Full(4-Pre).

participants exposed to an initial Suboptimal Candidate manipulation were significantly less likely to select the Optimal Candidate A than those who viewed a one page bullet list, even after viewing full candidate information.

Selection of suboptimal candidate (C).

Turning to the Suboptimal Candidate C, as expected, there was also a significant difference between participants in the MP (10.53%) and HP (58.41%) conditions who selected this candidate, χ^2 (1, N = 246) = 63.83, $p < .001$, Φ = .51. These results again replicated Studies 3 and 6, confirming that participants in the HP conditions who were exposed to an initial Suboptimal Candidate manipulation and then viewed candidate attributes across four lists at FDP-Full(4), were significantly less able to distinguish Candidate C as the Suboptimal Candidate compared to those in the Manifest Profile condition at FDP-Full(1-Pre). Furthermore, participants in the Hidden Profile Condition remained significantly most likely to select Candidate C, even after viewing all candidate information, thus confirming the existence of the Individual Preference Effect in my online paradigm. This replicated the results of Studies 3 and 6: Hidden Profile participants were unable to correct their initial suboptimal selection. (Note – as in Study 3 and 6, given the relatively small number of participants who selected Candidate B in all conditions (MP = 12, HP = 16(IDP-IP) and HP = 8(FDP-Full(4-Pre)), I will not further analyse data related to this Candidate).

Decision Confidence

Participant confidence in suboptimal candidate (C) – HP condition.

Hypothesis 9 predicted HP participants would be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)). This was supported by the data: an independent t-test was significant, $t(203.45) = 8.88$, $p < .001$.

Participant confidence in suboptimal candidate (A) – HP condition.

Hypothesis 10 predicted HP participants would be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre). This was supported by the data: an independent t-test was significant, $t(244) = -6.64$, $p < .001$. (See Table 12 for all descriptive statistics).

Table 12.

Means (Standard Deviations) for Participant Confidence by Information Condition and Candidate (Study 7).

Candidate	Manifest Profile (N = 133)	Hidden Profile (N = 113)
Optimal Candidate (A)	5.74 (1.32)	3.95 (1.78)
Suboptimal Candidate (C)	3.58 (1.62)	4.91 (1.52)

Gender Differences in the IPE

Hypothesis 11 predicted female participants in the HP condition would be better able to overcome the IPE and demonstrate greater improvement in decision quality having viewed full information, (compared to initially viewing partial information at IDP-PI). This was supported by the data. This hypothesis was tested in two McNemar tests. Female participants in the HP condition demonstrated better improvement in decision quality than their male counterparts at FDP-Full(4-pre), based on viewing full information, compared to decisions made at IDP-PI: 29.51% of male participants corrected their selection from the Suboptimal Candidate (C) to the Optimal Candidate (A) – $p < .001$; however, this compared with 39.58% of female participants who corrected their selection from the Suboptimal Candidate (C) to the

Optimal Candidate (A)– $p < .001$. Again, both male and female participants in Study 7 achieved significant improvement in decision quality, but this result also suggests female participants outperformed their male counterparts and were better able to correct their initial Suboptimal Candidate (C) selection decision. This finding that female participants are, potentially, less affected by the IPE than male participants, is consistent with the exploratory finding of Study 3 and the result of Study 6.

I also tested for any gender differences in decision quality in the MP condition at the single decision point, based on viewing full information presented on 1-page (FDP-Full(1-pre)). Amongst male participants, 80.95% selected the Optimal Candidate (A) compared to 79.41% female participants. The chi-square test was not significant, χ^2 (1, N = 131) = .05, p = .825, Φ = -.02.

Overall Confidence in Selection Decision

Hypothesis 12 predicted no significant differences in participants' overall confidence in their selection decision at FDP-Full(1-4 Pre).This was not supported by the data: I did find a significant difference between the two information conditions, $t(244) = -2.34$, $p = .020$ (M_{MP} =2.18, SD = 0.99 versus M_{HP} =2.49, SD = 1.06). Participants in the Hidden Profile condition were significantly less confident overall compared to participants in the Manifest Profile condition.

In summary, the results of hypotheses 8-11 replicated the results of Study 6. This again supports my premise that this new online paradigm can induce the Individual Preference Effect and is a suitable task to test the efficacy of the mental simulation intervention. The result of H12 was not consistent with the findings of the Exploratory analysis 1 in Study 6. However, it is consistent with findings that the Premortem, on which the mental simulation in this thesis is based, is an effective confidence reduction technique

(Veinott et al., 2010). As before, I will now move on to consider the Post-intervention/Control task findings.

Post-Intervention/Control Task

I again tested my specific directional hypothesis regarding improvements in decision quality for participants in the Hidden Profile condition following the mental simulation, isolating the effect to participants who initially preselected and maintained their Suboptimal Candidate (C) selection at FDP-Full(4-Pre), even after viewing full candidate information. This left 66 participants for analysis: 36 and 30 in the Control and mental simulation conditions respectively. This subset of the data was used to test H13-H16.

Information Processing: Decision Quality

Hypothesis 13 was supported by the data: HP participants who underwent the mental simulation intervention switched to the Optimal Candidate (A) significantly more frequently between FDP-Full(4-Pre) and FDP-Full(4-Post) than HP participants who completed the Control task: 20% of HP MS participants switched from the Suboptimal Candidate (C) to select the Optimal Candidate (A), thereby solving the Hidden Profile, compared to 8.33% in the HP Control condition. I analysed the difference between FDP-Full(4-Pre) and (4-Post) in a McNemar's test. There was no significant difference in the Control condition, $p = .250$, but there was a significant difference in the MS condition, $p = .031$, confirming that the Intervention attenuated the IPE, evidencing a positive effect on decision quality. (For completeness, I also report that 13.33% of HP MS participants switched from Candidate (C) to Candidate (B) and the remainder (66.67%) maintained their initial Suboptimal Candidate (C) selection. In the Control condition, no participants switched from Candidate (C) to Candidate (B); the remainder (91.67%) maintained their initial Suboptimal Candidate (C) selection).

Decision quality – manifest profile condition.

I also examined the effect of the intervention on decision quality in the MP condition, comparing the number of participants who selected the Optimal Candidate (A) at FDP-Full(4-Pre) and (4-Post) in the MP/MS and MP/Control conditions. Neither produced a significant McNemar's result: in the MP/MS condition, 50 participants solved the HP at FDP-Full(1-Pre) and 43 at FDP-Full(1-Post) 4-Post), a non-significant reduction, $p = .189$. In the MP/Control condition, 57 participants solved the HP at T1 and 56 at T2, $p > .999$.

Decision Confidence

Participant confidence in suboptimal candidate – HP condition.

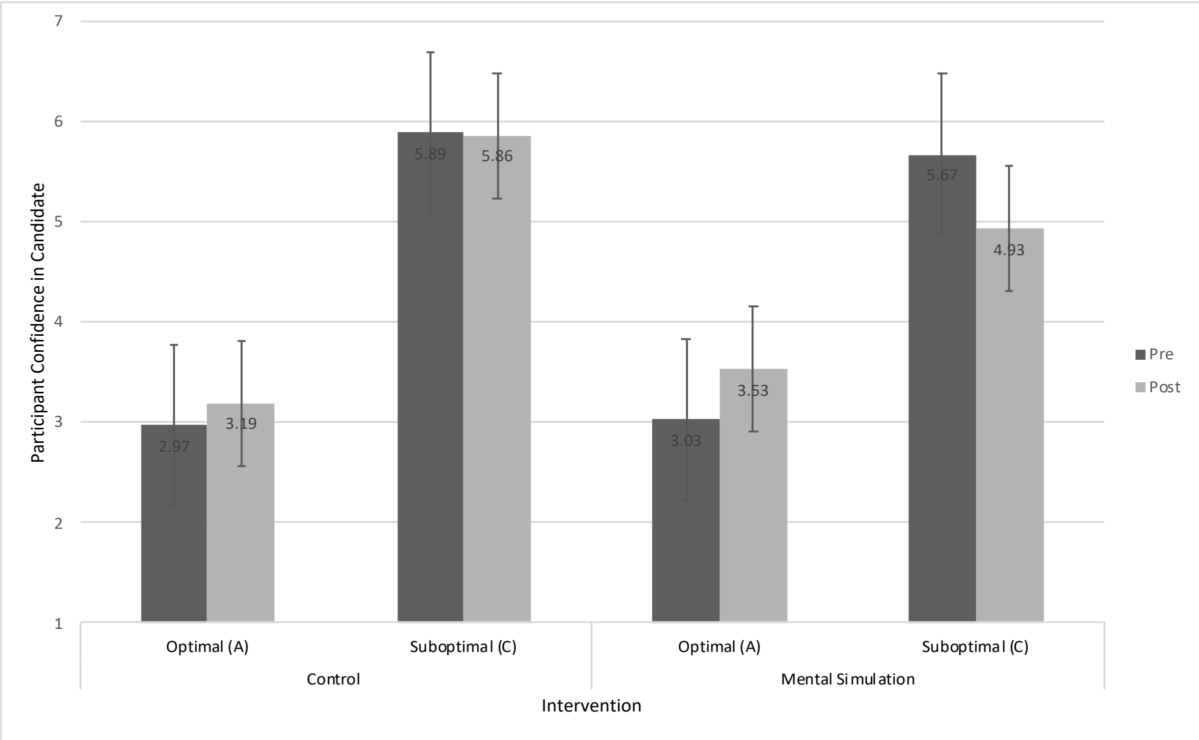
Hypothesis 14 was supported by the data: HP participants who underwent the MS intervention were significantly less confident in the Suboptimal Candidate (C) as 'best for the job' measured at FDP-Full(Post) compared to FDP-Full(Pre). A paired samples t-test was significant, $t(29) = 3.13$, $p = .004$. There was no significant difference in the HP Control condition, $t(35) = .15$, $p = .881$.

Participant confidence in optimal candidate – HP condition.

Hypothesis 15 was supported by the data: HP participants who underwent the MS intervention were significantly more confident in the Optimal Candidate (A) as 'best for the job' measured at FDP-Full(Post) compared to FDP-Full(Pre). A paired samples t-test was significant, $t(29) = -2.10$, $p = .045$. There was no significant difference in the HP Control condition, $t(35) = -1.54$ $p = .132$ (Figure 4).

Figure 4.

Means (Standard Deviations) for HP participant confidence in Optimal/Suboptimal Candidate by intervention and candidate (Study 7).



For completeness, I also analysed and report below the results for the MP condition for the same measures:

Participant confidence in suboptimal candidate (C) – MP condition.

A paired samples t-test confirmed there was no significant difference in confidence in the Suboptimal Candidate (C) as 'best for the job' between FDP-Full(Post) compared to FDP-Full(Pre) for participants in the MP condition, irrespective of whether they underwent a MS or Control task. Paired samples t-tests for the two conditions were: MS, $t(64) = 0.10$, $p = .921$ and in the MP Control condition, $t(67) = 0.50$ $p = .616$.

Participant confidence in optimal candidate (A) – MP condition.

A paired samples t-test confirmed there was a significant difference in confidence in the Optimal Candidate (A) as 'best for the job' between FDP-Full(Post) compared to FDP-Full(Pre) for participants in the MP/MS condition but not for those who undertook the Control task. Paired samples t-tests for the two conditions were: MS, $t(64) = 3.93$, $p < .001$ ($M_{\text{HPFDP-FULL(POST)}} = 4.82$, $SD = 1.50$ versus $M_{\text{HPFDP-FULL(PRE)}} = 5.66$, $SD = 1.29$) and in the MP Control condition, $t(67) = -0.38$ $p = .704$

Overall confidence in selection decision.

Hypothesis 16 predicted HP Participants undertaking the MS would be significantly less confident in their selection decision at FDP-Full(Post) compared to FDP-Full(Pre), with no difference for HP participants in the Control condition. This was not supported by the data. In the HP Condition, there was no significant difference in participants' confidence between the two measurement points, irrespective of whether they completed the Intervention or Control task. Paired samples t-test results for the two conditions were: HP Intervention, $t(29) = -1.68$, $p = .103$ and in the HP Control condition, $t(35) = 0.22$ $p = .831$.

The picture differed in the MP condition, however, where participants who underwent the MS reported a significant reduction in confidence between the two measurement points, $t(64) = -4.37$, $p < .001$ ($M_{\text{HPFDP-FULL(POST)}} = 2.83$, $SD = 1.05$ versus $M_{\text{HPFDP-FULL(PRE)}} = 2.32$, $SD = 1.03$). There was no Pre-Post difference in the Control condition, $t(67) = 0.94$, $p = .350$.

Results of the key findings are summarised in Table 13 below for ease of reference:

Table 13.

Summary of Results of Key Findings (Study 6/7).

Hypothesis	Hyp. No.	Study 6 Result	Study 7 Result
HP participants will select the Optimal Candidate (A) significantly less frequently than those in the MP condition, even after full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).	1/8	Supported: χ^2 (1, N = 144) = 31.42, p <.001, Φ = .47	Supported: χ^2 (1, N = 246) = 53.44, p <.001, Φ = -.47
HP participants will be significantly less confident in the Optimal Candidate (A) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).	2/9	Supported: t(136.92) = 5.16, p < .001	Supported: t(203.45) = 8.88, p < .001
HP participants will be significantly more confident in the Suboptimal Candidate (C) as 'best for the job' versus MP participants, even following full candidate information disclosure (comparison point = FDP-Full(1/4-Pre)).	3/10	Supported: t(138.41) = -6.79, p < .001	Supported: t(244) = -6.64, p < .001
Female participants in the HP condition will demonstrate better improvement in decision quality than their male counterparts between viewing partial information (at IDP-PI) and viewing full information (FDP-Full(4-pre)).	4/11	Supported: Male: p = .002 (30.30%) Female: p < .001 (50.00%)	Supported: Male: p < .001 (29.51%) Female: p < .001 (39.58%)
There will be no significant differences in participants' overall confidence in their selection decision at FDP-Full(1/4 Pre).	12		Not supported: t(244) = -2.34, p = .020. (Participants in the Hidden Profile condition were significantly less confident overall compared to participants in the Manifest Profile condition.)

HP participants in the Mental Simulation (MS) condition making an initial suboptimal candidate selection will evidence significantly better decision quality by selecting the Optimal Candidate (A) following a MS intervention (comparison points = FDP-Full(4-Pre) compared to FDP-Full(4-Post)). No significant difference for HP Control participants.	5/13	Supported: HPMS: *p*= .031 (31.57%) HPControl: *p* = 1.00 (0.00%)	Supported: HPMS: *p*= .031 (20.00%) HPControl: *p* = .250 (8.33%)
HP participants in the Mental Simulation (MS) condition will be significantly less confident in the Suboptimal Candidate (C) as 'best for the job' measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). No difference for HP Control Participants.	6/14	Supported: HPMS: $t(18) = 5.14$, $p < .001$ HPControl: $t(19) = -0.70$, $p = .494$	Supported: HPMS: $t(29) = 3.13$, $p = .004$ HPControl: $t(35) = 0.15$, $p = .881$
HP participants in the Mental Simulation (MS) condition will be significantly more confident in the Optimal Candidate (A) measured at FDP-Full(4-Post) compared to FDP-Full(4-Pre). No significant difference for HP Control Participants.	7/15	Weak Support: HPMS: $t(18) = -1.79$, $p = .090$ HPControl: $t(19) = -2.04$ $p = .055$	Supported: HPMS: $t(29) = -2.10$, $p = .045$ HPControl: $t(35) = -1.54$ $p = .132$
HP Participants undertaking the Mental Simulation (MS) will be significantly less confident in their selection decision at FDP-Full(Post) compared to FDP-Full(Pre). No difference for HP participants in the Control condition.	16		Not supported: HPMS: $t(29) = -1.68$, $p = .103$ HPControl: $t(35) = 0.22$ $p = .831$

7.4 Discussion

Studies 6 and 7 extended previous literature relating to the Individual Preference Effect in the Hidden Profile by firstly replicating the results of Study 3 (Chapter 5) testing a new online paradigm of an individual HP candidate selection task, based on a comparison of decision quality and candidate confidence between MP and HP participants. More importantly, these studies added to Study 3 and previous literature by testing an online version of a mental simulation intervention as a means of improving individual decision quality amongst Hidden Profile participants and positively impacting participant confidence in the Optimal and Suboptimal Candidates. Across both studies, participants in the Hidden Profile condition who underwent the mental simulation: (i) demonstrated improvements in decision quality, selecting the Optimal Candidate (A) more frequently following the intervention; (ii) they also reported increases in confidence in the Optimal Candidate (A), and; (iii) decreases in confidence in the Suboptimal Candidate (C) as ‘best candidate for the job’. As noted previously, Arnott (2006) highlighted *confidence biases* as particularly damaging and leading to prejudiced decision-making: not only do these biases increase a person’s belief in their own ability as a decision-maker, but they also curtail the search for new information relating to the decision task. As I noted in Chapter 5, given the high levels of confidence Hidden Profile participants reported in their initial Suboptimal Candidate selection, an important goal of the mental simulation was to dislodge and reduce that confidence. The results reported in these studies suggest that was achieved.

These results are important: when taken together with the positive results groups achieved in Studies 4 and 5 (Chapter 6), following the intervention: they demonstrate that mental simulation can lead to improvements in *both* face to face decision-making groups *and* online, in individual decision tasks. This presents strong support for the efficacy of mental simulation as a response to Greitemeyer & Schulz-Hardt’s (2003) admonition that "interventions should not exclusively focus on correcting dysfunctional group-level processes; instead, they should also be directed at debiasing the group members' individual information processing" (p.337).

The results of Study 6 and 7 also strongly support the suggestion of gender differences in the IPE, something which the extant literature does not appear to have contemplated or tested. In both studies, female participants in the Hidden Profile condition demonstrated greater improvement in decision quality when moving from viewing partial to full information than did their male counterparts. This suggests female participants were more able to overcome the IPE and identify the correct solution when presented with all of the information to do so.

7.4.1 Limitations and future directions

A clear limitation of these findings is the unlooked for effect on confidence and decision quality for Manifest Profile participants who underwent the mental simulation. As I have highlighted throughout, the Premortem, on which the mental simulation is based, has achieved success as a confidence reduction technique (Veinott et al., 2010) and these results underscore that. Although the reduction in the number of participants in the Manifest Profile condition selecting the Optimal Candidate (A) following the intervention was *not* statistically significant, it is notable and must be acknowledged as a limitation of the intervention.

Furthermore, MP participants who underwent the mental simulation reported significant reductions in confidence in the Optimal Candidate (A) and in their overall level of confidence in their selection decision. Perhaps it is the case that the mental simulation has a greater effect at the individual rather than the group level. If this is the case, then perhaps shaking the confidence of individual decision-makers, even those who select correctly, may be beneficial. Recall that Russo and Schoemaker (1992) noted that, although group judgements may force a compromise or even encourage open-mindedness, problems may still arise in groups if individuals remain too strongly anchored to their initial view and return to it given the chance. It is also possible that a group discussion could ‘soften’ the impact of the mental simulation at the individual group member level. Further research may take up the challenge posed by Fisher (2017), examining the optimal point for the mental simulation to occur in the decision-making process.

As noted, the results of both studies strongly support the suggestion of gender differences in the IPE, something which the extant literature does not appear to have contemplated or tested. Female participants in the Hidden Profile condition demonstrated greater improvement in decision quality when moving from viewing partial to full information than did their male counterparts, suggesting they were better able to overcome the IPE. Previous research has suggested gender differences in information processing: females engage in more detailed elaboration of message content and more detailed processing. By contrast, male processing is more selective, focused more on the overall message themes and deploys a schema-based strategy. Using a product purchase task, Darley and Smith (1995) found that not only were females comprehensive processors, more likely to consider both objective and subjective aspects of product purchase and use, but they were also more likely to change their processing strategy in response to increased product risk. By contrast, males did not change their processing strategy, as a consequence of their reliance on highly available and salient focal cues. This work has parallels with the Hidden Profile task in these online studies: the challenge for participants is to switch from their initial preferred Suboptimal selection to the Optimal selection when presented with new information, which requires a change in processing approach.

Across Studies 3, 6 and 7, results for gender differences on decision quality were derived from relatively small samples, creating concerns around power. The differences in female versus male decision quality improvement were also inconsistent. I therefore resolved to address these concerns by meta-analysing the gender difference results of these studies, together with two further studies, on this decision quality measure and several other measures, including: (i) mean confidence in the Optimal (A) and (ii) Suboptimal (C) Candidates; (iii) overall confidence in selection decision; and (iv) difficulty in changing the selection decision. This meta-analysis is reported in Chapter 8.

Chapter 8: He Says Yes, She Says No

8 Summary

Study 8 returns to the Individual Preference Effect (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010) discussed in Chapters 5 and 7, viewed through the lens of gender differences in decision-making.

Results from Studies 3, 6 and 7 point to potential differences in the ability of male and female participants to overcome the IPE: specifically, female participants in the Hidden Profile condition demonstrated greater improvement in decision quality when moving from viewing partial to full information than did their male counterparts, suggesting they were more able to overcome the IPE and identify the correct solution when presented with all of the information to do so. This gender differential in the IPE is an interesting finding, one not contemplated by previous IPE research. It may also offer a potential explanation for the mixed findings regarding the effect of diversity in improving group decision-making. For example, a meta-analysis of 120 diverse group studies into Top Management Team diversity (Homberg & Bui, 2013) found no evidence for any underlying empirical effect of diversity in improving decision-making. Could this finding be down not only to the IPE, but also the fact that it might impact differentially based on gender?

Goh, Hall, and Rosenthal (2016) set out a series of arguments for conducting meta-analysis on one's own studies including the ability to: (i) focus on effect sizes; (ii) clarify the results picture; (iii) offer a succinct summary of the results across studies; and (iv) leverage the statistical power provided by a meta-analysis. Accordingly, Study 8 seeks to further examine the possible finding of a gender differential in the IPE through meta-analysing the results of five individual online studies: firstly, the three studies reported in Chapters 5 (N = 120) and 7 (N = 160 and N = 280), which have already demonstrated the existence of the IPE on participants in the Hidden Profile condition, together with the adverse effect it has on decision quality. In addition, I include two further online studies (N = 160 and N = 240)[3]

Results from the meta-analysis show significant gender differences in participant decision quality, as well as on a range of other relevant variables, suggesting that the IPE may have differing effects by gender.

8.1 Theoretical background

8.1.1 Diversity and decision-making

There is a continuing drive to raise numbers of women and ethnic minorities in senior leadership positions. In the UK, unofficial 'targets' have increased the percentage of women on FTSE 100 boards to 32%, with a target of 33% for 2020 (Cranfield, 2019). A consequence of increased social diversity in organizations and institutions is the management of group decision-making and governance, which is still little understood (e.g. del Carmen Triana, Miller, & Trzebiatowski, 2014).

A summary of research prepared by Catalyst (2013) set out a strong business case for increasing gender diversity within organisations, summarising a number of areas associated with greater gender diversity, including: (i) improved financial performance; (ii) improved Return on Equity; and (iii) better performing teams when judged on profits and sales, although much of this research, around financial performance in particular, is correlational so no causal link can be established (Catalyst, 2018).

When it comes to decision-making, empirical evidence to support the benefits of gender diversity is, in fact, mixed. Homberg and Bui (2013) found no evidence for any underlying empirical effect of gender diversity in improving decision-making in a meta-analysis of 120 diverse group studies into Top Management Team diversity (age and ethnicity were dropped from their analysis due to insufficient studies). This led them to

[3] Not analysed or reported in detail in this thesis due to space constraints.

conclude that "the existence of the diversity-performance link must be questioned" (p.469). However, much of the extant literature on gender decision-making does not seem to contemplate the IPE (Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010), nor the possibility that this effect may differ by gender. It is not inconceivable that this may be one underlying explanation for the mixed results achieved for the effect of gender on decision-making. I will firstly begin by recapping the IPE.

8.1.2 The IPE: recap

Challenges to group decision-making operate not only at the group level but also at the individual group member level in the form of the Individual Preference Effect: (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch & Schulz-Hardt, 2010). The IPE offers a supplementary explanation for groups' failures in Hidden Profile tasks. The effect of the IPE is such that individual group members are unable to amend their initial suboptimal selection decision and remain committed to this, even when presented with full information enabling them to make the correction. The IPE is a significant contributing factor to groups' failures to solve the Hidden Profile. A comparison against real interacting groups suggested almost half of all groups would fail to solve the Hidden Profile, even when all information was exchanged and no co-ordination losses occurred, as a consequence of the IPE (Faulmüller at al., 2010).

The IPE appears to be largely driven by preference consistent evaluation of information. Greitemeyer and Schulz-Hardt (2003) found that the IPE was at least partially mediated by the biased evaluation of the importance and valence of information supporting the individual group members' initial suboptimal selection. Individual group members remain focused on the positive attributes of their initial suboptimal selection, whilst at the same time discounting any negative attributes of that selection, which may emerge during the group discussion. This significantly increases the threshold difficulty for solving the Hidden Profile.

My exploratory analysis in Study 3 suggested female participants in the Hidden Profile condition demonstrated better improvement in decision quality than their male counterparts in correcting their initial suboptimal decisions (made based on partial information) once full information was made available to them. This was further supported by similar results in Studies 6 and 7. No differences in decision quality were found for male versus female participants in the Manifest Profile (MP) condition, where all candidate attribute information was made immediately available to all participants on one page (results also suggested the IPE *was not* induced in the MP condition). This result, specific to the HP condition, suggests female participants were better able to correct their initial Suboptimal Candidate selection decision and, potentially, were less affected by the IPE.

Faulmüller et al. (2010) speculated that one possible reason for the IPE was differing amounts of cognitive resources being allocated to the processing of preference consistent versus inconsistent information: preference consistent information matches with prior beliefs, thus there is no need to challenge it and it can be accepted easily and quickly. Conversely, information which is not congruent with prior beliefs requires more cognitive resources to examine, making the acceptance process much more difficult. This Chapter examines whether previously identified gender differences in information processing, information use and decision-making confidence may help to understand whether, or how, male and female participants are affected differently by the IPE.

8.1.3 Gender differences in decision-making

It has long been suggested that men and women differ in their approaches to decision-making. Stereotypical views suggest that men are rational and analytic in their approach, whilst women are more intuitive (see Delaney, Strough, Parker, & de Bruin, 2015 for a discussion). As I noted in Chapter 1, research suggests two different modes of cognitive processes in decision-making: System 1, which occurs spontaneously; and System 2, which requires considerably more effort, motivation and concentration (Stanovich & West, 2000; Kahneman, 2011). A popular test of these two systems is the Cognitive Reflection Test (CRT: Frederick, 2005), a three-item test designed to measure an individual's ability to override an initial incorrect response and to engage in more detailed and further reflection, required in order to achieve the correct response. An example of an item from the CRT is "A bat and a ball cost $1.10 in total. The bat costs a dollar more than the ball. How much does the ball cost? ___ cents" [Correct answer = 5 cents; intuitive answer = 10 cents]. Supporting the classic gender stereotype, Frederick and colleagues found that men performed significantly better than women on the CRT; results suggested men were more likely than women to reflect on their answers and less inclined to go with their intuitive responses.

In a study designed to extend the three-item CRT into a seven-item scale, Toplak, West, and Stanovich (2014a) replicated the gender effect found by Frederick (2005) in the original three-item CRT and in the four new items, where men again significantly outperformed women. Effect sizes (Cohen's *d*) for the original three items and the new four items were remarkably similar at .637 and .652 respectively, indicating a medium to large effect. Extrapolating these findings to the potential impact of the IPE in the Hidden Profile, I can observe similarities to the CRT. The first response of selecting the suboptimal solution is - relatively - automatic. The effort needed to overcome that and integrate the additional information in order to correct to the optimal solution, requires proper reflection and a rejection of the intuitive response. Frederick's findings with respect to the CRT might suggest a possible gender difference in the IPE, such that men will be less affected by women by the IPE and demonstrate improved decision quality by overcoming the IPE.

Research elsewhere, however, paints a very different picture of gender differences in decision-making. Byrne and Worthy (2015) set up a dynamic decision-making task to examine gender differences in reward sensitivity and information processing: In Study 1, the optimal strategy was to forgo one option offering immediate and larger rewards in favour of one offering larger but delayed rewards. In Study 2, the optimal strategy was reversed, so that the selection of the larger, immediate rewards was optimal. Results showed male participants were more likely to perform better in the first task than females. Conversely, females outperformed males in the second task. Byrne and Worthy attributed this to gender differences in decision-making as a consequence of different information processing styles: positing that females were more comprehensive processors of information, able to maximize either immediate or long-term benefits in different situations, whilst males processed information more selectively, and demonstrated a cognitive bias towards maximizing long-term benefits.

Gender differences in decision-making: processing.

Research into the differing effects of advertising on the genders supports the view that males and females have different processing styles. Meyers-Levy and colleagues (Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991) examined gender differences in responses to advertising messages and developed the "selectivity theory". This suggested differences in information processing between the genders: females engage in more detailed elaboration of message content and more detailed processing. By contrast, male processing is more selective, focused more on the overall message themes, and deploys a schema-based strategy. This finding was empirically supported by Darley and Smith (1995) in a study using a product purchase task. Findings showed that not only were females comprehensive processors, more likely to consider both objective and subjective aspects of product purchase and use, but they were also more likely to change their processing strategy in response to increased product risk. By contrast, males did not change their processing strategy, as a consequence of their reliance on highly available and salient focal cues. Meyers-Levy and Sternthal (1991) attributed these differences to women having a lower elaboration threshold around message cues than their male counterparts. Women were much more likely to engage in deeper elaboration at lower thresholds than men, particularly when faced with more incongruent cues – that is, those more at odds with the 'typical' thrust of the message/content. This made them more able to apply these cues in reaching their judgments. Applying this to the current research, overcoming the IPE (and solving the Hidden Profile) requires a cognitive shift from participants when they move from viewing information which is – deliberately - highly favouring of a suboptimal solution, to viewing all information, which contains not only information favouring an *alternative* solution, but information which should also cause them to positively reject the initially favoured solution. If women are more able to engage with incongruent cues, this suggests they may have an advantage over their male counterparts in overcoming the IPE.

Gender differences in decision-making: information use

These processing differences also have implications for how the two genders approach and use information they are presented with. Chung and Monroe (1998) compared the performance of male and female accounting students in an evaluation task containing equal numbers of confirming and disconfirming cues: students were required to rate the importance of the cues to their hypothesis. Results from the study supported Chung and Monroe's prediction that male students were significantly more likely to ignore disconfirming information and were more hypothesis-confirming than their female counterparts, although they did not rate confirming evidence as more important than female students, nor did they assign more importance to confirming information.

One implication of a failure to account for disconfirming information is that solutions can be arrived at too quickly, before all information has been properly considered, resulting in suboptimal outcomes. This is consistent with the findings from extant Hidden Profile research, suggesting that group members actively seek out preference-consistent information which best aligns with their (suboptimal) pre-discussion selections. For example, Reimer et al. (2007) found that group members failed to integrate information contradicting their pre-discussion preferences.

In a follow up study, Chung and Monroe (2001) linked their earlier research finding to task complexity, noting that females became more efficient relative to males as information load and task complexity increased. They attributed this finding to females' greater ability to process multiple or inconsistent/incongruent cues, make finer distinctions between cues, as well as their better ability to recall and integrate cues. Using an audit-based review task, Chung and Monroe found that male students made less accurate judgments as task complexity increased. Conversely, female students' judgments were not significantly affected by additional information, even when much of it was incongruent or inconsistent. In a typical Hidden Profile paradigm, participants are presented with additional information following their initial suboptimal selection (based on only partial information) and need to integrate this to successfully correct their decision. Chung and Monroe's findings suggest female participants may outperform their male counterparts in overcoming the effect of the IPE, by evidencing more ability to correct their initial suboptimal decision in favour of the optimal one, once all relevant information is revealed.

Gender differences in decision-making: task and decision confidence

The results from Studies 3, 6 and 7 suggest that reducing confidence in the initial suboptimal candidate selection may be one key to overcoming the IPE and improving decision-making outcomes, so how the genders differ in confidence with respect to their decision-making may also have implications for their ability to overcome the IPE. A further factor to consider in this analysis of gender differences in decision-making is, therefore, whether task and decision confidence varies in male and females and, if so, how this may manifest itself in gender differences in the IPE.

In a review of gender differences in economic experiments, Croson and Gneezy (2009) noted that, whilst both men and women were overconfident, men were more overconfident in their success in situations of uncertainty compared to women. For example, in investment decisions, they noted that women were almost always less confident than men. Similarly, they noted that research suggests men display substantially more confidence with respect to their relative task performance (e.g. in mathematical problems) than women. There is further support for this elsewhere in the literature. For example, Kelley and Lemke (2015) used an analysis of a television game show involving a decision task ('Cash Cab') to demonstrate that, whilst women considered all information available to them, including poor plays and good plays, men appeared unduly influenced by their overall confident good play. They also noted that women appeared less confident than men, even in their correct answers. This finding is consistent with research into gender differences using the Iowa Gambling Task, a task used to study decision-making processes in conditions of uncertainty. The task is to earn as much money as possible: two decks offer long-term losses but the chance of big immediate rewards. The other two decks will win in the long-term but offer an immediate smaller award. Van den Bos et al. (2013) found that women focused on win-loss frequencies and were more sensitive to occasional losses in the longer-term winning decks.

8.1.4 Chapter overview and hypotheses

Results from Studies 3, 6 & 7 suggested that, in contrast to their male counterparts, female participants in the Hidden Profile condition demonstrated improved decision quality and were more able to correct their initial suboptimal candidate selection decision, based on partial information, when all candidate attribute information was subsequently made available to them. However, across five online studies, results for gender differences on decision quality were inconsistent and derived from small samples, creating concerns around power. Adopting the arguments of Goh et al. (2016), I therefore resolved to address these concerns by meta-analysing the results of the five studies on this decision quality measure and several other measures, including: (i) mean confidence in the Optimal (A) and (ii) Suboptimal (C) Candidates; (iii) overall confidence in selection decision; and (iv) difficulty in changing the selection decision. Based on extant literature in gender differences in decision-making, I hypothesized the following:

H1: Female participants will be better able to overcome the IPE and demonstrate more improved decision-making than male participants having viewed full candidate attribute information.

H2: Female participants will be more confident in the Optimal Candidate (A) than male participants having viewed full candidate attribute information.

H3: Female participants will be less confident in the Suboptimal Candidate (C) than male participants having viewed full candidate attribute information.

H4: Female participants will report lower overall confidence in their candidate selection decision compared to male participants having viewed full candidate attribute information.

H5: Female participants will report less difficulty in correcting and amending their candidate selection decision than male participants, having viewed full candidate attribute information.

8.2 Study 8

8.2.1 Method

The Studies

Studies for this meta-analysis include the three online individual studies reported in Chapters 5 and 7. These were supplemented by two further individual studies not included in this thesis, designed to explore whether manipulating the gender of Candidates (A), (B) and (C) had any effect on decision quality in Manifest and Hidden Profile conditions, using the same online Hidden Profile paradigm developed and reported in Chapters 5 and 7. In these two additional studies, the candidate attribute lists were clearly annotated with the gender of the candidate (see Appendix F). In all other respects, these studies were identical to that reported in Chapter 5, with the exclusion of the No Preference condition, since my specific focus was on comparing responses from participants in the Manifest and Hidden Profile conditions only. Preliminary analysis of the *candidate* gender manipulations showed no or non-significant effects. Accordingly, these conditions were collapsed and I then analysed the results by participant gender, combining them with the three prior online individual studies to create the meta-analytic sample for Study 8.

The focus of this meta-analysis is participants in the Hidden Profile condition in the five studies. However, I have also reported results of a meta-analysis of gender differences for participants in the Manifest Profile condition across these same studies. In the Manifest Profile condition there is only one decision point, which occurs after participants have viewed the one page list containing full candidate attribute information for all three candidates (FDP-Full(1)). Accordingly, the meta-analysis of participants in the Manifest Profile condition will report gender differences based on: (i) decision quality (whether or not the Optimal Candidate (A) was selected); (ii) participant confidence in the Optimal Candidate (A); (iii) participant confidence in the Suboptimal Candidate (C); and (iv) participant overall confidence levels in their candidate selection decision.

Participants and Design

Participants were recruited from Prolific Academic and took part in the experiment in return for a small monetary payment. Table 14 reports all participant numbers. All studies stipulated a criterion that participants should be a minimum age of 18. Participants were prevented by the software from taking part in more than one study. For the fifth study, a further participant criterion was added, which specified that participants needed to be engaged in full-time employment.

Table 14.

Study Details Including Total Participants and Split by Information Condition (Study 8).

Study	Total *N*	Manifest Profile *N*	Hidden Profile *N*
1	120	37	33
2	160	76	67
3	160	73	56
4	240	126	70
5	280	132	109

As reported in Chapter 5, the design of the first study was a mixed 3 Information Condition: Manifest Profile (MP) *vs.* Hidden Profile (HP) *vs.* No Preference (NP) X 2 Time: Initial Decision Point-Partial Information (IDP-PI: HP Only), Final Decision Point (FDP-Full) experimental design, with Decision Point as the within participants factor, only in the HP Condition. The subsequent studies excluded the No Preference condition, as I was specifically interested in comparing results of participants in the Manifest versus Hidden Profile conditions only. Additionally, for the purposes of this meta-analysis, I will not be considering the mental simulation. I am comparing gender decision quality (and the other measures) *prior* to the mental simulation intervention, with the aim of increasing our understanding of the impact of the IPE.

Hidden Profile Materials

To recap Chapter 5, the HP decision task material was adapted from Baker's (2010) group activity: participants were asked to choose between three candidates – (A), (B) and (C) - for the position of president of a new campus of a university. All participants received a brief description of the job and key selection criteria. Each candidate had 16 items of information drawn from interviews, references, personal observations, etc., typical of a real hiring scenario. Full information described Candidate (A) as the Optimal Candidate for the role with eight favourable, four neutral and four unfavourable characteristics; Candidates (B) and (C) each had four favourable, eight neutral, and four unfavourable characteristics (Table 7). All participants received full information on each candidate before making their final choice, but the form of the initial information distribution varied by condition (see Procedure below).

Procedure

The experiment was delivered online and was as described in Studies 3, 6 and 7. Only two conditions are of interest for this meta- analysis: the Manifest and Hidden Profile conditions. This will enable a direct comparison of gender differences in these two conditions: (i) in the Manifest Profile condition, where all candidate attribute information is immediately available, presented on one page; and (ii) in the Hidden Profile condition, where participants are presented initially with partial information favouring a Suboptimal Candidate (C), followed by full information presented over four pages, which should enable them to correct their initial suboptimal selection. This is summarised below.

Manifest profile (MP).

Participants in the MP condition viewed a one page list setting out full candidate information in bullet form, beginning with information about Candidate (A), then (B), then (C) (Appendix B). Participants were told their information was identical to their fellow, (fictitious) group members and asked to make one individual candidate selection decision based on the information held by them (FDP-Full(1)).

Hidden profile (HP).

Participants in the HP condition firstly made an Initial Decision Point-Partial Information (IDP-PI) selection, based on viewing partial candidate information on only one single list, either W, X, Y, Z (Appendix B: presentation of the lists was randomized). After making an IDP-PI selection, Hidden Profile participants then viewed their own information again, plus the information of their 'fellow group members' (they were told this information was not necessarily the same) – all lists W, X, Y Z (presentation was randomized) - and were asked to review their IDP-PI candidate selection, specifically whether they wanted to maintain or change that selection. This constituted their Final Decision Point (FDP-Full(4)).

The candidate attribute lists for the two studies not included in this thesis differed insofar as they were clearly annotated with the gender of the candidate (Appendix F). These annotations had no impact on the results reported in these studies, so this variable was collapsed for the purposes of this meta-analysis.

Measures

The following measures were subject to meta-analysis:

Decision quality.

Decision quality was a dichotomous measure, based on whether participants selected the Optimal Candidate (A) (coded 1) or a Suboptimal Candidate (coded 0).

Participant confidence in suboptimal/optimal candidate.

The second dependent variable was participant confidence in the Candidates. Following their candidate selection, participants were asked to record their level of confidence in each candidate for the job by responding to the statement "*I think Candidate A/B/C would be the best person for the job*", on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). I consider this measure important to better understand how the IPE may affect participant confidence levels in the Optimal and Suboptimal candidates.

Participant confidence in selection decision.

The third dependent variable asked participants to measure the level of their overall confidence in their selection decision, by responding to the statement "I am confident in my selection decision" on a 7-point Likert scale (1 = *strongly agree* to 7 = *strongly disagree*).

Participant difficulty in changing selection decision.

Participants in the Hidden Profile condition were asked how difficult they found it to change their selection decision from their initial choice, based on partial information only, which oriented them towards the Suboptimal Candidate (C) (IDP-PI) followed by viewing full information spread across all four lists. Participants were asked to respond to the statement "I found it difficult to change my selection decision" on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree.* The mid-point – 4 was *"I did not change my selection decision"*).

Meta-analytic Software

The meta-analyses effect sizes were calculated using 'Meta-Essentials' (version 1.1) [Excel spreadsheet] (Suurmond, van Rhee, & Hak, 2017). This is a set of Excel spreadsheet workbooks which is free to use and which can be downloaded from an accompanying website (www.meta-essentials.com) together with an accompanying user manual (Van Rhee, Suurmond, & Hak, 2015). Both the workbooks and the manual are licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. The seven workbooks comprise one generic workbook, calculating effect size data; three workbooks related to the *d*-family, calculating odds ratio/risk ratios or risk difference and standardized mean difference: Cohen's *d* or Hedges' *g*; and three workbooks relating to the *r*-family, calculating the zero-order correlation coefficient, partial and semi-partial correlation coefficients. These workbooks have been extensively validated by the authors against a range of other meta-analytic packages (see Suurmond et al., 2017 for a discussion and details of published meta-analyses using Meta-Essentials). All results were obtained from random-effect models, with the usual assumptions, (i.e. that observed effect sizes are drawn from a population of studies with varying effect sizes). Results were interpreted using Cohen's (1988) guidelines for small (d = 0.20), medium (d = 0.50) and large ($d \geq$ 0.80) effect sizes. For the decision quality gender difference comparison (Effect Size 1), involving dichotomous variables, test statistics were converted into odds ratio.

8.2.2 Results

Following the analytic approach of Faulmüller et al. (2010) and Toma et al. (2009; 2013), participants in the HP Condition who failed the HP Suboptimal Candidate manipulation at IDP-PI, (i.e. they did not select Candidate (C)), were excluded from the analysis. Since I am examining whether or not participants correct their initial suboptimal candidate selection once they have viewed full candidate information, this approach is justified. This subset of the data was used for all hypothesis testing in the Hidden Profile condition.

Effect Size 1: Gender difference in decision quality

H1 expected that female participants in the Hidden Profile condition would be better able to overcome the IPE and demonstrate more improved decision-making than their male counterparts, after viewing full candidate attribute information. The data supported this. The odds ratio of 0.47 was significant (p = .002) and indicated that female participants were approximately 50% more likely than male participants to correct their initial suboptimal candidate selection decision after viewing all candidate attribute information.

As a control, I examined whether there was any difference in decision quality for participants in the Manifest Profile condition. Results showed no significant difference in decision quality between male and female participants, p = .444. (Table 15).

Table 15.

Gender Differences in Decision Quality in Manifest and Hidden Profile Conditions (Study 8).

Condition	Overall results					Heterogeneity				
	N	OR	90% CI	Z-value	*p value*	Q	P_q	I^2%	T^2	T
Hidden Profile	335	0.47	0.28,0.80	-3.07	.002	4.12	.39	2.80	0.01	0.09
Manifest Profile	444	0.84	0.51,1.37	-0.77	.444	3.73	0.44	0	0	0

Note. N = total number of individuals; OR= odds ratio; 90% CI = 90% confidence interval

Effect Size 2: Gender difference in confidence in optimal candidate (A).

H2 expected female participants to be more confident in the Optimal Candidate (A) than their male counterparts having viewed full candidate attribute information. The data did not support this: there were no significant differences between the genders in confidence levels in the Optimal Candidate (A) in either the Manifest or Hidden Profile conditions (Table 16).

Table 16.

Gender Differences in Confidence in Optimal Candidate (A) in Manifest and Hidden Profile Conditions (Study 8).

Condition	Overall results					Heterogeneity				
	N	Cohen's *d*	90% CI	Z-value	*p value*	Q	P_q	I^2%	T^2	T
Hidden Profile	335	0.24	-0.20,0.67	1.17	.24	11.40	0.02	64.91	0.12	0.34
Manifest Profile	444	0.00	-0.17,0.17	-0.03	.97	2.76	0.60	0	0	0

Note. N = total number of individuals; 90% CI = 90% confidence interval

Effect Size 3: Gender difference in confidence in suboptimal candidate (C).

H3 expected female participants in the Hidden Profile condition to be less confident in the Suboptimal Candidate (C) than their male counterparts, having viewed full candidate attribute information. The data supported this: female participants in the Hidden Profile condition were significantly less confident in the Suboptimal Candidate (C) after viewing full information when compared to their male counterparts, $p = .01$, Cohen's $d = -0.28$, indicating a small to medium effect size.

There were no significant gender differences in confidence in the Suboptimal Candidate (C) for participants in the Manifest Profile condition (Table 17).

Table 17.

Gender Differences in Confidence in Suboptimal Candidate (C) in Manifest and Hidden Profile Conditions (Study 8).

Condition		Overall results				Heterogeneity				
	N	Cohen's *d*	90% CI	Z-value	*p value*	Q	P_q	I^2%	T^2	T
Hidden Profile	334	-0.28	-0.52,-0.05	-2.54	.01	3.96	0.41	0	0	0
Manifest Profile	444	-0.12	-0.50,0.27	-0.65	.52	11.54	0.02	65.34%	0.09	0.30

Note. N = total number of individuals; 90% CI = 90% confidence interval

Effect Size 4: Gender Difference in overall confidence in selection decision

H4 expected female participants in the Hidden Profile condition to report lower overall confidence in their candidate selection decision compared to their male counterparts, after viewing full candidate attribute information. The data provided only weak support for this: female participants in the Hidden Profile condition were marginally less confident in their overall selection decision after viewing full information when compared to their male counterparts, $p = .09$, Cohen's $d = 0.15$, a small/negligible effect size. There were no significant gender differences in confidence for participants in the Manifest Profile condition (Table 18).

Table 18.

Gender Differences in Overall Confidence in Selection Decision in Manifest and Hidden Profile Condition (Study 8).

Condition		Overall results				Heterogeneity				
	N	Cohen's *d*	90% CI	Z-value	*p* *value*	Q	P_q	I^2%	T^2	T
Hidden Profile	335	0.15	-0.04,0.35	1.67	.09	2.83	0.59	0	0	0
Manifest Profile	444	-0.01	-0.28,0.26	-0.10	.92	7.22	0.12	44.62%	0.04	0.20

Note. N = total number of individuals; 90% CI = 90% confidence interval

Effect Size 5: Gender difference in difficulty in correcting suboptimal candidate (C) Selection

H5 applied only to participants in the Hidden Profile condition and anticipated male participants would report greater difficulty in correcting their initial Suboptimal Candidate (C) selection having viewed full candidate attribute information. The data supported this: male participants in the Hidden Profile condition reported more difficulty in correcting their initial Suboptimal Candidate (C) selection decision when compared to female participants, $p = .03$, Cohen's $d = 0.22$, a small effect size (Table 19).

Table 19.

Gender Differences in Difficulty in Correcting Suboptimal Candidate (C) Selection Decision in Hidden Profile Condition (Study 8).

Condition	Overall results					Heterogeneity				
	N	Cohen's *d*	90% CI	Z-value	*p value*	Q	P_q	I^2%	T^2	T
Hidden Profile	334	0.22	0.00,0.45	2.11	.03	3.66	0.45	0	0	0

Note. N = total number of individuals; 90% CI = 90% confidence interval

8.3 Discussion

This meta-analysis of five online individual decision making studies provides empirical evidence, for the first time, that the Individual Preference Effect may impact males and females differently. An important point to note is that an accompanying meta-analysis of gender differences in participants in the Manifest Profile condition on the same variables found no significant differences between male and female participants. Confronted with all candidate attributes on a one page sheet of information, male and female participants made very similar selection decisions and reported the same levels of confidence in the Optimal/Suboptimal candidates and their overall selection decision. The position was very different, however, for participants in the Hidden Profile condition, where the IPE was induced. Specifically, female participants displayed better decision quality and were more able to correct from their initial Suboptimal Candidate (C) selection decision than their male counterparts, after viewing full candidate information. Male participants reported finding it more difficult to switch their candidate selection decision and, consistent with this, their decision quality was inferior to that of female participants. This result suggests female participants were more able than male participants to integrate new information relating to the candidates when presented with all four sheets (W, X, Y Z) and apply this in order to correct their initial suboptimal decision, thereby overcoming the IPE.

Female participants were more likely to switch their selection to the Optimal Candidate (A), having viewed full information, when compared to their male counterparts, although the fact that there was no significant difference between the genders in confidence in the Optimal Candidate (A) suggests that some degree of caution in interpreting this result is necessary. This parallels the findings of Chung and Monroe (1988) that male accounting students exhibited greater confirmatory behaviour as a result of ignoring disconfirming evidence and were more 'hypothesis-confirming' than their female counterparts, although given the structure of my studies, I am unable to fully assert this. Future research could test this by asking participants to rate the importance of each candidate attribute to their decision on a Likert-type scale following their final selection decision, to ascertain which were given the greatest weighting.

As discussed in 8.1.3 above, confidence has also been shown not only to be an important factor in decision-making, but also to differ between the genders in their decision-making processes (Croson & Gneeezy, 2009; Kelley & Lemke, 2015). Whilst there was no difference between the genders in confidence in the Optimal Candidate (A), female participants were significantly less confident in the Suboptimal Candidate (C) than their male counterparts, after viewing full candidate information. This suggests that they were perhaps more able to recognise the new information they were presented with regarding Candidate (C), although the effect was not great enough to increase their confidence in Candidate (A). In addition, female participants reported marginally lower overall confidence in their selection decision, compared to their male counterparts. A 'popular' suggestion of recent years is the existence of a "confidence gap" between men and women in the workplace, where the latter are seen as less confident than men in their abilities. This is often pointed to as one reason for women's seemingly lower attainment levels in, for example, promotions, leadership roles and pay increases. That said, alternative perspectives have suggested no differences in confidence exist between the genders and other explanations (e.g. women's fear of "backlash") have been put forward as one reason for lower attainment (Thomson, 2018). Given that my data suggests only marginal differences between the genders in their overall confidence levels, there may indeed be some merit in these alternative explanations.

Byrne and Worthy (2015) noted that as selective processors, males perform worse when integrating multiple sources of information. Conversely, females are comprehensive processors and rely on multiple sources of information. The Hidden Profile is a task which relies on multiple sources of information: participants are initially asked to make a decision based on a small amount of information, then review that decision on the basis of a much larger amount of information. In this online paradigm, the multiple sources of information are represented by the four candidate attribute sheets (W, X, Y, Z) viewed by participants in the Hidden Profile condition. Research evidence would therefore suggest females should outperform males in overcoming the IPE, which the findings here support.

Meyers-Levy (1989) also suggested that male decisions may be more affected by a 'primacy bias', whereas females' decisions have more of a 'recency bias'. With respect to these studies, this would suggest that male participants should find it more difficult to 'shake off' the effect of the IPE, since they would be more biased towards the initial information viewed, on which they based their suboptimal decision. By contrast, female participants should be more influenced by the larger, complete information set, which was viewed last. Again, this is consistent with the results here. This could be tested by adding a participant recall task to the study, following the final selection decision. This could allow me to ascertain the candidate attributes that continued to resonate most strongly with participants, providing a rationale for their candidate selection decision.

Yet, further research suggests something more complicated may be going on than may at first appear. Toplak, West, and Stanovich (2017) found that males outperformed females on a heuristics and biases composite and endorsed more actively open-minded thinking than females. Notwithstanding, Delaney et al. (2015) undertook cluster analysis to examine differing styles of decision-making and found that women were 37% less likely than men to be in the "affective/experiential" mode of decision-making, where decisions are made quickly, often based on gut feelings and experience. This seems to be at complete odds with Toplak et al. This has led some to speculate that gender differences in decision-making are more about the behavioural styles/demands of gendered social roles than any difference in intellectual competency (e.g. De Acedo Lizarraga, de Acedo Baquedano, & Cardelle-Elawar, 2007).

Clearly, earlier research findings are mixed, but this meta-analysis demonstrates that the IPE may be even more complicated than previously thought, given that it appears to impact males and females in different ways. I believe this finding is an important step in opening up new research avenues that will help us understand decision-making in these scenarios and, furthermore, may also offer an explanation as to why empirical evidence to support the benefits of gender diversity in decision-making groups is so equivocal (e.g. Homberg & Bui, 2013). I posit that increasing our examination and understanding of this area may open up the possibility of improving decision outcomes in mixed-gender groups, allowing the 'diversity dividend' to be fully recognised.

8.3.1 Limitations and future directions.

A limitation of these findings is that the meta-analytic effect sizes for the gender differences were in the small to medium range. More studies should be carried out in this area, with greater sample sizes, in order to test whether these findings can also be replicated consistently in primary studies. This will help to increase the understanding of gender differences in decision-making and how these may manifest themselves in an individual, group or virtual environment. It will also enable me to test for boundary conditions and whether situational factors (e.g. group composition) can attenuate or amplify these differences.

Should the *process* of group decision-making should be varied to accommodate the potential gender differences discussed here? For example, the optimal timing and type of pre-discussion information distribution could differ between male and female group members, given their differing approaches to processing of information and strategies for its usage. These findings also suggests that a ‘one-size fits all’ intervention to overcome the IPE may not be the optimal solution and something more ‘nuanced’ is required, recognising the gender differences I have highlighted. Of course, any changes to process, or training or skills interventions, must also take into consideration what is feasible and practical to the well-ordered running of the group, or larger organisation.

Finally, picking up on the speculations of De Acedo Lizarraga et al. (2007), further research should examine the interaction between decision-making and gendered social roles, for example, by considering the strength of identification with one’s gender as a further variable. Would the fact of a male group member, identifying highly as a male, predict greater reliance on heuristic processing? Untangling the answers to these types of questions may open up new thoughts or ideas about ways to overcome these challenges and improve information processing to place less reliance on heuristics. Perhaps it is only once these gender differences in decision-making are fully understood that we can advance effective interventions and solutions.

Chapter 9: Conclusion and Implications

9 Summary

The analysis and original research reported in this thesis took on three challenges: (i) to expand our understanding of asymmetric information and the interactions of group members in Hidden Profile decision tasks; (ii) to consider whether the Individual Preference Effect (IPE), which has been shown to play a significant role in groups' failures to solve Hidden Profile decision tasks, manifests itself differently in men and women; and (iii) to test a mental simulation intervention designed to work at *both* the individual group member *and* group level, leading to improvements in both information exchange *and* decision quality. There is almost 35 years of research into Hidden Profiles, starting with the seminal study of Stasser and Titus (1985), which demonstrates how poorly groups do in solving Hidden Profile decision tasks, when compared to Manifest Profiles, where all decision-relevant information is distributed equally and in an identical manner to all group members (see Lu et al., 2012). Yet, irrespective of the vast body of work which has been undertaken, it seems we are no closer to fully understanding what really causes these well-documented failures, let alone devising successful interventions to overcome them.

The frequency of hidden profiles.

As I detailed in Chapter 1, the simplest conception of information asymmetry is a condition where "different people know different things" (Stiglitz, 2002, p. 470). One point to consider is how often Hidden Profiles of the type I have examined here, where information is distributed asymmetrically, occur. If they are rare, then the need to understand them and remediate them is less important. Brodbeck et al. (2007) suggested that Manifest Profiles, where all group members have access to the same information set, with consistent individual and group decisional outcomes, occur much more often than Hidden Profiles. I challenged this line of thought and suggested that the physical distribution of information is only one example of a scenario where a Hidden Profile may occur. Specifically, I contended that asymmetric information (and therefore Hidden Profiles) can also arise, driven by the differing perspectives, specialized knowledge, values, priorities, and goals each decision-making team member brings to the discussion, as discussed in Dooley and Fryxell (1999). This led me to suggest that the problem of asymmetric information in group decision-making is much more widespread than may have been thought, suggesting a need for more research, both in order to increase our understanding and to identify interventions to overcome the challenges of Hidden Profiles.

Individual group member behaviours.

The behaviours of the individual group members can be profoundly affected by the lack of symmetric information, which is particularly problematic when increasing numbers of groups of employees make decisions under conditions of distributed knowledge (Brodbeck et al., 2007). Ways of working have been subjected to wholesale re-design across many organizations, specifically to bring together employees with different knowledge and expertise, driven largely by the expectation that this will prompt the exchange of more and different information, as well as enhancing innovation, creativity and group decision outcomes. All of the evidence points to the fact that the anticipated premium is not being recognised. My theoretical analysis outlined in Chapter 1 and 2 and which I return to throughout the subsequent Chapters, suggests one key reason for this is the behaviour of the focal actors – that is, the individual members of decision-making groups. It is only if all group members are able to collaborate successfully to reduce the information asymmetries inherent in Hidden Profiles (*reduce-reduce*: Bergh et al., 2018), that optimal information exchange *and* decision-making can emerge. However, this requires cooperation amongst the group members and this is hard to achieve, owing in part, to the cognitive biases that are inherent in human reasoning (Arnott, 2006). Past research has concluded that groups may demonstrate the same heuristic-based biases as individuals (Kerr & Tindale, 2004) and that the relationship between individual and group biases is by no means simple: individual biases can influence group decision processes, but unbiased group decision processes can exacerbate individual biases at the group level (Kerr et al., 1996).

Placing a greater focus on the individual group members, their motivations and actions opens up a potentially different research pathway. Brodbeck et al.'s (2007) detailed analysis of the reasons groups do not outperform individuals in Hidden Profiles, categorised these into challenges at the group level, including: (i) negotiation focus; the group discussion focuses on preference negotiation; and (ii) discussion bias, operating at the group level of information processing, which leads groups to focus on introducing and repeating shared versus unique information (Larson et al., 1996). At the individual level, there is also the challenge of: (iii) evaluation bias, leading to the individual group member favouring shared and preference consistent information (Brodbeck et al., 2007). Group members place a higher value on shared information, which is known to several group members (Greitemeyer, Schulz-Hardt, & Frey, 2003 cited in Brodbeck et al., 2007). Such information also provides social validation as it can be corroborated by others (Wittenbaum et al., 1999). Finally, individuals evaluate information as more credible when it is consistent with their personal opinions (Greitemeyer & Schulz-Hardt, 2003). I have also discussed and outlined in detail the further significant challenge presented by the Individual Preference Effect: (IPE: Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 2003; Mojzisch and Schulz-Hardt, 2010). This affects individual group members in such a way that they are unable to disconfirm, and remain committed to, their initial suboptimal selection decisions, even when presented with full information enabling them to correct them. I have argued that the challenges operating at the group level are driven by the actions of the group members, for example, negotiation focus would not happen were it not for the group members choosing to negotiate on the basis of their initial individual selections and preferences. These individual actions also drive the group-level challenge of discussion bias. Accordingly, I believe there is a need to focus on the biases and motivations operating at the individual group member level (including gender differences in information processing and application) and seek ways to overcome them in order to overcome Hidden Profiles. This is a departure somewhat from the examination of previous interventions to overcome the Hidden Profile, the majority of which have focused on the group.

A role for mental simulation?

The search for effective interventions led me into a consideration and examination of mental simulation, defined as “imitative cognitive constructions of an event or series of events”, (Gaglio, 2004. p.537). Mental simulation, in the form of counterfactual thinking, has achieved some success in improving performance in Hidden Profile situations, but, as I have noted, more recent work has cast questions over the efficacy of counterfactual thinking, suggesting that in certain social situations, such as group decision-making, it may even be detrimental and actually *increase* both biased communication and decision-making (e.g. Ditrich et al., 2019; Galinsky et al., 2000; Galinsky & Kray, 2004; Hirt et al., 2004; Liljenquist et al., 2004). Accordingly, I took the approach of creating a new mental simulation intervention based on a Premortem technique (Klein, 2003) as a means of improving group members’ (and consequently, groups’) performance in a Hidden Profile decision task. The mental simulation is based on the premise that the decision the group has made has led to poor organizational outcomes. Essentially, it represents a failed decision: the first choice candidate selected by the group has performed poorly and things have gone badly wrong. This is not something the group can have foreseen at the time of making the decision and it is this unexpected turn of events which, I anticipated, would lead the group members to interrogate their initial decision and the assumptions underlying it at a deeper level. There is support for this in the literature: as Gaglio notes “the perception and interpretation of an event as unexpected. . .typically prompts sensemaking and problem-solving activity” (p.537).

The form of the mental simulation, imagining failure, triggers “prospective hindsight” (Mitchell et al., 1989, p.26). The fact that the failure is portrayed as a ‘sure’ outcome rather than a ‘maybe’, is based on Mitchell and colleagues contention that subjects will work harder and think differently in order to explain more thoroughly an event which is a ‘known outcome’, rather than something which may or may not occur. Mitchell et al. found that inducing prospective hindsight led individuals to generate *more* (although not necessarily superior) reasons for an event. Conversely, the intervention I designed and tested in this program of research, based on prospective hindsight, showed success in improving decision-making outcomes, at *both* the individual *and* group level. These results suggest the intervention enabled not only more, but better, reason generation for the failure of the initial Candidate selection.

9.1 Overview of the main findings

The first study was a qualitative thematic analysis, to examine and interpret the voice of the individual group members. Whilst much Hidden Profile research has focused on counting unique or shared information contributed by individual group members and subjecting this to quantitative analysis, taking a qualitative approach allowed a more interpretive and dynamic analysis of the group members’ words. This helped me to gain a better understanding of their individual motivations and actions, which are central to understanding the behaviours and actions of the group. I believe this qualitative approach is unique in Hidden Profile research. The dialogue excerpts capturing the group member interactions demonstrated the effects of Communication Apprehension (McCroskey, 1977); the Individual Preference Effect (IPE: Faulmüller, et al., 2010; Greitemeyer & Schulz-Hardt, 2003); negotiation and discussion bias; intragroup dissent (Schulz-Hardt et al., 2002); and the special license afforded to 'experts' within the group (Wittenbaum, 2000). Study 1 also tested for the first time whether a mental simulation, based on a Premortem (Klein, 2003) could help group members to overcome some of these challenges. Both the qualitative and quantitative analysis showed the mental simulation to be at least partially successful in achieving this.

Study 2 empirically tested the mental simulation in a face-to-face group study involving a Hidden Profile decision task. The results showed initial positive support for mental simulation as an important procedural intervention, leading to an increase in group members' exchange of critical, unique information and a reduction in confidence in the Suboptimal Candidates. Results for group decision quality were, however, equivocal, as groups who underwent the mental simulation showed both improvements *and* decrements in decision-making quality in equal measure.

Study 3 extended previous literature by successfully creating and testing a new online paradigm of an individual Hidden Profile candidate selection task, based on a comparison of decision-quality between participants in a Manifest Profile, Hidden Profile and No Preference condition, in a partial replication of Faulmüller et al. (2010, Study 2). Results supported the existence of the IPE in the online Hidden Profile paradigm. In an extension to Faulmüller et al's. work, an examination of participants' confidence levels in the Optimal versus Suboptimal Candidate showed that the IPE prevailed in such a way as to undermine and suppress Hidden Profile participants' confidence in the Optimal Candidate (A) as the best person for the job, whilst inflating their confidence levels in the Suboptimal Candidate (C). This suggested that dislodging confidence in the Suboptimal Candidate might be one approach to overcoming the IPE.

Study 4 tested the mental simulation in a face-to-face group study and introduced a procedural change, whereby group members were not asked to make an individual pre-selection decision before entering the group discussion (although they were not specifically instructed *not* to form a preference). The results from Study 4 showed further support for the positive effect of the mental simulation intervention in Hidden Profile decision tasks, leading to an increase in group members' exchange of critical, unique information; a reduction in confidence in the Suboptimal Candidates; increases in confidence in the Optimal Candidate; and improved group decision quality. Study 4 also suggested, however, that one unintended consequence of the mental simulation could be the triggering of "Affective Conflict" (Amason, 1996) in the group. Study 5 was designed to examine this further in a face-to-face group study, by specifically comparing perceptions of anger and friction in participants in groups undertaking the intervention, against participants in a 'Devil's Advocacy' condition, which has been shown to induce "Affective Conflict" (Waddell et al., 2013). Results from Study 5 showed further positive support for the efficacy of mental simulation: groups reported a reduction in confidence in the Suboptimal Candidates and improved group decision quality. Comparisons between members of groups who undertook a Devil's Advocacy (DA) procedure, a Control (word) task, or the mental simulation, confirmed that participants in DA groups perceived the highest levels of personal friction across the three experimental conditions.

Studies 6 and 7 returned to the online paradigm, this time testing an online version of the mental simulation and its ability to attenuate the Individual Preference Effect. The results from Study 6 showed positive outcomes in attenuation of the IPE: individuals who underwent the mental simulation demonstrated improvements in decision quality. Study 7 replicated these results with a larger sample size, drawn from a different organizational population, that is, the participant criterion specified they must be working in full-time employment, which, I assumed, would give them more experience of day-to-day decision making. In sum, both studies provided positive support for mental simulation as an important tool to attenuate the

Individual Preference Effect. Individuals exposed to an online version of the mental simulation reported a reduction in confidence in the Suboptimal Candidate (C); increases in confidence in the Optimal Candidate (A); and improved individual decision quality.

Study 8 returned to the Individual Preference Effect but from a different perspective, prompted by the results of the analysis reported in Studies 3, 6 and 7 relating to the effect of participant gender on decision quality. The results of five individual online studies (the three studies reported in Chapters 5 (N = 120) and 7 (N = 160 and N = 280) respectively, together with two further online studies not otherwise analysed or reported in this thesis (N = 160 and N = 240) were subject to a mini meta-analysis. The results from the analysis highlighted gender differences in participant decision quality; mean confidence in the Suboptimal Candidate as “best for the job”; mean overall confidence in the selection decision; and mean overall difficulty in correcting the candidate selection decisions between the two (partial and full information) decision points in the Hidden Profile condition. Taken together, these results suggested that the IPE may manifest differently by gender, something not been contemplated in the research previously and which opens up new opportunities for research and, potentially, more targeted interventions.

Across the different studies, I predicted various effect for the mental simulation intervention on decision-making. Some of these were not supported by the data. Specifically, the mental simulation did not consistently lead to improvements in confidence in the Optimal Candidate (A), although it did decrease confidence in the Suboptimal Candidate (C) across all studies. Faulmüller et al. (2010) questioned whether the IPE might be moderated by the group members being attracted to alternatives, or aversions to those candidates, or a combination of both. Results here suggest that the success of the mental simulation in improving decision outcomes may have been predicated more on increasing individuals’ aversions to the initially selected candidate, rather than driving decision change based on increased attractiveness of the Optimal Candidate (A), that is to say, the mental simulation had more of a ‘push’ than a ‘pull’ effect. This may also lie behind the unhelpful effect of the intervention on decision quality in earlier studies when the Optimal Candidate (A) was chosen at the outset, prior to the mental simulation. In some instances where this occurred, the mental simulation then had the unlooked for effect of eroding confidence in the correct decision, such that individuals and groups switched their decision to a Suboptimal Candidate. This suggests that there is a fine balance to be drawn in framing the intervention, between making the decision failure appear *too* real, such that a correct decision is overturned, rather than being interrogated at a deeper level, before being reaffirmed. Of course, at the same time the intervention needs to work in such a way that an incorrect decision *is* both interrogated and *then* overturned.

9.2 Main contributions and practical implications

One of the main contributions to this work is the potential for application to organizational decision-making, whether in face-to-face groups or online. The challenges identified to good group decision-making, (e.g. social loafing (Latané et al., 1979); group polarization (Bettenhausen, 1991); and groupthink (Janis, 1982)) have negative effects and, as I have shown, poor decision-making in groups has been shown to adversely impact a wide range of outcomes, with significant financial and other downsides (24/7 Wall Street, 2010). Nor is this eased by the increasing trend for online working. Rather the reverse is true. Knowledge sharing in virtual teams is particularly problematic, requiring extra time and energy to deal with issues such as establishing trust (compounded through lack of face-to-face engagement), complicated technologies, and lack of knowledge-sharing confidence and ability (Hao et al., 2019). Individuals engaged in Computer Supported Collaborative Learning discussions have been found to align existing information with that of other team members, rather than construct new knowledge (Shukor et al., 2014). Distributed teams fall foul of Hidden Profiles also: the presence of problem critical unique information, which is vital to solving the problem, but which may not be immediately obvious, has been shown to obstruct the performance of such teams, decrease team cognition quality and impede problem solving (Jefferson et al., 2004).

Unique information exchange: overcoming communication apprehension.

The present research provides experimental evidence to increase our understanding of why these challenges arise. In Study 1, the effects of Communication Apprehension (McCroskey, 1977) and the Individual Preference Effect (Faulmüller, et al., 2010) were evident in group members' unwillingness to contribute, challenge or acknowledge unique information. There was also a focus on contributing information aligned to the individual group member's initial individual preferences. This changed, however, as a consequence of the mental simulation intervention tested in this program of research. Specifically, the form of the intervention appeared to encourage and embolden group participants to contribute new and unique information, as they searched for reasons to explain the [imagined] failure of their first selected candidate. I also obtained experimental evidence suggesting that the mental simulation increased the exchange of unique information between group members (Study 2 and 4). Group members who underwent the mental simulation were more able to recognise the presence of unique information in their exchanges, something which can only have arisen as a consequence of more unique information emerging in those groups. No such effect was noted amongst members of Control groups.

Confidence and the IPE.

Another contribution of the present work is to provide further evidence for the existence and importance of the IPE in Hidden Profile decision-making groups and to underscore the important role of confidence in that effect. A major factor in the strength of the IPE is the inflated confidence that individuals have in their initial suboptimal selection decision; so to the success of any intervention to improve decision-making depends on deflating that confidence. The mental simulation achieved that across both the online and face-to-face group studies (Studies 2-7). The online studies are particularly helpful, since they demonstrate the reduction in confidence as a consequence of the mental simulation, alongside improvements in individual decision quality in a new, online Hidden Profile paradigm (Studies 6 and 7). This supported my hypothesis that the mental simulation can attenuate the IPE (Faulmüller et al., 2010; Greitemeyer & Schulz-Hardt, 200;) and that attenuating the IPE can lead to improvements in decision-making. This extends the work of Faulmüller and colleagues, firstly by providing further evidence for the existence of the IPE, then attenuating it through the application of the mental simulation intervention.

Gender differences and the IPE.

One significant finding to emerge with respect to the IPE is the idea that it may manifest differently based on gender. The meta-analysis in Study 8 suggested that males may be more adversely impacted by the IPE than females, as a consequence of their selective processing style (e.g. Byrne & Worthy, 2015; Meyers-Levy & Maheswaran, 1991; Meyers-Levy & Sternthal, 1991). This is consistent with earlier research identifying differences between the genders in information search, processing, information application and problem-solving strategies. For example, research into gender shopping behaviours suggest women undertake a more comprehensive information search process than their male counterparts, who have been shown to use a simpler, selective information search process (Laroche, Saad, Cleveland & Browne, 2000). Furthermore, men have been shown to adopt hypothesis-confirming strategies (Chung & Monroe, 1998), making them more likely to integrate *confirming* rather than *disconfirming* information and to be less comfortable handling incongruent cues and information. Conversely, women are likely to engage in deeper elaboration than men at lower thresholds, particularly when faced with incongruent clues

(Meyers-Levy & Sternthal, 1991). Using a computerized Perceptual Maze Test, Klinteberg, Levander, and Schalling (1987) found that problem-solving strategies also differed between the genders: boys preferred to use an impulsive-global strategy (i.e. they started tracking the maze without any planning – almost a 'dive straight in' approach), whilst girls used a more reflective-sequential task-solving strategy (i.e. they inspected the maze carefully before starting to track and preferred accuracy to speed). This combination of factors, including information search, problem-solving strategies, the use of information to confirm or disconfirm a hypothesis, seems to offer a legitimate explanation for my finding that the IPE appeared to manifest differently in men and women. Specifically, women seemed to outperform men in overcoming the IPE in the online studies (Study 8), perhaps because they were better able to integrate and apply information, once it was made available to them or because they were actively looking for and applying information to *disconfirm* their initial Suboptimal Candidate selection rather than confirm it. Future research is needed to untangle this

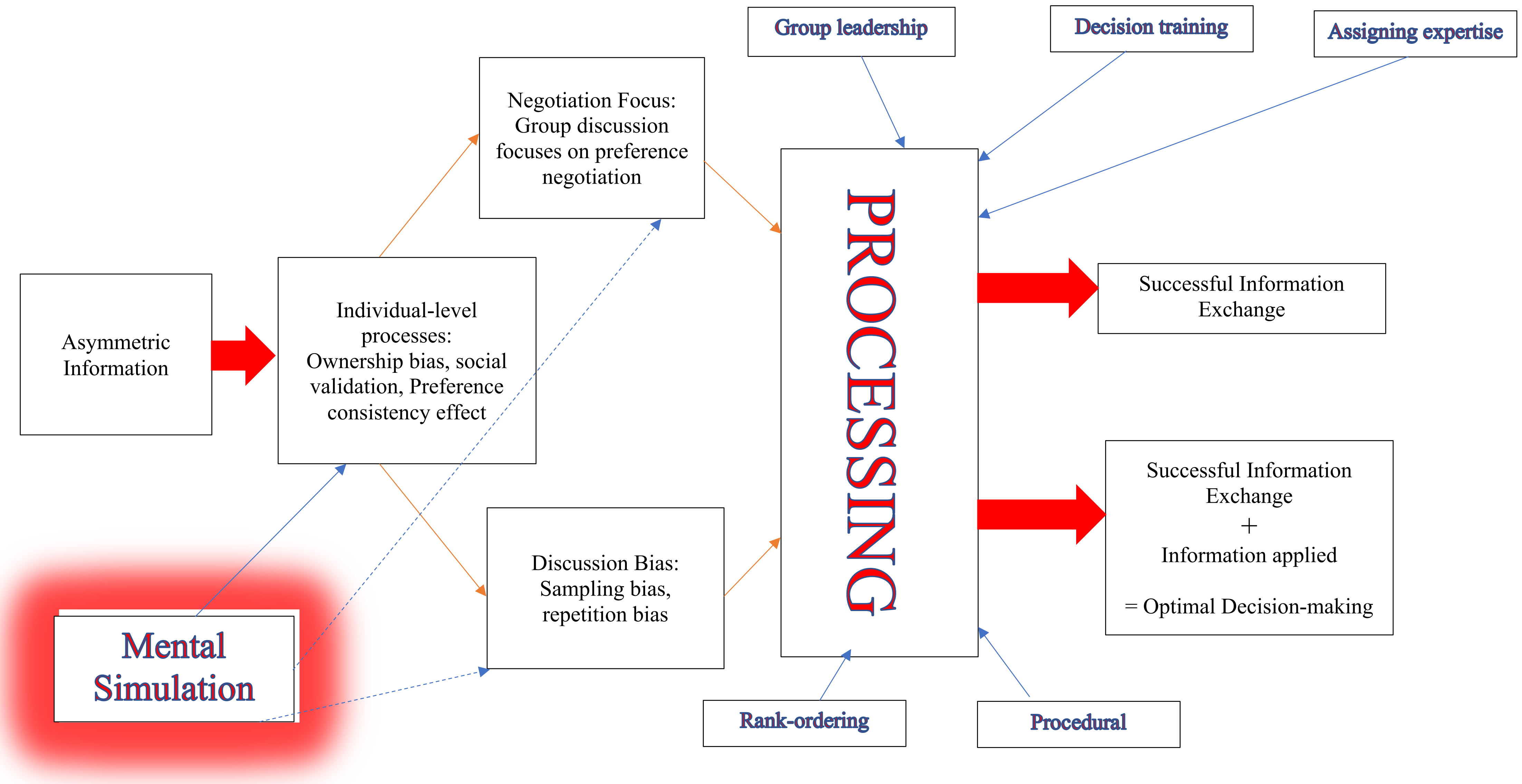
Returning to the role of confidence discussed above, this is also differentiated in the genders' decision-making. Croson and Gneezy (2009) noted that, whilst both men and women were overconfident, men were more overconfident in their success in situations of uncertainty compared to women. Women have also been noted to appear less confident than men, even in their correct answers (Kelley & Lemke, 2015). This could explain the meta-analytic result in Study 8 that female participants in the Hidden Profile condition were less confident in the Suboptimal Candidate (C) after viewing full information, compared to their male counterparts. They were also marginally less confident in their overall selection decision after viewing full information compared to their male counterparts. In this instance, the lower confidence levels expressed by women may have played a part in their ability to overcome the IPE and to integrate the new information in order to revise their previous

Suboptimal Candidate (C) selection. Indeed, male participants in the Hidden Profile condition reported more difficulty in correcting their initial Suboptimal Candidate selection decision when compared to female participants. From an applied perspective, this may suggest a need to adjust how information pertinent to a decision is presented to the genders, in order to accommodate these different information processing and use approaches. It also suggests that different intervention approaches may be helpful in assisting the genders to overcome the IPE.

Mental simulation – a useful intervention?

Undoubtedly, the most important contribution of this work is the creation of a practical and relatively easy to use mental simulation intervention to improve information processing *and* decision quality. Brodbeck et al. (2007) suggested that whenever group decisions are made involving distributed knowledge, something I would argue is more commonplace than might have been imagined, as a minimum, 'low cost' interventions should be considered (e.g. information vigilance, information management, time management and critical norms). Low cost interventions are those defined as shaping the individual and collective information processing during the group discussion, in contrast with high cost interventions which typically target characteristics of the group and the group's composition and the organizational context, for example, group decision support systems, transactive memory systems and establishing authentic dissent. I have argued that it is the actions and motivations of the group members which are the foundation of the group's information sharing and decision outcomes. This focus may require a recapitulation of Brodbeck's model, such that the individual level processes are shown to *precede* the group level processes of negotiation focus and discussion bias, rather than running in parallel with them (Figure 5). Mental simulation is then shown as an intervention targeted firstly at the individual group member, then followed by the group (as signified by the solid arrow and dotted arrows respectively).

Figure 5. The Recapitulated Information Asymmetries Model and the role of Mental Simulation



9.3 Limitations and future directions

The intervention tested here is by no means perfect, as these studies have shown, but it shows real potential and, unlike many interventions which have been tried and tested over the years, has shown itself capable of improving *both* information exchange and decision quality in Hidden Profile decision tasks. A weakness of the intervention is, as I have highlighted, that it appears to have the capacity to undermine correct decisions if individuals (or groups) arrive at the optimal solution before undertaking the intervention. There is a risk in simulating failure and making it certain, that confidence in a correct decision is undermined. More experienced decision-makers may be better equipped to handle this.

On that note, a potential limitation is that the face-to-face group studies in this program of research were conducted with first year psychology students, relatively inexperienced decision-makers, certainly when faced with a task such as recruitment. This may have contributed to a lack of confidence in their decision-making, manifesting itself in the decision of several groups to rank *down* the Optimal Candidate, particularly in Study 2, following the mental simulation. I will look for further opportunities to test the intervention with more experienced decision-makers.

I also acknowledge that this task had a clear right answer, albeit obscured. Decision making is not quite so straightforward in the 'real' world; it is often only with the passage of time that the 'rightness' or 'wrongness' of a decision emerges. Nonetheless, the use of decision-tasks, such as the one in this research, are commonly adopted in the literature. They enable the examination of psychological processes in a controlled context. In order to increase confidence in the findings, however, it is important to replicate these findings with a range of decision-makers and perhaps with alternative decision tasks, where the outcome is not so clear cut.

Refining the design of the mental simulation to emphasise that groups did not need to change their selection decision, and, indeed, could take actions to remediate the failures of their first selected candidate, seems to have helped with the 'push' effect of the mental simulation away from the Suboptimal Candidates. I am eager to investigate further refinements to the intervention with the aim of bringing more emphasis to the positive qualities of the Optimal Candidate (A), perhaps through introducing a candidate attribute recall task after the mental simulation. As I discussed above, there is also a question about where, procedurally, the mental simulation should occur, in order to have the greatest positive effect. Fisher (2017) found more evidence that groups receiving *in-process* interventions pooled more critical information and demonstrated improved decision-making compared to groups receiving pre-task interventions. In a classic Hidden Profile decision task design, where the typical experimental procedure is: (i) individual selection decision followed by; (ii) group selection decision, this suggests that the mental simulation could have the greatest effect if it occurred *directly after* the initial individual selection decision and *prior to* the group selection decision, in order to successfully target the individual-level processes of ownership bias, social validation, the preference consistency effect and the IPE. This raises an interesting array of possible outcomes: for example, if there is decision homogeneity amongst group members, does the mental simulation break down this homogeneity? If there is heterogeneity, does the mental simulation allow for a discussion of all possible alternatives? Future studies can elicit this by manipulating both the timing of the intervention and decision homogeneity/heterogeneity.

The focus on individual group members outlined in my research also suggests an increased need to focus on individual differences amongst group members in group decision-making research, more so than has previously been contemplated. Perhaps the role of epistemic motives amongst group members has not been sufficiently considered and there is a need to understand the different social-cognitive processing tendencies amongst individual group members and how this may impact at the group level. For example, this research has elicited seeming differences in the manifestation of the IPE based on participant gender. Individual differences should be considered and tested in order to determine whether they also produce differing results, for example whether a group member is high in Personal Need for Structure (PNS: Thompson, Naccarato, & Parker, 1989; Thompson, Naccarato, Moskowitz, & Parker, 2001) may affect their handling of information and how to apply it. Similarly, Need for Cognitive Closure (NFC: Kruglanski & Webster, 1996) varies in individuals and affects how they are motivated to process information, form judgements and value agreement. Incorporating these measures into future studies, in tandem with the mental simulation, could help to understand whether the intervention can engender improvements *irrespective* of these individual differences. For example, Hirt et al. (2004) found that alternative generation tasks did not activate a counterfactual mindset (CFM) in individuals high in need for structure. Perhaps these individual differences also lead to differing outcomes in the efficacy of mental simulation.

As I noted at the outset, research into groups and teams suggests overwhelmingly that people should be involved in the decisions that affect them (Allen & Hecht, 2004). This is important to give individuals a sense of participation, democracy and empowerment. Brodbeck et al. 2007 noted this leads to higher acceptance and better implementation of a decision. All of this means that group decision-making is not going away anytime soon and, consequently, ongoing research into understanding and improving the performance of groups and their individual group members remains important. Brodbeck et al. (2007) called for future research to address “the complementary and interactive effects motivational and cognitive processes have on group decision making” (p.470). I believe this research does that by placing a greater focus on the individual group member and the decision-making challenges they face. Furthermore, I believe I have shown that mental simulation can play a key role in tackling the difficult side of these motivational and cognitive processes, by overcoming individual biases and the desire for preference consistent information. Mental simulation is viewed as "an essential element of the human experience and, as such, a correspondingly critical component of behavioural change strategies" (Crisp et al., 2011, p.261): we all engage in it. The upside of the intervention is the ease with which it can be taught and implemented, which gives it real generalisability to the organizational context.

References

Akerlof, G. A. (1970). The market for lemons: Quality uncertainty and the market mechanism. *Quarterly Journal of Economics (84)*, 488-500. Retrieved from: https://www2.bc.edu/thomas-chemmanur/phdfincorp/MF891%20papers/Ackerlof%201970.pdf

Allen, N. J., & Hecht, T. D. (2004). The "romance of teams": Toward an understanding of its psychological underpinnings and implications. *Journal of Occupational and Organizational Psychology*, *77*(4), 439–461. https://doi-org.chain.kent.ac.uk/10.1348/0963179042596469

Amason, A. C. (1996). Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. *Academy Of Management Journal*, *39*(1), 123-148. doi:10.2307/256633

Arnott, D. (2006). Cognitive biases and decision support systems development: A design science approach. Information Systems Journal, 16(1), 55–78. https://doi-org.chain.kent.ac.uk/10.1111/j.1365-2575.2006.00208.x

Baker, D. F. (2010). Enhancing group decision making: An exercise to reduce shared information bias. *Journal of Management Education*, *34*(2), 249–279. https://doi-org.chain.kent.ac.uk/10.1177/1052562909343553

Bergh, D. D., Ketchen, D. J., Orlandi, I., Heugens, P. P. M. A. R., & Boyd, B. K. (2019). Information Asymmetry in Management Research: Past Accomplishments and Future Opportunities. *Journal of Management*, *45*(1), 122–158. https://doi-org.chain.kent.ac.uk/10.1177/0149206318798026

Bettenhausen, K. L. (1991). Five years of groups research: What we have learned and what needs to be addressed. *Journal Of Management*, *17*(2), 345-381. doi:10.1177/014920639101700205

Block, R. A., & Harper, D. R. (1991). Overconfidence in estimation: Testing the anchoring-and-adjustment hypothesis. *Organizational Behavior and Human Decision Processes*, *49*(2), 188–207. https://doi-org.chain.kent.ac.uk/10.1016/0749-5978(91)90048-X

Blume, B. D., Dreher, G. F., & Baldwin, T. T. (2010). Examining the effects of communication apprehension within assessment centres. *Journal Of Occupational And Organizational Psychology*, *83*(3), 663-671. doi:10.1348/096317909X463652

Bolaños, R., Fontela, E., Nenclares, A., & Pastor, P. (2005). Using interpretive structural modelling in strategic decision-making groups. *Management Decision*, *43*(6), 877–895. https://doi-org.chain.kent.ac.uk/10.1108/00251740510603619

Bowman, J. M., & Wittenbaum, G. M. (2012). Time pressure affects process and performance in hidden-profile groups. *Small Group Research*, *43*(3), 295-314. doi:10.1177/1046496412440055

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research In Psychology*, *3*(2), 77-101. doi:10.1191/1478088706qp063oa

Brodbeck, F. C., Kerschreiter, R., Mojzisch, A., & Schulz-Hardt, S. (2007). Group decision making under conditions of distributed knowledge: The information asymmetries model. *The Academy Of Management Review*, *32*(2), 459-479. doi:10.2307/20159311

Brodbeck, F. C., Kerschreiter, R., Mojzisch, A., Frey, D., & Schulz-Hardt, S. (2002). The dissemination of critical, unshared information in decision-making groups: The effects of pre-discussion dissent. *European Journal Of Social Psychology*, *32*(1), 35-56. doi:10.1002/ejsp.74

Byrne, K. A., & Worthy, D. A. (2015). Gender differences in reward sensitivity and information processing during decision-making. *Journal of Risk and*

Uncertainty, *50*(1), 55–71. https://doi-org.chain.kent.ac.uk/10.1007/s11166-015-9206-7

Byrne, M., Flood, B., & Shanahan, D. (2012). A qualitative exploration of oral communication apprehension. *Accounting Education*, *21*(6), 565-581. doi:10.1080/09639284.2012.725636

Cahill, L. (2006). Why sex matters for neuroscience. *Nature Reviews Neuroscience*, *7*(6), 477–484. https://doi-org.chain.kent.ac.uk/10.1038/nrn1909

Catalyst. (2013). Why Diversity Matters. Retrieved from https://www.catalyst.org/research/why-diversity-matters/

Catalyst. (2018). Why Diversity and Inclusion Matter: Financial Performance. Retrieved from https://www.catalyst.org/research/why-diversity-and-inclusion-matter-financial-performance/

CIMA: Chartered Institute of Management Accountants. (2016). Retrieved from https://www.cgma.org/content/dam/cgma/resources/downloadabledocuments/joining-the-dots-report.pdf

Chazan, H. (2017). *The Simple Way to Rank Job Applicants* (Hiring). Retrieved from https://authentic.co/rank-job-applicants-free-template/

Chin, W. W., Salisbury, W. D., Pearson, A. W., & Stollak, M. J. (1999). Perceived cohesion in small groups: Adapting and testing the Perceived Cohesion Scale in a small-group setting. *Small Group Research*, *30*(6), 751–766. https://doi-org.chain.kent.ac.uk/10.1177/104649649903000605

Chung, J., & Monroe, G. S. (1998). Gender differences in information processing: An empirical test of the hypothesis-confirming strategy in an audit context. *Accounting & Finance*, *38*(2), 265–279. Retrieved from http://search.ebscohost.com.chain.kent.ac.uk/login.aspx?direct=true&db=bsu&AN=1310644&site=ehost-live

Chung, J., & Monroe, G. S. (2001). A Research Note on the Effects of Gender and Task Complexity on an Audit Judgment. *Behavioral Research in Accounting*, *13*, 111. https://doi-org.chain.kent.ac.uk/10.2308/bria.2001.13.1.111

Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic Analysis. In J. A. Smith (Editor), *Qualitative Psychology A Practical Guide to Research Methods(3rd ed.)* (pp. 222-249). London: SAGE Publications Ltd.

Connelly, B. L., Certo, S. T., Ireland, R. D., & Reutzel, C. R. (2011). Signaling Theory: A Review and Assessment. *Journal of Management*, *37*(1), 39–67. https://doi-org.chain.kent.ac.uk/10.1177/0149206310388419

Cordes, S. (2016). Virtual team learning: The role of collaboration process and technology affordance in team decision making. *Knowledge Management & E-Learning, 8*(4), 602–627. Retrieved from: https://www.researchgate.net/publication/312068440_Virtual_team_learning_The_role_of_collaboration_process_and_technology_affordance_in_team_decision_making [accessed May 31 2019].

Cranfield University. (2019). The Female FTSE Board Report 2019. Retrieved from https://www.cranfield.ac.uk/som/expertise/changing-world-of-work/gender-and-leadership/female-ftse-index

Crisp, R. J., & Turner, R. N. (2012). Imagined intergroup contact. In G. Hodson & M. Hewstone (Eds.), Advances in Intergroup Contact (pp. 135-151). Hove: Psychology Press (Taylor & Francis)

Crisp, R. J., Birtel, M. D., & Meleady, R. (2011). Mental simulations of social thought and action: Trivial tasks or tools for transforming social policy? *Current Directions in*

Psychological Science, *20*(4), 261–264. https://doi-org.chain.kent.ac.uk/10.1177/0963721411413762

Crisp, R. J., Husnu, S., Meleady, R., Stathi, S., & Turner, R. N. (2010). From imagery to intention: A dual route model of imagined contact effects. *European Review of Social Psychology*, *21*(1), 188–236. https://doi-org.chain.kent.ac.uk/10.1080/10463283.2010.543312

Croson, R., & Gneezy, U. (2009). Gender Differences in Preferences. *Journal of Economic Literature*, *47*(2), 448–474. https://doi-org.chain.kent.ac.uk/http://www.aeaweb.org/jel/index.php

Darley, W. K., & Smith, R. E. (1995). Gender differences in information processing strategies: Am empirical test of the selectivity model in advertising response. *Journal of Advertising*, *24*(1), 41–56. https://doi-org.chain.kent.ac.uk/10.1080/00913367.1995.10673467

de Acedo Lizárraga, M. L. S., de Acedo Baquedano, M. T. S., & Cardelle-Elawar, M. (2007). Factors that affect decision making: Gender and age differences. *International Journal of Psychology & Psychological Therapy*, *7*(3), 381–391. Retrieved from http://search.ebscohost.com.chain.kent.ac.uk/login.aspx?direct=true&db=psyh&AN=2007-19592-006&site=ehost-live

del Carmen Triana, M., Miller, T. L., & Trzebiatowski, T. M. (2014). The double-edged nature of board gender diversity: Diversity, firm performance, and the power of women directors as predictors of strategic change. *Organization Science*, *25*(2), 609–632. https://doi-org.chain.kent.ac.uk/10.1287/orsc.2013.0842

Delaney, R., Strough, J., Parker, A. M., & de Bruin, W. B. (2015). Variations in decision-making profiles by age and gender: A cluster-analytic approach. *Personality and*

Individual Differences, *85*, 19–24. https://doi-org.chain.kent.ac.uk/10.1016/j.paid.2015.04.034

Dennis, A. (1996). Information Exchange and Use in Group Decision Making: You Can Lead a Group to Information, but You Can't Make It Think. *MIS Quarterly, 20*(4), 433-457. doi:10.2307/249563. Retrieved from: https://www.jstor.org/stable/249563?read-now=1&refreqid=excelsior%3A8350989a7891d372796f4bba2321f323&seq=1#page_scan_tab_contents

Ditrich, L., Landkammer, F., & Sassenberg, K**.** (2019). What if my colleague was wrong and I was right? The impact of counterfactual mindsets and interpersonal focus on written communication and decision making in a hidden profile task. *Acta Psychologica, 192*, 118-125. https://doi.org/10.1016/j.actpsy.2018.11.003

Dittman, D. R., Hawkes, M., Deokar, A. V., & Sarniker, S. (2010). Improving virtual team collaboration outcomes through collaboration process structuring. *Quarterly Review of Distance Education, 11*(4), 195-210.

Dooley, R. S., & Fryxell, G. E. (1999). Attaining decision quality and commitment from dissent: The moderating effects of loyalty and competence in strategic decision-making teams. *Academy of Management Journal*, *42*(4), 389–402. https://doi-org.chain.kent.ac.uk/10.2307/257010

Eden, Dov. (2017). Field Experiments in Organizations. Annual Review of Organizational Psychology and Organizational Behavior. 4. 10.1146/annurev-orgpsych-041015-062400.

Escalas, J. E., & Luce, M. F. (2004). Understanding the effects of process-focused versus outcome-focused thought in response to advertising. *Journal of Consumer Research*, *31*(2), 274–285. https://doi-org.chain.kent.ac.uk/10.1086/422107

Evans, K. L., & Hampson, E. (2015). Sex differences on prefrontally-dependent cognitive tasks. *Brain and Cognition*, *93*, 42–53. https://doi-org.chain.kent.ac.uk/10.1016/j.bandc.2014.11.006

Faude-Koivisto, T. S., Würz, D., & Gollwitzer, P. M. (2009). Implementation intentions: The mental representations and cognitive procedures of if-then planning. In K. D. Markman, W. M. P. Klein, & J. A. Suhr (Eds.), *Handbook of imagination and mental simulation.* (pp. 69–86). New York, NY: Psychology Press. Retrieved from http://search.ebscohost.com.chain.kent.ac.uk/login.aspx?direct=true&db=psyh&AN=2008-07500-005&site=ehost-live

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2013). G*Power Version 3.1.2 [computer software]. Uiversität Kiel, Germany. Retrieved from http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/download-and-register

Faulmüller, N., Kerschreiter, R., Mojzisch, A., & Schulz-Hardt, S. (2010). Beyond group-level explanations for the failure of groups to solve hidden profiles: The individual preference effect revisited. *Group Processes & Intergroup Relations*, *13*(5), 653-671. doi:10.1177/1368430210369143

Faulmüller, N., Mojzisch, A., Kerschreiter, R., & Schulz-Hardt, S. (2012). Do you want to convince me or to be understood?: Preference-consistent information sharing and its motivational determinants. *Personality And Social Psychology Bulletin*, *38*(12), 1684-1696. doi:10.1177/0146167212458707

Feltz, D. L., & Landers, D. M. (1983). The effects of mental practice on motor skill learning and performance: A meta-analysis. *Journal of Sport Psychology*, *5*(1), 25–57. Retrieved from https://www.researchgate.net/profile/Deborah_Feltz/publication/228118028_The_effe cts_of_mental_practice_on_motor_skill_learning_and_performance_A_Meta-analysis/links/0046351e937edc69d3000000.pdf

Fisher, C. M. (2017). An ounce of prevention or a pound of cure? Two experiments on in-process interventions in decision-making groups. *Organizational Behavior and Human Decision Processes*, *138*, 59–73. https://doi-org.chain.kent.ac.uk/10.1016/j.obhdp.2016.11.004

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4), 25–42. https://doi-org.chain.kent.ac.uk/10.1257/089533005775196732

Gaglio, C. M. (2004), The Role of Mental Simulations and Counterfactual Thinking in the Opportunity Identification Process*. Entrepreneurship Theory and Practice, 28: 533-552. doi:10.1111/j.1540-6520.2004.00063.x

Galinsky, A. D., & Kray, L. J. (2004). From thinking about what might have been to sharing what we know: The effects of counterfactual mind-sets on information sharing in groups. *Journal Of Experimental Social Psychology*, *40*(5), 606-618. doi:10.1016/j.jesp.2003.11.005

Galinsky, A. D., Moskowitz, G. B., & Skurnik, I. (2000). Counterfactuals as self-generated primes: The effects of prior counterfactual activation on person perception judgements. *Social Cognition*, *18*(3), 252-280. doi:10.1521/soco.2000.18.3.252

Garcia, S. M., Weaver, K., Moskowitz, G. B., & Darley, J. M. (2002). Crowded minds: The implicit bystander effect. *Journal of Personality and Social Psychology*, *83*(4), 843–853. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.83.4.843

Gigone, D., & Hastie, R. (1993). The common knowledge effect: Information sharing and group judgment. *Journal of Personality and Social Psychology*, *65*(5), 959–974. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.65.5.959

Gigone, D., & Hastie, R. (1997). The impact of information on small group choice. *Journal Of Personality And Social Psychology*, *72*(1), 132-140. doi:10.1037/0022-3514.72.1.132

Gilead, M., Sela, M., & Maril, A. (2019). That's my truth: Evidence for involuntary opinion confirmation. *Social Psychological and Personality Science*, *10*(3), 393–401. https://doi-org.chain.kent.ac.uk/10.1177/1948550618762300

Goh, J. X., Hall, J. A., & Rosenthal, R. (2016). Mini meta-analysis of your own studies: Some arguments on why and a primer on how. *Social and Personality Psychology Compass*, *10*(10), 535–549. https://doi-org.chain.kent.ac.uk/10.1111/spc3.12267

Greitemeyer, T., & Schulz-Hardt, S. (2003). Preference-consistent evaluation of information in the hidden profile paradigm: Beyond group-level explanations for the dominance of shared information in group decisions. *Journal Of Personality And Social Psychology*, *84*(2), 322-339. doi:10.1037/0022-3514.84.2.322

Greitemeyer, T., & Würz, D. (2005). Mental simulation and the achievement of health goals: The role of goal difficulty. *Imagination, Cognition and Personality*, *25*(3), 239–251. https://doi-org.chain.kent.ac.uk/10.2190/D4UA-RQFQ-0H5T-W9YY

Greitemeyer, T., Schulz-Hardt, S., Brodbeck, F. C., & Frey, D. (2006). Information sampling and group decision making: The effects of an advocacy decision procedure and task experience. *Journal of Experimental Psychology: Applied*, *12*(1), 31–42. https://doi-org.chain.kent.ac.uk/10.1037/1076-898X.12.1.31

Hambrick, D. C., & Mason, P. A. (1984). Upper Echelons: The Organization as a Reflection of Its Top Managers. *Academy of Management Review*, *9*(2), 193–206. https://doi-org.chain.kent.ac.uk/10.5465/AMR.1984.4277628

Hannagan, R. J., & Larimer, C. W. (2010). Does gender composition affect group decision outcomes? Evidence from a laboratory experiment. *Political Behavior*, *32*(1), 51–67. https://doi-org.chain.kent.ac.uk/10.1007/s11109-009-9087-z

Hao, Q., Yang, W., & Shi, Y. (2019). Characterizing the relationship between conscientiousness and knowledge sharing behavior in virtual teams: An interactionist approach. *Computers in Human Behavior*, *91*, 42–51. https://doi-org.chain.kent.ac.uk/10.1016/j.chb.2018.09.035

Henningsen, D. D., & Henningsen, M. M. (2004). The effect of individual difference variables on information sharing in decision-making groups. *Human Communication Research*, *30*(4), 540-555. doi:10.1111/j.1468-2958.2004.tb00744.x

Hirt, E. R., & Markman, K. D. (1995). Multiple explanation: A consider-an-alternative strategy for debiasing judgments. *Journal Of Personality And Social Psychology*, *69*(6), 1069-1086. doi:10.1037/0022-3514.69.6.1069

Hirt, E. R., Kardes, F. R., & Markman, K. D. (2004). Activating a mental simulation mind-set through generation of alternatives: Implications for debiasing in related and unrelated domains. *Journal Of Experimental Social Psychology*, *40*(3), 374-383. doi:10.1016/j.jesp.2003.07.009

Ho, S. S., & McLeod, D. M. (2008). Social-psychological influences on opinion expression in face-to-face and computer-mediated communication. *Communication Research*, *35*(2), 190-207

Hollingshead, A. B. (1996). The rank-order effect in group decision making. *Organizational Behavior And Human Decision Processes*, *68*(3), 181-193. doi:10.1006/obhd.1996.0098

Homberg, F., & Bui, H. M. (2013). Top management team diversity: A systematic review. *Group & Organization Management*, *38*(4), 455-479. doi:10.1177/1059601113493925

Hopthrow, T., Feder, G., & Michie, S. (2011). The role of group decision making processes in the creation of clinical guidelines. *International Review Of Psychiatry*, *23*(4), 358-364. doi:10.3109/09540261.2011.606539

Hopthrow, T., Hooper, N., Mahmood, L., Meier, B.P. and Weger, U. (2017). Mindfulness reduces the correspondence bias. *The Quarterly Journal of Experimental Psychology*, 70(3), pp. 351-360. doi: 10.1080/17470218.2016.1149498

Hunt, V., Layton, D., & Prince, S. (2015). *Diversity Matters* (McKinsey&Company). Retrieved from http://www.mckinsey.com/insights/organization/why_diversity_matters

Hurmerinta-Peltomaki, L., & Nummela, N. (2006). Mixed methods in international business research: A value-added perspective. Management International Review, 46, 439-459. Retrieved from: https://link-springer-com.chain.kent.ac.uk/content/pdf/10.1007%2Fs11575-006-0100-z.pdf

Janis, I. L. (1982). Groupthink: Psychological Studies of Policy Decisions and Fiascos. Boston: Houghton Mifflin.

Jefferson, T., Ferzandi, L., & McNeese, M. (2004). Impact of Hidden Profiles on Distributed Cognition in Spatially Distributed Decision-Making Teams. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *48*(3), 649–652. https://doi.org/10.1177/154193120404800380

Jehn, K. A. (1992, December). The impact of intragroup conflict on effectiveness: A multimethod examination of the benefits and detriments of conflict. *Dissertation Abstracts International*, *53*, 2005.

Jehn, K. A. (1994). Enhancing effectiveness: An investigation of advantages and disadvantages of value-based intragroup conflict. *International Journal Of Conflict Management*, *5*(3), 223-238. doi:10.1108/eb022744

Jones, E. E., & Kelly, J. R. (2007). Contributions to a group discussion and perceptions of leadership: Does quantity always count more than quality? *Group Dynamics: Theory, Research, And Practice*, *11*(1), 15-30. doi:10.1037/1089-2699.11.1.15

Jones, D. B., & Murray, K. B. (1996). State-trait communication apprehension dimensions and potential clients' responses to help offering ads. *Psychology & Marketing*, *13*(1), 1-17. doi:10.1002/(SICI)1520-6793(199601)13:1<1::AID-MAR1>3.0.CO;2-K

Kahneman, D. (2011). *Thinking, Fast and Slow*. London: Penguin.

Kämmer, J. E., Gaissmaier, W., & Czienskowski, U. (2013). The environment matters: Comparing individuals and dyads in their adaptive use of decision strategies. *Judgment and Decision Making*, *8*(3), 299–329. Retrieved from http://search.ebscohost.com.chain.kent.ac.uk/login.aspx?direct=true&db=psyh&AN=2013-20059-008&site=ehost-live

Kelley, M. R., & Lemke, R. J. (2015). Gender differences when subjective probabilities affect risky decisions: An analysis from the television game show Cash Cab. *Theory and Decision*, *78*(1), 153–170. https://doi-org.chain.kent.ac.uk/10.1007/s11238-013-9389-9

Kelly, J. R., & Karau, S. J. (1999). Group decision making: The effects of initial preferences and time pressure. *Personality and Social Psychology Bulletin*, *25*(11), 1342–1354. https://doi-org.chain.kent.ac.uk/10.1177/0146167299259002

Kerr, N. L., MacCoun, R. J., & Kramer, G. P. (1996). Bias in judgment: Comparing individuals and groups. *Psychological Review*, *103*(4), 687–719. https://doi-org.chain.kent.ac.uk/10.1037/0033-295X.103.4.687

Kerr, N. L., & Tindale, R. S. (2004). Group performance and decision making. *Annual Review of Psychology*, *55*, 623–655. https://doi-org.chain.kent.ac.uk/10.1146/annurev.psych.55.090902.142009

Klein, G. *The power of intuition.* (2003). New York, NY: Currency Books, Random House Inc.

Klinteberg, B. A., Levander, S. E., & Schalling, D. (1987). Cognitive sex differences: Speed and problem-solving strategies on computerized neuropsychological tasks. *Perceptual and Motor Skills*, *65*(3), 683–697. https://doi-org.chain.kent.ac.uk/10.2466/pms.1987.65.3.683

Klocke, U. (2007). How to improve decision making in small groups: Effects of dissent and training interventions. *Small Group Research*, *38*(3), 437–468. https://doi-org.chain.kent.ac.uk/10.1177/1046496407301974

Kolb, M. R., & van Swol, L. M. (2016). Manipulating a synchronous or separatist group orientation to improve performance on a hidden profile task. *Group Processes & Intergroup Relations*, *21*(1), 57–72. https://doi-org.chain.kent.ac.uk/10.1177/1368430216647188

Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: “Seizing” and “freezing.” *Psychological Review*, *103*(2), 263–283. https://doi-org.chain.kent.ac.uk/10.1037/0033-295X.103.2.263

Kugler, T., Kausel, E. E., & Kocher, M. G. (2012). Are groups more rational than individuals? A review of interactive decision making in groups. *WIREs Cognitive Science*, *3*(4), 471–482. https://doi-org.chain.kent.ac.uk/10.1002/wcs.1184

Laroche, M., Saad, G., Cleveland, M., & Browne, E. (2000). Gender differences in information search strategies for a Christmas gift. *Journal of Consumer Marketing*, *17*(6), 500–522. https://doi-org.chain.kent.ac.uk/10.1108/07363760010349920

Larson, J. R., Foster-Fishman, P. G., & Keys, C. B. (1994). Discussion of shared and unshared information in decision-making groups. *Journal of Personality and Social Psychology*, *67*(3), 446–461. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.67.3.446

Larson, J. R., Christensen, C., Abbott, A. S., & Franz, T. M. (1996). Diagnosing groups: Charting the flow of information in medical decision-making teams. *Journal Of Personality And Social Psychology*, *71*(2), 315-330. doi:10.1037/0022-3514.71.2.315

Larson, J. J., Foster-Fishman, P. G., & Franz, T. M. (1998). Leadership style and the discussion of shared and unshared information in decision-making groups. *Personality And Social Psychology Bulletin*, *24*(5), 482-495. doi:10.1177/0146167298245004

Latané, B., Williams, K., & Harkins, S. (1979). Many hands make light the work: The causes and consequences of social loafing. *Journal Of Personality And Social Psychology*, *37*(6), 822-832. doi:10.1037/0022-3514.37.6.822

Latham, A. (2015). 12 Reasons Why How You Make Decisions is More Important Than What You Decide. Retrieved from: https://www.forbes.com/sites/annlatham/2015/11/15/12-reasons-why-how-you-make-decisions-is-more-important-than-what-you-decide/#15f4ba967db8

Levine, J. M., & Moreland, R. L. (1990). Progress in small group research. *Annual Review Of Psychology*, *41*585-634. doi:10.1146/annurev.ps.41.020190.003101

Liljenquist, K. A., Galinsky, A. D., & Kray, L. J. (2004). Exploring the Rabbit Hole of Possibilities by Myself or with My Group: The Benefits and Liabilities of Activating Counterfactual Mind-sets for Information Sharing and Group Coordination. *Journal of Behavioral Decision Making*, *17*(4), 263–279. https://doi-org.chain.kent.ac.uk/10.1002/bdm.479

Lovallo, D., & Sibony, O. (2010). *The case for behavioural strategy* (McKinsey&Company). Retrieved from https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-case-for-behavioral-strategy

Lu, L., Yuan, Y. C., & McLeod, P. L. (2012). Twenty-five years of hidden profiles in group decision making: A meta-analysis. *Personality And Social Psychology Review*, *16*(1), 54-75. doi:10.1177/1088868311417243

Mason, R O., & Mitroff, I. I. (1981). *Challenging strategic planning assumptions.* New York: Wiley-Interscience.

Maznevski, M. L. & Chudoba, K. M. (2000). Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness. *Organization science, 11*(5)*,* 473-492.

McCroskey, J. C. (1977). Oral communication apprehension: A summary of recent theory and research. *Human Communication Research*, *4*(1), 78-96. doi:10.1111/j.1468-2958.1977.tb00599.x

McCroskey, J. C., & Richmond, V. P. (1992). Communication apprehension and small group communication. In R. S. Cathcart & L. A. Samovar (Eds.), *Small group communication: A reader.* Retrieved from: http://www.jamescmccroskey.com/publications/bookchapters/006_1984.pdf

McHugh, M. L. (2013). The Chi-square test of independence. *Biochemia Medica, 23*(2), 143-9. Retrieved from: http://dx.doi.org?10.116113/BM.2013.018

McKinsey Quarterly Survey, January 2009. Retrieved from: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/flaws-in-strategic-decision-making-mckinsey

Meleady, R., Hopthrow, T., & Crisp, R. J. (2013). Simulating social dilemmas: Promoting cooperative behavior through imagined group discussion. *Journal of Personality and Social Psychology*, *104*(5), 839–853. https://doi-org.chain.kent.ac.uk/10.1037/a0031233

Meleady, R., Hopthrow, T., & Crisp, R. J. (2013). The group discussion effect: Integrative processes and suggestions for implementation. *Personality and Social Psychology Review*, *17*(1), 56–71. https://doi-org.chain.kent.ac.uk/10.1177/1088868312456744

Mennecke, B. E. (1997). Using group support systems to discover hidden profiles: An examination of the influence of group size and meeting structures on information sharing and decision quality. *International Journal of Human-Computer Studies*, *47*(3), 387–405. https://doi-org.chain.kent.ac.uk/10.1006/ijhc.1997.0136

Mesmer-Magnus, J. R., & DeChurch, L. A. (2009). Information sharing and team performance: A meta-analysis. *Journal Of Applied Psychology*, *94*(2), 535-546. doi:10.1037/a0013773

Meyers-Levy, J., & Maheswaran, D. (1991). Exploring differences in males' and females' processing strategies. *Journal of Consumer Research*, *18*(1), 63–70. https://doi-org.chain.kent.ac.uk/10.1086/209241

Meyers-Levy, J., & Sternthal, B. (1991). Gender differences in the use of message cues and judgments. *Journal of Marketing Research*, *28*(1), 84–96. https://doi-org.chain.kent.ac.uk/10.2307/3172728

Mitchell, G. (2012). Revisiting truth or triviality: The external validity of research in the psychological laboratory. *Perspectives on Psychological Science*, *7*(2), 109–117. https://doi-org.chain.kent.ac.uk/10.1177/1745691611432343

Mitchell, D. J., Russo, J. E., & Pennington, N. (1989). Back to the future: Temporal perspective in the explanation of events. *Journal of Behavioral Decision Making*, *2*(1), 25–38. https://doi-org.chain.kent.ac.uk/10.1002/bdm.3960020103

Mojzisch, A., & Schulz-Hardt, S. (2010). Knowing others' preferences degrades the quality of group decisions. *Journal Of Personality And Social Psychology*, *98*(5), 794-808. doi:10.1037/a0017627

Mojzisch, A., Kerschreiter, R., Faulmüller, N., Vogelgesang, F., & Schulz-Hardt, S. (2014). The consistency principle in interpersonal communication: Consequences of preference confirmation and disconfirmation in collective decision making. *Journal of Personality and Social Psychology*, *106*(6), 961–977. https://doi-org.chain.kent.ac.uk/10.1037/a0036338

Molina-Azorin, J. F. (2012). Mixed methods research in strategic management: Impact and applications. *Organizational Research Methods*, *15*(1), 33–56. https://doi-org.chain.kent.ac.uk/10.1177/1094428110393023

Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of Management, 36*(1), 5-39. doi: 10.1177/0149206309347376

Nova, A. (2018) Where Former Lehman Employees are Today. Retrieved from: https://www.cnbc.com/2018/09/10/loyalty-doesnt-exist-anymore-what-former-lehman-brothers-employees-learned.html

NVivo qualitative data analysis Software (Version 11); QSR International Pty Ltd., Victoria, Australia

O'Cathain, A., Murphy, E., & Nicholl, J. (2010). Three techniques for integrating data in mixed methods studies. British Medical Journal, 314, 1147-1150.

doi:10.1186/1472-6963-7-85

Random picker tool retrieved from: https://www.miniwebtool.com/random-picker/

Patel, M. (2017). *Offline recruitment has a shelf life – here's why.* Retrieved from http://www.hrmagazine.co.uk/article-details/offline-recruitment-has-a-shelf-life-heres-why-1

RW^3 CultureWizard (2016). *Trends in global virtual teams report.* Retrieved from http://info.rw-3.com/virtual-teams-survey-0 (2016)

Reavis, R., & Overman, W. H. (2001). Adult sex differences on a decision-making task previously shown to depend on the orbital prefrontal cortex. *Behavioral Neuroscience*, *115*(1), 196–206. https://doi-org.chain.kent.ac.uk/10.1037/0735-7044.115.1.196

Reimer, T., & Hoffrage, U. (2006). The ecological rationality of simple group heuristics: Effects of group member strategies on decision accuracy. *Theory and Decision*, *60*(4), 403–438. https://doi-org.chain.kent.ac.uk/10.1007/s11238-005-4750-2

Reimer, T., Kuendig, S., Hoffrage, U., Park, E., & Hinsz, V. (2007). Effects of the information environment on group discussions and decisions in the hidden-profile paradigm. *Communication Monographs*, *74*(1), 1–28. https://doi-org.chain.kent.ac.uk/10.1080/03637750701209947

Richmond, V. P. (2013) . Situational Communication Apprehension Measure (SCAM) . Measurement Instrument Database for the Social Science. Retrieved from www.midss.ie

Rivkin, I. D., & Taylor, S. E. (1999). The effects of mental simulation on coping with controllable stressful events. *Personality and Social Psychology Bulletin*, *25*(12), 1451–1462. https://doi-org.chain.kent.ac.uk/10.1177/01461672992510002

Russo, J & Schoemaker, Paul. (1992). Managing Overconfidence. Sloan Management Review. 33. 7-17.

Ryan, D. (2018). Weeding Through the Decision-Making Process. Retrieved from: https://www.forbes.com/sites/forbescoachescouncil/2018/03/22/weeding-through-the-decision-making-process/#6b760a2059a5

Sauer, S. J. (2011). Taking the reins: The effects of new leader status and leadership style on team performance. *Journal Of Applied Psychology*, *96*(3), 574-587. doi:10.1037/a0022741

Schittekatte, M. (1996). Facilitating information exchange in small decision-making groups. *European Journal of Social Psychology*, *26*(4), 537–556. https://doi-org.chain.kent.ac.uk/10.1002/(SICI)1099-0992(199607)26:4<537::AID-EJSP776>3.0.CO;2-I

Schittekatte, M., & Van Hiel, A. (1996). Effects of partially shared information and awareness of unshared information on information sampling. *Small Group Research*, *27*(3), 431–449. https://doi-org.chain.kent.ac.uk/10.1177/1046496496273006

Schulz-Hardt, S., & Mojzisch, A. (2012). How to achieve synergy in group decision making: Lessons to be learned from the hidden profile paradigm. *European Review Of Social Psychology*, *23*(1), 305-343. doi:10.1080/10463283.2012.744440

Schulz-Hardt, S., Jochims, M., & Frey, D. (2002). Productive conflict in group decision making: genuine and contrived dissent as strategies to counteract biased information seeking. *Organizational Behavior and Human Decision Processes*, *88(2),* 563-586, doi:10.1016/S0749-5978(02)00001-8.

Schulz-Hardt, S., Brodbeck, F. C., Mojzisch, A., Kerschreiter, R., & Frey, D. (2006). Group decision making in hidden profile situations: Dissent as a facilitator for decision quality. *Journal of Personality and Social Psychology*, *91*(6), 1080–1093. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.91.6.1080

Schweiger, D. M., Sandberg, W. R., & Ragan, J. W. (1986). Group approaches for improving strategic decision making: A comparative analysis of dialectical inquiry, devil's advocacy, and consensus. *Academy Of Management Journal*, *29*(1), 51-71. doi:10.2307/255859

Seekamp, E., Harris, C. C., Hall, T. E., & Craig, T. Y. (2010). A mixed methods approach to measuring depth of group information processing in the context of deliberative public involvement. *Journal of Mixed Methods Research*, *4*(3), 222–247. https://doi-org.chain.kent.ac.uk/10.1177/1558689810370601

Shanteau, J. (1988). Psychological characteristics and strategies of expert decision makers. *Acta Psychologica*, *68*(1–3), 203–215. https://doi-org.chain.kent.ac.uk/10.1016/0001-6918(88)90056-X

Shukor, N. A., Tasir, Z., Van der Meijden, H., & Harun, J. (2014). Exploring Students' Knowledge Construction Strategies in Computer Supported Collaborative Learning Discussions Using Sequential Analysis. *Educational Technology & Society. 17*(4), 216-228.

Sohrab, S., Waller, M., & Kaplan, S. (2015). Exploring the Hidden-Profile Paradigm. Small Group Research, *46*(5), 489-535. doi: 10.1177/1046496415599068

Somech, A. (2006). The Effects of Leadership Style and Team Process on Performance and Innovation in Functionally Heterogeneous Teams. *Journal Of Management*, *32*(1), 132-157. doi:10.1177/0149206305277799

Sorrentino, R. M., & Boutillier, R. G. (1975). The effect of quantity and quality of verbal interaction on ratings of leadership ability. *Journal Of Experimental Social Psychology*, *11*(5), 403-411. doi:10.1016/0022-1031(75)90044-X

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? *Behavioral and Brain Sciences*, *23*(5), 645–665. https://doi-org.chain.kent.ac.uk/10.1017/S0140525X00003435

Stasser, G., & Titus, W. (1985). Pooling of unshared information in group decision making: Biased information sampling during discussion. *Journal Of Personality And Social Psychology*, *48*(6), 1467-1478. doi:10.1037/0022-3514.48.6.1467

Stasser, G., & Titus, W. (1987). Effects of information load and percentage of shared information on the dissemination of unshared information during group discussion. *Journal of Personality and Social Psychology*, *53*(1), 81–93. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.53.1.81

Stasser, G., Taylor, L. A., & Hanna, C. (1989). Information sampling in structured and unstructured discussions of three- and six-person groups. *Journal of Personality and Social Psychology*, *57*(1), 67–78. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.57.1.67

Stasser, G., Stewart, D. D., & Wittenbaum, G. M. (1995). Expert roles and information exchange during discussion: The importance of knowing who knows what. *Journal of Experimental Social Psychology*, *31*(3), 244–265. https://doi-org.chain.kent.ac.uk/10.1006/jesp.1995.1012

Stasser, G., Vaughan, S. I., & Stewart, D. D. (2000). Pooling unshared information: The benefits of knowing how access to information is distributed among group members. *Organizational Behavior and Human Decision Processes*, *82*(1), 102–116. https://doi-org.chain.kent.ac.uk/10.1006/obhd.2000.2890

Stewart, D. D., & Stasser, G. (1995). Expert role assignment and information sampling during collective recall and decision making. *Journal of Personality and Social Psychology*, *69*(4), 619–628. https://doi-org.chain.kent.ac.uk/10.1037/0022-3514.69.4.619

Stewart, D. D., & Stasser, G. (1998). The sampling of critical, unshared information in decision-making groups: The role of an informed minority. *European Journal of Social Psychology*, *28*(1), 95–113. https://doi-org.chain.kent.ac.uk/10.1002/(SICI)1099-0992(199801/02)28:1<95::AID-EJSP847>3.0.CO;2-0

Stewart, D. D., Billings, R. S., & Stasser, G. (1998). Accountability and the discussion of unshared, critical information in decision-making groups. *Group Dynamics: Theory, Research, and Practice*, *2*(1), 18–23. https://doi-org.chain.kent.ac.uk/10.1037/1089-2699.2.1.18

Stigler, G. J. (1961). The economics of information. *Journal of Political Economy*, *69*, 213–225. Retrieved from http://search.ebscohost.com.chain.kent.ac.uk/login.aspx?direct=true&db=eoh&AN=1209161&site=ehost-live

Stiglitz, J. E. (2002). Information and the Change in the Paradigm in Economics. *American Economic Review*, *92*(3), 460–501. https://doi-org.chain.kent.ac.uk/http://www.aeaweb.org/aer/

Suurmond R, van Rhee, H, Hak T. (2017). Introduction, comparison and validation of Meta-Essentials: A free and simple tool for meta-analysis. Research Synthesis Methods. 1-17. doi.org/10.1002/jrsm.1260.

Taylor, S. E., Pham, L. B., Rivkin, I. D., & Armor, D. A. (1998). Harnessing the imagination: Mental simulation, self-regulation, and coping. *American Psychologist*, *53*(4), 429-439. doi:10.1037/0003-066X.53.4.429

Thomson, S. (2018). A Lack of Confidence isn't what's holding back working women. Retrieved from https://www.theatlantic.com/family/archive/2018/09/women-workplace-confidence-gap/570772/

Thompson, M. M., Naccarato, M. E., Moskowitz, G. B., & Parker, K. J. (2001). The personal need for structure and personal fear of invalidity measures: historical perspectives, current applications, and future directions. In G. B. Moskowitz (Ed.), *Cognitive social psychology: The Princeton symposium on the legacy and future of social cognition* (pp. 19–39). Mahwah, NJ: Erlbaum.

Thompson, M. M., Naccarato, M. E., & Parker, K. E. (1989). Assessing cognitive need: The development of the personal need for structure and personal fear of invalidity scales. Paper presented at the annual meeting of the Canadian Psychological Association, Halifax, Nova Scotia, Canada.

Tinson, J. S., & Nuttall, P. J. (2014). Social collective decision making among adolescents: A review and a revamp. *Psychology & Marketing*, *31*(10), 871–885. https://doi-org.chain.kent.ac.uk/10.1002/mar.20740

Toma, C., & Butera, F. (2009). Hidden profiles and concealed information: Strategic information sharing and use in group decision making. *Personality And Social Psychology Bulletin*, *35*(6), 793-806. doi:10.1177/0146167209333176

Toma, C., Gilles, I., & Butera, F. (2013). Strategic use of preference confirmation in group decision making: The role of competition and dissent. *British Journal Of Social Psychology*, *52*(1), 44-63. doi:10.1111/j.2044-8309.2011.02037.x

Toplak, M. E., West, R. F., & Stanovich, K. E. (2014). Assessing miserly information processing: An expansion of the Cognitive Reflection Test. *Thinking & Reasoning*, *20*(2), 147–168. https://doi-org.chain.kent.ac.uk/10.1080/13546783.2013.844729

Toplak, M. E., West, R. F., & Stanovich, K. E. (2017). Real-world correlates of performance on heuristics and biases tasks in a community sample. *Journal of Behavioral Decision Making*, *30*(2), 541–554. https://doi-org.chain.kent.ac.uk/10.1002/bdm.1973

24/7 Wall Street (2012). The Worst Business Decisions of All Time. Retrieved from: https://247wallst.com/special-report/2012/10/17/the-worst-business-decisions-of-all-time/2/

Vallaster, C., & Koll, O. (2002). Participatory group observation: A tool to analyze strategic decision making. *Qualitative Market Research: An International Journal*, *5*(1), 40–57. https://doi-org.chain.kent.ac.uk/10.1108/13522750210414508

van den Bos, R., Homberg, J., & de Visser, L. (2013). A critical review of sex differences in decision-making tasks: Focus on the Iowa Gambling Task. *Behavioural Brain Research*, *238*, 95–108. https://doi-org.chain.kent.ac.uk/10.1016/j.bbr.2012.10.002

Van Rhee, H.J., Suurmond, R., & Hak, T. (2015). User manual for Meta-Essentials: Workbooks for meta-analysis (Version 1.2) Rotterdam, The Netherlands: Erasmus Research Institute of Management. Retrieved from www.erim.eur.nl/research-support/meta-essentials

Van Swol, L. M., Savadori, L., & Sniezek, J. A. (2003). Factors that may affect the difficulty of uncovering hidden profiles. *Group Processes & Intergroup Relations*, *6*(3), 285-304. doi:10.1177/13684302030063005

Van Swol, L. M. (2007). Perceived importance of information: The effects of mentioning information, shared information bias, ownership bias, reiteration, and confirmation bias. *Group Processes & Intergroup Relations*, *10*(2), 239–256. https://doi-org.chain.kent.ac.uk/10.1177/1368430207074730

Veinott, B., Klein, G. A., & Wiggins, S. (2010, May). Evaluating the effectiveness of the PreMortem Technique on plan confidence. In *Proceedings of the 7th International ISCRAM Conference* – Seattle, USA, May 2010.

Waddell, B. D., Roberto, M. A., & Yoon, S. (2013). Uncovering hidden profiles: Advocacy in team decision making. *Management Decision*, *51*(2), 321-340. doi:10.1108/00251741311301849

Wei, W. (2010). Tony Hsieh: Bad Hires have cost Zappos over $100 million. Retrieved from http://www.businessinsider.com/tony-hsieh-making-the-right-hires-2010-10?IR=T

Winquist, J. R., & Larson, J. J. (1998). Information pooling: When it impacts group decision making. *Journal Of Personality And Social Psychology*, *74*(2), 371-377. doi:10.1037/0022-3514.74.2.371

Wittenbaum, G. M. (2000). The bias toward discussing shared information: Why are high-status group members immune? *Communication Research*, *27*(3), 379–401. https://doi-org.chain.kent.ac.uk/10.1177/009365000027003005

Wittenbaum, G. M., Hollingshead, A. B., & Botero, I. C. (2004). From Cooperative to Motivated Information Sharing in Groups: Moving Beyond the Hidden Profile Paradigm. *Communication Monographs*, *71*(3), 286-310. doi:10.1080/0363452042000299894

Wittenbaum, G. M., Hubbell, A. P., & Zuckerman, C. (1999). Mutual enhancement: Toward an understanding of the collective preference for shared information. *Journal of Personality and Social Psychology, 77*(5), 967-978. doi:10.1037/0022-3514.77.5.967

Xiao, Y., Zhang, H. and Basadur, T. M. (2013). Does information sharing always improve team decision making? An examination of the hidden profile condition in new product development 2015. *Journal of Business Research, 69*(2), 587-595. doi: http://dx.doi.org/10.1016/j.jbusres.2015.05.014

Appendix A: Mental Simulation: Study 2

Mental Simulation Task 1 - Recorder: Please read the following information to the group.

- Imagine we have proceeded with the hiring of your first ranked candidate [Stevens/Roberts/Jones].
- We are now looking forward 12 months and the last year has gone very badly:
    - Stevens/Roberts/Jones has upset work colleagues. Relationships between the group members are tense with many people now not even talking to each other!
    - Relationships with the local community are at an all time low and alumni funding is down.
    - Application numbers are well down and the University has slid 10 places down the rankings in 12-months.
    - Some senior academics have resigned and more are rumoured to be going to do the same.
- KEY QUESTION FOR THE GROUP – "WHAT COULD HAVE CAUSED THIS"?

Task 2 – Generate and record reasons for failure

- Using the attached sheet the Recorder should write down all of the reasons the Group can come up with as to why the last year has gone so badly. This could be any reason you can think of, based on the information you have for the candidates, or any other factor.

Please consider carefully whether the other two candidates could have done a better job and whether you would prefer to change your candidate ranking or maintain your original ranking.

Appendix B - Manifest Profile Stimuli: Study 3, 6 and 7

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Excellent teacher • Faculty research productivity increased • Volunteer • Influential contacts • Thoughtful leader/listener • Secured grant • Collaborative decision maker • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Had a low success rate in court during legal career • Temper • Tension with Provost • High turnover/abrasive leader
• Is a vegetarian • Plays golf and tennis • Divorced, remarried, 2 children • Apartment in Spain	• Only teaches 1 module • Continues to do some consulting work • Married with 3 children • Likes biking and running • Family lives nearby • Likes to garden • Spouse teaches Spanish • Enjoys sports	• Spouse is a physician • Likes reading mystery novels/biographies • Has a grown-up child • Enjoys cooking • Likes to play bridge (a card game) • Enjoys travelling • Lives in the area • Has 2 dogs and 2 cats

Appendix B – Hidden Profile/No Preference Stimuli: Study 3, 6 and 7 (6/7 Hidden Profile only)

List W

Candidate Attributes: Please Review Carefully

Candidate A	**Candidate B**	**Candidate C**
• Influential contacts • Collaborative decision maker	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• High turnover/abrasive leader
• Apartment in Spain	• Spouse teaches Spanish • Enjoys sports	• Lives in the area • Has 2 dogs and 2 cats

List X

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Thoughtful leader/listener • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Had a low success rate in court during legal career
• Divorced, remarried, 2 children	• Family lives nearby • Likes to garden	• Likes to play bridge (a card game) • Enjoys travelling

List Y

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Volunteer • Secured grant	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Temper
• Plays golf and tennis	• Married with 3 children • Likes biking and running	• Has a grown-up child • Enjoys cooking

List Z

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Excellent teacher • Faculty research productivity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Tension with Provost (College Head)
• Is a vegetarian	• Only teaches 1 module • Continues to do some consulting work	• Spouse is a physician • Likes reading mystery novels/biographies

Appendix C: Mental Simulation: Study 4 (MS New)

Mental Simulation Task 1 - Recorder: Please read the following information to the group.

- Imagine we have proceeded with the hiring of your chosen candidate.
- We are now fast forwarding 12 months to the probationary review and the last year has not gone well:
    - Your candidate hire has upset work colleagues. Relationships between group members are tense with many people now not even talking to each other.
    - Relationships with the local community are at an all-time low and alumni funding is down.
    - Application numbers are well down and the University has slid 10 places down the rankings in 12 months.
    - Some senior academics have resigned and more are rumoured to be going.

Task 2 – Generate and record reasons for last year's poor record:

- Using the additional sheet, identify the reasons you can think of for last year's poor record, based on the candidate information you hold. These can be brief, e.g. 'cold', 'tension with Provost'. You do not need to fill the entire sheet.

Task 3 – Identify potential solutions:

- Then note down any potential solutions to the situation that you can derive from the candidate information. These solutions could be based on the attributes of your chosen candidate e.g. management training, presentation training, etc. or it may be there are attributes which the other two candidates (both still available for hire) might better bring to bear on the problems identified. These can be brief.

Task 4 – Confirm your initial candidate selection or reject and select an alternative

- You are now asked to consider carefully whether you wish to approve and retain your candidate post probation or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate selection. Who do you think should be offered the position?

Recorder: please ask the Group to identify possible reasons for last year's poor record and any potential solutions (NB: You do not need to fill the entire sheet).

Number	Reasons for last year's poor record	Potential solutions
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

GROUP NUMBER (Session number/Card number on the door) ____________________________

(PMN)

Appendix C: Mental Simulation: Study 4 (MS Old)

Mental Simulation Task 1 - Recorder: Please read the following information to the group.

- Imagine we have proceeded with the hiring of your chosen candidate.
- We are now fast forwarding 12 months to the probationary review and the last year has not gone well:
    - Your candidate hire has upset work colleagues. Relationships between group members are tense with many people now not even talking to each other.
    - Relationships with the local community are at an all-time low and alumni funding is down.
    - Application numbers are well down and the University has slid 10 places down the rankings in 12 months.
    - Some senior academics have resigned and more are rumoured to be going.

Task 2 – Generate and record reasons for last year's poor record:

- Using the additional sheet, identify the reasons you can think of for last year's poor record, based on the candidate information you hold. These can be brief, e.g. 'cold', 'tension with Provost'. You do not need to fill the entire sheet.

Task 3 – Confirm your initial candidate selection or reject and select an alternative

- You are now asked to consider carefully whether you wish to approve and retain your candidate post probation or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate selection. Who do you think should be offered the position?

Recorder: please ask the Group to identify possible reasons for last year's poor record (NB: You do not need to fill the entire sheet). (Handout 6a)

Number	**Reasons for last year's poor record**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

GROUP NUMBER (Session number/Card number on the door) ____________________________

Appendix C: Control: Study 4

Task 1 - Word fill task

- Imagine we have proceeded with the hiring of your chosen candidate.
- Please think of and write down below as many different words as possible to summarise your experiences of providing data as a participant in psychological studies. We are only interested in the number of words - there are no right or wrong answers.

Task 2 – Confirm your initial candidate selection or reject and select an alternative

- We are now looking forward 12 months to the probationary review and you are asked to consider carefully whether you wish to approve and retain your candidate post probation or whether you believe the other two candidates (both still available) could have done a better job and you now wish to amend your selection. Who do you think should be offered the position?

Appendix D: Mental Simulation: Study 5

Task 1 - Recorder: Please read the following information to the group.

- Imagine we have proceeded with the hiring of your first ranked candidate.
- We are now fast forwarding 12 months to the probationary review and the last year has not gone well:
    - Your candidate hire has upset work colleagues. Relationships between group members are tense with many people now not even talking to each other.
    - Relationships with the local community are at an all-time low and alumni funding is down.
    - Application numbers are well down and the University has slid 10 places down the rankings in 12 months.
    - Some senior academics have resigned and more are rumoured to be going.

Task 2 – Generate and record reasons for last year's poor record:

- Using the additional sheet, identify the reasons you can think of for last year's poor record, based on the candidate information you hold. These can be brief, e.g. 'cold', 'tension with Provost'. You do not need to fill the entire sheet.

Task 3 – Identify potential solutions:

- Then note down any potential solutions to the situation that you can derive from the candidate information. These solutions could be based on the attributes of your chosen candidate e.g. management training, presentation training, etc. or it may be there are attributes which the other two candidates (both still available for hire) might better bring to bear on the problems identified. These can be brief.

Task 4 – Confirm your initial candidate ranking OR revise this ranking

- You are now all asked to consider carefully whether you wish to maintain the first ranking of your candidate post probation or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate ranking. Who do you think should be offered the position?

Note: You do not need to change the ranking if you decide your first decision was correct.

Recorder: please ask the Group to identify possible reasons for last year's poor record and any potential solutions (NB: You do not need to fill the entire sheet). (Handout 6a)

Number	**Reasons for last year's poor record**	**Potential solutions**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

GROUP NUMBER (Session number/Card number on the door) ______________________________

Appendix D: Devil's Advocacy: Study 5

Task 1 - Recorder: Please read the following information to the group.

- Imagine we have proceeded with the hiring of your first ranked candidate.

Task 2 – Devil's Advocacy procedure

- The person sitting in the club card seat has been selected to be the Devil's Advocate (DA). Your task is to identify all disadvantages of this selection and check the group's proposal for possible mistakes and false assumptions using the additional sheet.
- You should then present your criticisms to the other group members.
- Whilst the DA is working on their task, the remaining three group members should work individually to do as follows: ***Working Individually*** - please think of and write down below as many different words as possible to summarise your experience of the School of Psychology since arriving at Kent. We are only interested in the number of words – there are no right or wrong answers.

Task 3 – Additional Group Analysis

- The group should then work together to analyse all additional pieces of information identified by the Devil's Advocate that could be important for the group's final decision.

Task 4 – Confirm your initial candidate ranking OR revise this ranking

- You are now all asked to consider carefully whether you wish to maintain the first ranking of your candidate or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate ranking. Who do you think should be offered the position?

Note: You do not need to change the ranking if you decide your first decision was correct.

DA: please identify and write down all disadvantages of the group's first selection and check the group's proposal for possible mistakes and false assumptions using this additional sheet. (NB: You do not need to fill the entire sheet). (Handout 7a)

Number	**All Disadvantages of group's first selection**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

GROUP NUMBER (Session number/Card number on the door) ______________________________

Appendix D: Control: Study 5

Task 1 - Word fill task

- Imagine we have proceeded with the hiring of your first ranked candidate.
- As a group please think of and write down below as many different words as possible to summarise your experience of the School of Psychology since arriving at Kent. We are only interested in the number of words – there are no right or wrong answers.

Task 2 – Confirm your initial candidate ranking OR revise this ranking

- You are now all asked to consider carefully whether you wish to approve the first ranking of your candidate or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate ranking. Who do you think should be offered the position?

Note: You do not need to change the ranking if you decide your first decision was correct.

Appendix E: Mental Simulation: Study 6 & 7

Task 1 - Please read the following information carefully:

- Imagine we have proceeded with the hiring of your chosen candidate.
- We are now fast forwarding 12 months to the probationary review and the last year has not gone well:
    - Your candidate hire has upset work colleagues. Relationships between group members are tense with many people now not even talking to each other.
    - Relationships with the local community are at an all time low and alumni funding is down.
    - Application numbers are well down and the University has slid 10 places down the rankings in 12 months.
    - Some senior academics have resigned and more are rumoured to be going to go.

Task 2 – Generate and record reasons for failure:

- Using the space below, identify all of the reasons you can think of as to why the last year has gone so badly, based on the candidate information you hold. These can be brief, e.g. ‘cold’, ‘tension with Provost’.

Task 3 – Identify potential solutions:

- Then note down any potential solutions to the situation that you can derive from the candidate information. These solutions could be based on the attributes of your chosen candidate e.g. management training, presentation training, etc. or it may be there are attributes which the other two candidates (both still available for hire) might better bring to bear on the problems identified. These can be brief.

Task 4 – Confirm your initial candidate selection or reject and select an alternative

- You are now asked to consider carefully whether you wish to approve and retain your candidate post probation or whether you believe one of the other two candidates (both still available) could have done a better job and you now wish to amend your candidate selection. Who do you think should be offered the position?

Appendix E: Control Task: Study 6 & 7

Task 1 - Word fill task

- Imagine we have proceeded with the hiring of your chosen candidate.
- Please think of and write down below as many different words as possible to summarise your experiences of providing data as a participant in psychological studies. We are only interested in the number of words - there are no right or wrong answers.

Task 2 – Confirm your initial candidate selection or reject and select an alternative

- We are now looking forward 12 months to the probationary review and you are asked to consider carefully whether you wish to approve and retain your candidate post probation or whether you believe the other two candidates (both still available) could have done a better job and you now wish to amend your selection.

Appendix F – Manifest and Hidden Profile Material with Candidate Gender: Study 8

List W

Candidate A (MALE)	**Candidate B (MALE)**	**Candidate C (MALE)**
• Influential contacts • Collaborative decision maker	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• High turnover/abrasive leader
• Apartment in Spain	• Spouse teaches Spanish • Enjoys sports	• Lives in the area • Has 2 dogs and 2 cats

Candidate Attributes: Please Review Carefully

List W

Candidate Attributes: Please Review Carefully

Candidate A (FEMALE)	Candidate B (MALE)	Candidate C (MALE)
• Influential contacts • Collaborative decision maker	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• High turnover/abrasive leader
• Apartment in Spain	• Spouse teaches Spanish • Enjoys sports	• Lives in the area • Has 2 dogs and 2 cats

List X

Candidate Attributes: Please Review Carefully

Candidate A (MALE)	Candidate B (MALE)	Candidate C (MALE)
• Thoughtful leader/listener • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Had a low success rate in court during legal career
• Divorced, remarried, 2 children	• Family lives nearby • Likes to garden	• Likes to play bridge (a card game) • Enjoys travelling

List X

Candidate Attributes: Please Review Carefully*

Candidate A (FEMALE)	Candidate B (MALE)	Candidate C (MALE)
• Thoughtful leader/listener • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Had a low success rate in court during legal career
• Divorced, remarried, 2 children	• Family lives nearby • Likes to garden	• Likes to play bridge (a card game) • Enjoys travelling

List Y

Candidate Attributes: Please Review Carefully

Candidate A (MALE)	**Candidate B (MALE)**	**Candidate C (MALE)**
• Volunteer • Secured grant	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Temper
• Plays golf and tennis	• Married with 3 children • Likes biking and running	• Has a grown up child • Enjoys cooking

<u>List Y</u>

Candidate Attributes: Please Review Carefully

Candidate A (FEMALE)	Candidate B (MALE)	Candidate C (MALE)
• Volunteer • Secured grant	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Temper
• Plays golf and tennis	• Married with 3 children • Likes biking and running	• Has a grown-up child • Enjoys cooking

<u>List Z</u>

Candidate Attributes: Please Review Carefully

Candidate A (MALE)	Candidate B (MALE)	Candidate C (MALE)
• Excellent teacher • Faculty research productivity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Tension with Provost (College Head)
• Is a vegetarian	• Only teaches 1 module • Continues to do some consulting work	• Spouse is a physician • Likes reading mystery novels/biographies

List Z

Candidate Attributes: Please Review Carefully

Candidate A (FEMALE)	Candidate B (MALE)	Candidate C (MALE)
• Excellent teacher • Faculty research productivity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Tension with Provost (College Head)
• Is a vegetarian	• Only teaches 1 module • Continues to do some consulting work	• Spouse is a physician • Likes reading mystery novels/biographies

Manifest Profile

Candidate Attributes: Please Review Carefully

Candidate A (MALE)	Candidate B (MALE)	Candidate C (MALE)
• Excellent teacher • Faculty research productivity increased • Volunteer • Influential contacts • Thoughtful leader/listener • Secured grant • Collaborative decision maker • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Had a low success rate in court during legal career • Temper • Tension with Provost • High turnover/abrasive leader
• Is a vegetarian • Plays golf and tennis • Divorced, remarried, 2 children • Apartment in Spain	• Only teaches 1 module • Continues to do some consulting work • Married with 3 children • Likes biking and running • Family lives nearby • Likes to garden • Spouse teaches Spanish • Enjoys sports	• Spouse is a physician • Likes reading mystery novels/biographies • Has a grown up child • Enjoys cooking • Likes to play bridge (a card game) • Enjoys travelling • Lives in the area • Has 2 dogs and 2 cats

Manifest Profile

Candidate Attributes: Please Review Carefully

Candidate A (FEMALE)	Candidate B (MALE)	Candidate C (MALE)
• Excellent teacher • Faculty research productivity increased • Volunteer • Influential contacts • Thoughtful leader/listener • Secured grant • Collaborative decision maker • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Had a low success rate in court during legal career • Temper • Tension with Provost • High turnover/abrasive leader
• Is a vegetarian • Plays golf and tennis • Divorced, remarried, 2 children • Apartment in Spain	• Only teaches 1 module • Continues to do some consulting work • Married with 3 children • Likes biking and running • Family lives nearby • Likes to garden • Spouse teaches Spanish • Enjoys sports	• Spouse is a physician • Likes reading mystery novels/biographies • Has a grown-up child • Enjoys cooking • Likes to play bridge (a card game) • Enjoys travelling • Lives in the area • Has 2 dogs and 2 cats

Appendix F – Manifest and Hidden Profile Material with Candidate Gender: Study 8 (Control (No Gender) Condition – Added for second gender study)

Hidden Profile

List W

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Influential contacts • Collaborative decision maker	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• High turnover/abrasive leader
• Apartment in Spain	• Spouse teaches Spanish • Enjoys sports	• Lives in the area • Has 2 dogs and 2 cats

List X

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Thoughtful leader/listener • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Had a low success rate in court during legal career
• Divorced, remarried, 2 children	• Family lives nearby • Likes to garden	• Likes to play bridge (a card game) • Enjoys travelling

List Y

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Volunteer • Secured grant	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for obtaining donations	• Temper
• Plays golf and tennis	• Married with 3 children • Likes biking and running	• Has a grown-up child • Enjoys cooking

List Z

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Excellent teacher • Faculty research productivity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Tension with Provost (College Head)
• Is a vegetarian	• Only teaches 1 module • Continues to do some consulting work	• Spouse is a physician • Likes reading mystery novels/biographies

Manifest Profile

Candidate Attributes: Please Review Carefully

Candidate A	Candidate B	Candidate C
• Excellent teacher • Faculty research productivity increased • Volunteer • Influential contacts • Thoughtful leader/listener • Secured grant • Collaborative decision maker • Diversity increased	• Nationally recognised researcher • Recognized by business leaders • Emphasized collaboration • Speaking skills	• Pleasant personality • Strategic thinker • Active trustee • Students like as a teacher
• Cold • Out of Higher Education for 4 years • Lacks campus/student life experience • Accused of changing positions	• Seen drinking heavily • Left without raising funds • Discourages innovation • Not responsible for donations obtained	• Had a low success rate in court during legal career • Temper • Tension with Provost • High turnover/abrasive leader
• Is a vegetarian • Plays golf and tennis • Divorced, remarried, 2 children • Apartment in Spain	• Only teaches 1 module • Continues to do some consulting work • Married with 3 children • Likes biking and running • Family lives nearby • Likes to garden • Spouse teaches Spanish • Enjoys sports	• Spouse is a physician • Likes reading mystery novels/biographies • Has a grown-up child • Enjoys cooking • Likes to play bridge (a card game) • Enjoys travelling • Lives in the area • Has 2 dogs and 2 cats