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Video-modelling as an effective solution for coaching carers of autistic adults

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Video-modelling as an effective solution for coaching carers of

autistic adults

Introduction

Many autistic adults lack daily life skills, reducing their quality of life (QOL) (Bertelli *et al.*, 2011; Jacobson and Ackerman, 1990; Jonsson *et al.*, 2016). Barnard *et al.* (2001) found that only 3% of 450 autistic adults lived completely independently; 10% could complete a range of unaided daily tasks, and about one-third lacked social interaction outside their family homes. Underdeveloped skills may exacerbate these poor levels of engagement, as well as their sense of helplessness, vulnerability, and serious short-term and permanent health problems (Boutain *et al.*, 2020).

Applied Behaviour Analysis

Applied behaviour analysis is an evidence-based approach traditionally tied to behavioural skills training, such as teaching independent living skills and solving practical problems based on basic behavioural science (Hugh-Pennie *et al.*, 2018). It is effective in addressing the needs of autistic people. It entails applying behavioural principles to meaningfully change socially significant behaviours through careful observation and systematic experimentation (Baer *et al.*, 1968).

Much research has described difficulties in teaching self-care skills to autistic adults. For example, adequate oral hygiene involves tooth-brushing with fluoride toothpaste to prevent caries (Marinho *et al.*, 2003). Since many autistic adults experience multi-sensory sensitivity, achieving healthy oral

hygiene can be difficult. Unsurprisingly, poorer oral hygiene and enhanced

periodontal disease are evident among autistic adults, making this a major

challenge for carers (Martens *et al.*, 2000). Poor oral hygiene may have

broader negative effects, such as discouraging carers from providing

adequate support, potentially deteriorating into a vicious circle, that ultimately

results in poorer quality of life (QOL) (Dawson *et al.*, 2007; Felce and Perry,

1996). One way, therefore, to enhance the lives of vulnerable individuals may

be to train their carers in teaching skills to facilitate greater independence for

their clients.

Many relevant staff training packages have been developed, often

incorporating behavioural skill training programs (BSTs) (Homlitas *et al.*,

2014; LaBrot *et al.*, 2018; Sarakoff and Sturmey, 2004; Stewart *et al.*, 2007).

In training staff to implement discrete trial teaching with autistic children,

Sarakoff and Sturmey employed instructions, feedback, rehearsal, and

modelling. Such approaches are generally effective, with trainee

performances increasing substantially post-training. However, without

component analysis, we cannot attribute these positive outcomes to specific

training procedures. Apart from weak experimental control, this may result in

unnecessarily costly interventions (Stolz, 1976).

Felce *et al.* (2015) illustrate the cost of intervention: they evaluated staff

BST programs, employing similar training procedures to Sarakoff and

Sturmey (2004). Four staff members were trained, each member receiving

three to four hours of one-on-one instruction over six months, while spending

time preparing written material for the instruction and feedback phases.

Service providers are not always willing to or financially capable of

implementing lengthy BSTs (e.g., Boutain *et al.*, 2020; Clayton, 2019).

Lengthy, complex, expensive staff training programs may then have

counterproductive effects of delaying or preventing clients' learning and

achievement.

Video-Modelling

Video-modelling is well-researched: many papers suggest its viability as

an affordable and simple means to substantially improve staff teaching

performance (Bandura, 1969; Haydon *et al.*, 2016; Nosik *et al.*, 2012; Prelock,

2017). Similarly, Digennaro-Reed *et al.* (2010) used individualized video-

modelling to increase integrity when treating problematic behaviour, which is

valuable because it tends to enhance intervention outcomes. Sigafoos *et al.*

(2015) used individualized video feedback (IVF) to train parents, enhancing

their interactions with their autistic children as part of a BST program.

However, it was not possible to attribute the positive outcomes to IVF or any

other single variable.

Single-component training procedures, therefore, have the advantages of

reduced cost and enhanced evidence of specific effectiveness. They may, of

course, be less effective than BST, requiring additional resources, and this

paper aims to develop and evaluate the efficacy of an innovative, low-cost,

single-element training program to enable staff to teach socially significant

behaviour. **Methodology**

Participants and Learners

Three untrained support workers with no experience in behaviour

analysis procedures and no previous studies or degree in any subject served

as participants. All participants were providing home-based support for an

autistic adult (learner). Participant 1 (Eliah, female, 26 years, pseudonym) had

supported vulnerable individuals for three years and had cared for her learner

for one-and-a-half years. Participant 2 (Alfred, male, 39 years, pseudonym),

with no previous experience, had supported his client for five years.

Participant 3 (Srulik, male, 25 years, pseudonym), also with no experience,

had supported his client for three months. English was the second language

of all participants.

All learners were autistic adults. The first learner (supported by Eliah) was

a 28-year-old female with severe communication difficulties and aggressive

behaviour. The second learner (supported by Alfred) was a 34-year-old male

with severe communication difficulties. The third learner (supported by Srulik)

was a 29-year-old male with severe communication difficulties.

Settings and materials

A multiple-baseline experimental design across participants was used (Carr, 2005). Sessions occurred in the learners' houses in ordinary-sized bathrooms measuring 2.5–7 m^2, equipped with ordinary household fixtures. Most sessions involved participants and learners standing at the washbasin. Materials included a toothbrush, plastic cup, hand-towel, a 1-min Scrabble Electronic Timer® (timer), edible toothpaste, and a bin (where relevant). For maintenance and generalization purposes, the order and positioning of the materials resembled usual settings. Actual training involved participants watching an approximately 14-minute instructional DVD at their leisure.

Instructions for learners

All sessions began with the same instruction, 'X, please brush your teeth', accompanied by pointing at the task area. Next, learners were given five seconds to perform each step unaided before providing graded support as well as contingent and immediate reinforcement.

Additionally, the researcher followed an 11-step teeth-brushing task analysis, based on Horner and Keilitz (1975). The researcher demonstrated alternative ways to provide graded support and gestures, particularly when learners did not respond or made errors, ensuring learners completed each step successfully with minimal errors.

The data-recording systems (DRS) contained elements used in previous research (e.g., Lerman *et al.*, 2015; Yun *et al.*, 2017). Some elements were

linked with client characteristics: for example, measurement of prompts,

gestures, and physical guidance (likely to be associated with better skill

acquisition) and absence of speech and verbal demands (commonly

associated with problem behaviour among autistic adults). Other elements

encompassed several basic principles in behaviour analysis, such as the

physical configuration of the material (Moore and Fisher, 2007). All sessions

were video-taped and the elements were coded.

Ethics and risk-assessment

All participants provided informed consent. For ethical purposes,

participants (and learners' families) were formally informed of the study

procedure and potential outcomes. Bangor University Research Ethics

Committee granted ethical approval for the research.

For health and safety reasons, risk assessment was conducted and

appropriate responses were agreed upon with respect to termination of trials

in the event of challenging behaviour.

Producing the video-model

Video footage was taken from all three carers supporting their individuals

and of the researcher modelling similar skills. The researcher viewed the

entire footage along with his own performance and added subtitles to the

footage correcting participants' training skills. Three sections of 14-minute

footage were individually designed, each personalized and containing a range

of behavioural teaching techniques that naturally complemented participants'

behaviour respectively. Next, both subtitled video clips were digitally

transferred onto a single DVD to provide a complete video-model for one

participant. This was done to increase social validity as viewers could watch it

at their leisure and on a range of devices.

Procedure

Pre-baseline

This phase involved a single session in which participants supported

learners in tooth-brushing. The purpose was principally to ascertain

participants' pre-training experience and the type and efficacy of

reinforcement they used. It additionally enabled the researcher to practice the

DRS 'live' to verify its suitability and assess the feasibility of using a GoPro-

camera in the learners' bathrooms, where the sessions were conducted. All

layouts were left as usual, and participants used ordinary materials.

Baseline

Several days of baseline performance were recorded for all participants

on the same dates. Layouts were left as usual. Participants were allowed ten

minutes to read an instruction sheet before the first baseline session

explaining how to conduct the tooth-brushing session, listing an 11-step task-

analysis. To enhance understanding (as English was not the participants' first language) the researcher read the information sheets aloud and answered questions. Baseline sessions began following a short request: 'Support your learner to brush their teeth, please'. No further interaction occurred during sessions, which ended once participants said so, waved, or when learners' behaviour criteria for ending the session were met. Each session lasted two to four minutes. The researcher video-recorded all 37 sessions, and conducted observations subsequently.

Intervention

During this phase, participants received their video-model, an instructional DVD, 14-minutes long on average, integrating two video clips: one from the baseline phase and one depicting a researcher supporting the same activity with the same learner. Participants were asked to watch the DVD six times, and then return it to the researcher. The clip of the participant was carefully chosen to ensure that it contained ample learning opportunities. The researcher footage aimed to aid learning by demonstrating how to rearrange the layout, introduce new materials, and employ basic behavioural teaching techniques. Each clip was accompanied by subtitles to draw attention to key messages.

Digital footage was examined and participants' behaviour was evaluated in each step of the 11-step task-analysis using the DRS. This

enabled the researcher to identify weak areas in participants' performances.

Further frame-by-frame analysis enabled the researcher to hypothesize about

weak areas requiring attention and add subtitles at specific points in the

footage, directing participants to amend these areas of their behaviour. That

is, integrating frame-by-frame analysis within an accurate digital editing

program enabled the researcher to determine the onset/offset of the subtitles,

a feature specific to video-modelling.

Recording sessions recommenced once DVDs were returned. Participants

were given time to arrange the physical environment. Similar initial

instructions were provided to those given during the baseline phase. The

researcher did not interact with the participant or the learner during sessions.

All sessions were video-taped, and observations made subsequently.

Criterion for success

The success criterion was set as correctly enacting a minimum of 70% of

the 11-element DRS over two consecutive sessions (Conine *et al.*, 2020;

Horner and Keilitz, 1975; Lerman *et al.*, 2015). The decision to set a relatively

low criterion for success was taken by relevant parties at a multidisciplinary

meeting discussing this intervention and its potential outcome. All agreed that

to promote the experience of success for both learners and participants, it

was crucial to set relatively low criteria.

Procedural fidelity and inter-observer agreement

These were conducted by a secondary observer who remained oblivious

to the study purpose. Assessment of procedural fidelity was conducted for

100% of video-models, ensuring that each included five key characteristics: (i)

DVDs were personalized; (ii) the researcher modelled desired behaviour; (iii)

subtitles accompanied DVD footage; (vi) DVD footage systematically followed

elements of the DRS; (v) the researcher did not interact with either

participants or learners during sessions. Fidelity was 100%. Inter-observer

agreement on correct responses was assessed for 37% and 28% of the

intervention and baseline sessions, respectively. Researcher and secondary-

observer data were compared on an interval-by-interval basis, lasting two to

four minutes each and including the 11 steps of task analysis.

Agreements/disagreements were determined by dividing the number of

agreements by the number of agreements plus disagreements and multiplying

by 100. The mean inter-observer agreement was 90% and 88% for the

baseline and intervention sessions, respectively. Overall, inter-observer

agreement averaged 88% for the 20 observed sessions, ranging between

82% and 94%. This suggests that the data were sufficiently reliable.

Results

An element-by-element correct-performance-percentage was calculated

for all three participants. Figure 1 depicts participants' overall use of

behavioural teaching techniques during baseline and intervention sessions,

calculated as described above. Each datapoint represents one session.

Place Figure 1 here

A detailed analysis of pre-post percentage averages of participants'

behavioural teaching techniques, which were measured for each of the 11

steps of task analysis, is illustrated in Table 1. Following video-modelling (i.e.

during the Intervention Phase), all three participants increased their

behavioural teaching techniques by 41.53% on average, ranging from 1.4% to

100%.

Place Table 1 here

Social validity

To promote a stable, low-cost, sustainable program, and to secure

commitment from those involved, all sessions occurred during participants'

typical working hours and at times (e.g. late evening) when toothbrushing

routines occurred naturally. A 9-item Feedback Questionnaire (FQ),

previously developed by Reimers *et al.* (1992), was modified to score

participants' and learners' parents' satisfaction with the procedures. The FQ

used a 1–5 rating scale, where higher values indicated greater satisfaction.

Questionnaires were completed anonymously; the return rate was 100%. The

results delineated an overall encouraging evaluation of the training method,

that is, of its favourability, affordability, and general social validity. Their

responses indicated that the intervention procedure was acceptable and

likable, with minimal risks to both learners and participants. The overall

satisfaction score achieved across the six forms completed by all participants

and learners' parents was 92.5%.

Discussion

Observations

This study's main goal was to evaluate use of individualized video-

modelling technology in training carers to teach self-help skills to autistic

adults. The results suggest, both experimentally and clinically, that the single-

element video-modelling BST used was reasonably successful, affordable,

and socially valid. Participant 1 achieved the performance criterion in

intervention sessions 8 and 9 of 11 (79% in both cases). Though they did not

achieve the criterion for any sessions, the remaining two participants did

achieve a relatively high performance: participant 2 gained 72% on session 5

and 73% on session 8 of 8; participant 3 achieved 73% on session 2 and 69%

on session 4 of 5. The results are unlikely to be attributable to practice or time

factors because the multiple baseline design quite effectively demonstrated

that behaviour change occurred only once training was applied. Furthermore,

in the present study, baseline performance averaged 17%, and the

subsequent performance increase averaged 46%. In related studies wherein

multi-element training programs were used, baseline performances were

typically higher than in the current study, and average performance increases

lower. For example, using a non-concurrent multiple-baseline across eight

participants, LaBrot *et al.* (2018) evaluated the effectiveness of a range of

multi-component behavioural skills training programs: instructions, rehearsal,

modelling, and feedback. Baseline performance averaged 52-59% with a

subsequent average performance increase of 34.5%. Furthermore,

participants in the current study had less prior training and experience than

participants in most comparable studies; hence, it was affordable.

Given its impact on participant performance, video-modelling may

represent a low-cost and relatively simple single-element training program

with several advantages. First, video-modelling produced positive outcomes

with participants who had no previous training, limited experience, and for

whom English was their second language. This is potentially significant

because many service providers rely on untrained and inexperienced

personnel to provide adequate support for vulnerable individuals. In contrast,

much previous research on staff training has used more experienced and

qualified participants, at a much higher cost. For example, Clair *et al.* (2018)

examined the coupling of behaviour-specific praise, teacher performance

feedback, and contingency-specifying stimuli as primary strategies taught in

the staff skill training package. Researchers hired two highly skilled

consultants who delivered classroom intervention programs aiming to

increase teaching skills. This intervention was a relatively costly, complex multi-element training program requiring approximately 31 days and 6.5 hours per day. Their study resulted in an average increase of 18% from baseline to intervention.

The video-modelling presented in this study required participants to view 14-minute DVDs six times at their leisure, promoting the study's social validity. The training method had high social validity, being willingly accepted by participants and learners' parents. For example, two of the families requested that participants watch the DVD footage together with their son/daughter twice daily. In fact, in many instances, viewing became a group event, gathering family, participant, and learner together in front of the TV, making the training procedure both fun and educational. Moreover, video-modelling is individualized and can, therefore, be designed to complement participant strengths and weaknesses. For example, footage subtitles were set to 'run' long enough to give the participants, for whom English was their second language, extra time to read and understand.

Limitations

The current study has several limitations. First, video-modelling is described as a single element training program in contrast to the multi-element programs found in the literature (e.g., Clair *et al*, 2018; Ward-Horner and Sturmey, 2012). Video-modelling itself comprises several sub-

components that could have separate effects on participants' behaviour. These include use (or absence) of subtitles, extent of individualization, DVD length, and possibly time spent viewing. In the absence of suitable controls, it might be argued, for example, that similar results could have been achieved without personalizing the footage or providing subtitles, potentially reducing costs and making the training program more viable. Similarly, in a multi-component BST investigation, Ward-Horner and Sturmey (2012) found that both modelling and feedback are effective components of BST; therefore, neither modelling nor feedback can be considered the sole necessary effective component of BST. Moreover, because both components are effective for some participants, it cannot be surmised that either was insufficient to produce behavioural change.

Second, the 70% mastery criterion was lower than in previous ABA studies, considering that modern research recommends 100%. Nonetheless, two studies (Conine *et al.*, 2019; Rapp *et al.*, 2019) used a 70% criterion for success, and there is a paucity of data around the personnel-skills acquisition of untrained and inexperienced carers aiming to teach independent living skills to autistic adults with co-occurring intellectual disabilities via video-modelling (e.g., Lerman *et al.*, 2015). Owing to the paucity of data relating to simple, affordable single-element video modelling intervention programs, we chose to adopt the lower percentage criterion used in previous studies.

Future research should seek to replicate the efficacy of video-modelling and related programs and investigate effects of their sub-components and variations in these such as voice-overs vs. subtitles. It would also be useful to explore the potential for using video-modelling across a range of learner settings (e.g. work, education, family, respite). A study conducted with a specific learner might be aimed at enhancing the consistency of approach or generalization and maintenance of skills. Video-modelling or related approaches may be particularly adaptable training tools; subtitles can be translated to other languages and voice-overs can be added. Video-modelling may focus on a particular learner or might be designed to develop more generalized training skills in a particular activity.

Practical implications

This study's findings have potentially important implications for social care providers who use BST to train caregivers and parents to implement interventions. First, where possible, it may be more affordable and efficient to begin with video-modelling in isolation before introducing other training components such as instruction and rehearsal. Of course, it may be impossible to completely remove other training components, particularly if the interventionist is unfamiliar with video-modelling; although video-modelling does not necessarily require preliminary training, it does require familiarity with the technology and relevant computer software. In such cases, it might

be more beneficial to implement a multi-component conventional package,

reserving video-modelling training programs for situations in which the trainer

has the necessary knowledge.

Notwithstanding, the availability of mobile Apps may make producing

video-models more accessible than before. Additionally, the ease of video

viewing allows for flexibility and spontaneity in terms of place and time;

subsequently, treatment integrity has rapidly improved. Intervention

procedures that are implemented over long periods (e.g., Clair *et al.*, 2018)

may not facilitate cost reduction, hence decreasing the feasibility and

efficiency of such methods compared to a simple, affordable video-modelling

training procedure.

In summary, this study's overall aim was to enhance the lives of

vulnerable individuals and improve their autonomy by training those

supporting them in behavioural teaching skills. It was shown that a simple,

affordable video-modelling intervention could substantially improve the

performance of three previously untrained support workers. Many service

providers require continuous training programs for their staff and carers to

ensure high-quality support to clients. The type of staff training program

presented herein might appeal to these service providers. Speaking loosely, if

untrained staff or carers with limited experience could develop relevant

behavioural teaching skills relatively quickly after watching a 14-minute

personalized DVD, such training programs could be disseminated extensively,

potentially influencing many autistic individuals and ultimately enhancing their

QOL.

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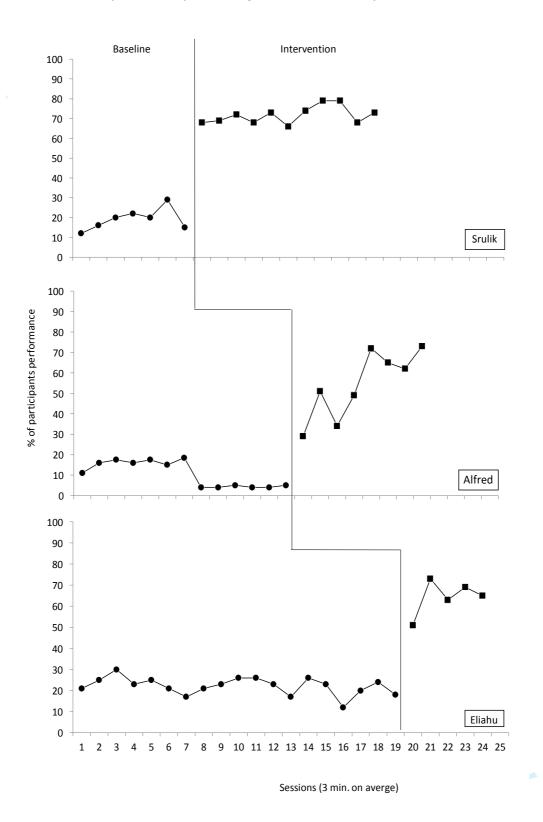Reimers, T.M., Wacker, D.P., Cooper, L.J. and DeRaad, A. (1992),

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Figure 1. Session-by-session percentages of the correctly attained 11-element

behavioural teaching techniques during baseline and intervention phases.

Table I. Pre-post percentage averages of participants' element behavioural teaching techniques, measured for each of the 11 steps of the task analysis.

Task analysis Items	Srulik		Alfred		Eliah	
	Pre	Post	Pre	Post	Pre	Post
Physical Environment	9.4	100	22.8	100	12.1	100
No. of steps completed	63.8	96.7	51	77	72.9	92.2
5 seconds given to learners before Sd presented	14.1	42.54	0	57.3	8	82
Use of speech	82	5	87	23	69	7.8
Use of gestures	20.5	60.8	0	6.7	18	10
Use of physical guidance	2.5	66.6	0	48	1.4	58
Use of contingent reinforcement	5.1	47.5	0	26	10.4	27
Use of immediate reinforcement	5.1	46.7	0	25.8	10.4	27