Teaching children with autism social skills using video modelling

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A thesis submitted in complete fulfilment of the requirements for the degree of Master of Science in Psychology, The University of Auckland, 2015.

Abstract

Video modelling (VM) combined with video embedded instructions were used to teach social skills to four children aged between ten to fifteen who were diagnosed with an autism spectrum disorder. The aim of this study was to contribute towards the existing literature on the efficacy of VM. In addition to this purpose, this study focused on programming for response and stimuli generalisation through the videos created and the intervention procedures. A multiple baseline design across participants and social skills was used. Results showed the intervention was effective at teaching responding to greetings, personal space and verbal request. The intervention effects were questionable for teaching requesting a turn. All the participants generalised the social skill across different stimuli. Response generalisation was only applicable to three out of four participants, and two of the participants demonstrated successful response generalisation. Despite no response generalisation occurred for the third participant, response variation was observed. These results suggest that a simple intervention of VM paired with instructions can be highly effective at teaching social skills and promoting generalisation of the skills. The limitations and implications of this research are also discussed.

Acknowledgements

I would like to thank my supervisor, Dr. Angela Arnold-Saritepe for all her support, comments and feedback she has provided me throughout the year. Without her my thesis would not have been possible.

I am grateful to all my actors who were volunteers to this research. I appreciated their enthusiasm in creating the videos, and their videos formed the most essential component to this research.

I would also like to thank all my participants including the students and teachers. Their willingness to participate, creativity and patience all contributed to the success of my research.

Lastly, I would like to thank my fiancé, Jonathan for all his support both emotionally and technically throughout the year.

Table of Contents

List of Figures

List of Tables

Introduction

Autism

Definition and prevalence. According to the American Psychiatric Association (2013), autism spectrum disorder (ASD) is a neurodevelopmental disorder, and is defined by persistent deficits in social interaction, communication and repetitive behaviours and restricted interests. Social deficits include difficulties in; social reciprocity, nonverbal communicative behaviours during social interactions, and limited skills for developing and maintaining relationships. Social deficits will be further explained in the later section. Repetitive behaviours and restricted interests include unusual interests and preoccupations, odd sensory seeking behaviours, and compulsive rituals and behaviours (Lord & Bishop, 2010).

One of the most common disorders co-occurring with ASD is Intellectual disability (ID). Three criteria are required to meet the diagnosis of ID; (1) difficulties in intellectual functions such as problem solving, planning and reasoning, confirmed by clinical assessments and standardised intelligence testing, (2) deficits in adaptive functioning that does not meet sociocultural and developmental standards for personal independence and (3) the onset of adaptive and intellectual deficits must occur during developmental period (American Psychiatric Association, 2013). It is estimated that of all ASD cases, 50-70 % also have an ID (Fombonne, 2003). The high co-morbidity between ASD and ID is an important factor to consider as research has suggested that differences in behaviour patterns exist between individuals diagnosed with either ASD, ID or both disorders (Matson & Shoemaker, 2009). Individuals diagnosed with ASD and ID were more likely to have impaired non-verbal and verbal communication and present restricted and repetitive activities, compared to individuals diagnosed with ASD alone (Deb and Prasad, 1994). Even though comorbidity with ID and ASD is beyond the scope of the current paper, this should be considered in treatment plans for

individuals with dual diagnoses, given the poorer prognosis and differences in behaviour symptoms.

Currently, it is estimated that up to twelve per one thousand children across the world meet the criteria for being diagnosed with autism (Centre for Disease Control and Prevention, 2015). In addition, there has been a rise in autism diagnoses, increasing from 50% to 200% over the past ten years globally (Kopetz & Endowed, 2012). The challenges associated with this complex disability significantly affect the child, their family members, schools, communities and public policies. In the United States, the direct (medical and non-medical costs) and indirect (including productivity lost) costs to care for all people diagnosed with autism are estimated to be thirty five billion dollars per year (Ganz, 2006). The increase in autism diagnoses coupled with wide spread effects, calls for greater awareness and understanding of the challenges associated with autism. With higher levels of awareness and understanding, different and relevant parts of the community may collaborate to support and accommodate challenges associated with autism.

Social deficits experienced. The type(s) of social skill impairment experienced by individuals with autism are diverse, but usually involve interaction with others, speech production and linguistic conventions. Social stimuli are variable and unpredictable. According to Dawson et al. (1998) children with autism struggle with processing complex social stimuli, and thus do not naturally attend to social stimuli. This lack of attention limits the child's opportunities for engaging in crucial social experiences, which is fundamental for social development. Frequently identified social impairments among children with autism include difficulties in turn-taking, understanding the listener’s perspective and issues with expressing and understanding emotions (White, Keonig, & Scahill, 2007). Matson, Compton and Sevin (1991) identified saying thank you appropriately, exhibiting eye contact, initiating conversation

and smiling at familiar people to be particularly challenging for a sample of children with autism.

Social deficits often lead to undesirable direct and indirect consequences for individuals with an ASD. Bauminger and Kasari (2000) reported greater loneliness, poor peer support and the desire for more peer interactions among high functioning young individuals with ASD, compared to typically developing peers. In addition, social deficits can foster anxiety and mood problems, and hinder the child's ability to form relationships, which reduces their quality of life (White, Keonig, & Scahill, 2007). This raises concerns around the social rights for individuals with disabilities. It is critical that all measures and available resources are utilised so that full realisation of social and cultural rights are achieved for individuals with disabilities. This entails promoting full inclusion, enjoyment and participation in the community. (United Nations, 2006). One might propose placing the child into a mainstream school in order to reduce issues around loneliness and to promote the child's social and educational rights. Indeed, parents of children with autism have supported the idea of inclusion from a legal and philosophical viewpoint (Leyser & Kirk, 2004). Inclusion appears to be the most appropriate and just solution for children with autism as the legislation systems in New Zealand, the United Kingdom, America and Australia all support the inclusion of individuals with ID into mainstream schools (U.S Department of Education, 2015; Ministry of Education, 2015; Forlin et al., 2013; MacBeath et al., 2006).

Implications of social deficits. However, placing the child with autism into a mainstream school without equipping them with the social skills crucial for peer acceptance can create the opposite effect to that intended, as mainstreaming could lead to social isolation and thus a more restrictive social environment (Gresham, 1981). Mainstreaming does not guarantee social acceptance and interaction with typically developing peers. In a study of parents of mainstreamed children with autism, Whitaker (2007) found 40% dissatisfaction.

This figure raises concerns as to whether mainstreaming is the best solution for children with autism. The balance between attaining the fundamental rights of a child in the least restrictive social environment, and any potentially adverse consequences arising from mainstreaming, is a challenge which warrants the need for effective interventions that may ultimately increase peer acceptance and positive interactions.

Social skills and Applied Behaviour Analysis

There are numerous studies that have shown the effectiveness of different interventions in teaching social skills (Strain & Tim, 1974; Buffington et al., 1998). Gresham (1981) organised studies that taught social skills into four main categories. These are: (1) manipulation of antecedents, (2) manipulation of consequences, (3) cognitive-behaviour therapy, and (4) modelling.

Antecedent manipulation. The manipulation of antecedents involves altering the social environment in order to set the occasion for the social behaviours to occur. Peer initiation is one example of an antecedent intervention whereby the child is taught to respond to another person's initiation. Strain and Tim (1974) used peers who initiated social interaction to increase the rates of verbal social interactions among children with moderate ID. A potential problem with antecedent interventions is the implicit assumption that the target skill (in this case-responding to other's initiation), is already present in the child’s behaviour repertoire, but just not performed at a desirable level (Gresham, 1981). Thus, if an antecedent intervention was to be implemented, the child must know how to demonstrate the social skill(s) prior to the treatment.

Consequent manipulation. For interventions that involve consequent manipulation, many researchers believe that low rates of social interactions are due to lack of reinforcement of appropriate social behaviours (Gresham, 1981). Token reinforcement is one type of

consequent intervention. In Buffington et al.'s (1998) study, the therapist delivered a token and social praise when the child with autism displayed appropriate gestural and verbal responses. Results showed the intervention was effective in increasing social skills. A potential issue associated with consequence interventions is that they demand active monitoring and thus more effort from the trainer, as the consequent delivery is contingent on the occurrence of the behaviour.

Cognitive behaviour therapy. Cognitive behavioural therapy (CBT) is based on a combination of behavioural and cognitive principles. This model emphasises problem solving through changing unhelpful thinking and behaviours (Beck, 2011). Spence, Donovan and Brechman-Toussaint (2000) compared the effectiveness of CBT, CBT and parent involvement and no treatment in treating children diagnosed with social phobia. The intervention consisted of multiple components. The behaviour component included social skills training which used modelling, prompts, reinforcement, role-play, graded exposure to social situations and relaxation techniques. The cognitive component included positive self-instruction such as teaching the children to identify "unhelpful" thoughts and changing them to "helpful thoughts". Results showed significantly greater reductions in the social anxiety scores in the CBT groups compared to the control group that received no treatment. However, one of the issues associated with this study and many other studies involving CBT techniques, is the ue of self and parent reported measures, which could be biased and less informative compared to behavioural measures.

Modelling. Modelling interventions can be categorised into two types - live modelling and symbolic modelling. Live modelling is where the child observes the model perform the social behaviour in a natural or laboratory setting (Gresham, 1981). Garfinkie (2002) used live peers as models to assess whether preschool children would imitate their peers' social behaviours and the results showed an increase in social behaviours. The issue with live

modelling is that often the peer or model is required to model the behaviour multiple times until the learner has mastered the skill, which could be time consuming. In addition, the target skill may only be modelled given the right circumstances and thus the learner could have limited opportunities to learn the target skill (Gresham, 1981). Symbolic or video modelling is an alternative method that combats these issues associated with live modelling.

Social skills and Video Modelling

Background and reasons for using video modelling. Video modelling (VM) is a method that uses videos where actors demonstrate the target behaviour(s), and the viewer imitates the actor's behaviour until mastery (Bellini & Akullian, 2007). There are a number of reasons why VM is favourable approach for teaching children with autism. Firstly, individuals with autism tend to process visual stimuli better than auditory stimuli (Ayres & Langone, 2005). Secondly, with the widespread influence of technology on society and the popularity of tablets and other electronic devices among children, VM could easily capture this opportunity to teach learners useful skills. Thirdly, VM could be less labour intensive relative to other techniques, such as live modelling. Finally, there are numerous studies that have demonstrated the effectiveness of VM in teaching social skills to individuals with autism. These studies will be discussed later in this chapter

Video self-modelling (VSM) is a method similar to VM but instead of observing another actor, the learner watches a video of himself or herself demonstrate the desired behaviour(s) (Bellini & Akullian, 2007). The video is created by the learner performing the target behaviour with prompts or assistance of others. The prompts are then edited out, to give the appearance that the learner is performing the target behaviour independently (Hosford, 1980). Many studies have demonstrated that VSM has been effective at teaching individuals' social skills (Buggey, 2005; Buggey, Toombs, Gardener & Cervetti, 1999; Wert & Neisworth,

2003). Sherer et al. (2001) compared the effectiveness of VSM and VM in teaching conversational questions, and found both VM and VSM were effective across all participants. VSM is briefly mentioned because it is a technique that has also been used to teach various skills including functional and motor skills, similar to VM (Bellini & Akullian, 2007).

There have been a number of studies that used VM to teach social skills to individuals with autism as seen in the table below. The effectiveness of the studies is based on the results and evaluated by its practical significance. Across all the studies mentioned in Table 1 both the results and type of social skill trained were variable. Some of the social skills trained included greetings, compliment giving, sharing toys, play comments and responding to questions.

Table 1
Characteristics of studies that have used VM to teach social skills

Author(s)	Participant characteristics	Stimuli used	Social skills targeted	Results
Apple, Billingsley, Schwartz & Carr (2005)	2 boys, 5 yoa with autism	Items of participant's interest	Compliment responses & initiation	VM itself effective for initiations only. Reinforcement needed to increase responses
Avcioglu (2013)	4 children, 10-11 yoa with ID	None	Greetings	Highly effective for all participants
Alzyoudi, Sartawi & Almuhiri (2015)	5 boys, 5-7 yoa with autism	None	Social initiation, answer/asking questions	Effective, but data variable during VM phase
Banda et al. (2010)	2 young adults, 17 & 21 yoa with autism	Preferred items	Spontaneous requests	Variable. Effective for 1 participant, ineffective for the other
Cardon (2013)	3 boys, 3-5 yoa with autism	Toys	Imitate gesture	Effective for 2/3 participants. Ineffective for 1.
Charlop & Milstein (1989)	3 boys, 6-7 yoa with autism	favourite toys	Question and answer	Questions: moderately effective, variable data Answers; effective for all participants
Charlop-Christy, Le and Freeman (2000)	1 boy, 10 yoa with autism	Toys	Spontaneous greetings	Highly effective
Marzullo-Kerth et al. (2011)	4 boys, 7-8 yoa with autism	Crayons, toys, food	Sharing	Effective, but slow increase in sharing at the onset of intervention
Kroeger et al. (2007)	13 children, 4-6 yoa with autism	Play materials	Multiple play & social skills including taking turns	Direct teaching group more effective than play activities group
Macdonald et al. (2005)	2 boys, 4 & 7 yoa with autism	Toys	Scripted verbalizations. Play actions. Unscripted play actions	Highly effective for all participants
Macpherson et al. (2014)	5 children, 9-11 yoa with autism	Cones and a ball	Compliments (verbal & gestural)	Moderately effective. Data variable for 3/5 participants
Maione & Mirenda (2006)	1 boy, 5 yoa with autism	Toys	Social initiations & responses	VM alone effective for 2/3 toys.
Miltenberger & Charlop (2015)	4 boys, 7-12 yoa with autism	Toys and games	Conversational speech. Interactive play. Question asking	Moderately effective. Data variable for interactive play, and slow increase for conversational speech
Nikopolous & Keenan (2007)	3 boys, 7 yoa with autism	Items participant familiar with. Vacuum cleaner, jacket, ball	engagement time in social play	Effective for all participants
Simpson, Langone & Ayres (2004)	2 girls, 5 & 6 yoa; 2 boys, 5 & 6 yoa all with autism.	Class activities- reading, maths, art	Greeting others, sharing materials	Effective for all participants
Sherer et al. (2001)	5 boys, 6-8 yoa with autism	None	Answering series of questions	Effective for 4/5 participants
Taylor, Leving & Jasper (1999)	2 boys, 6 & 9 yoa with autism	Favourite toys	Play comments	Highly effective for both participants

Table 1. *continued*

Author(s)	Experimental setting	Generalisation	Generalisation results	Intervention
Apple, Billingsley, Schwartz & Carr (2005)	Classroom free-play time	Gen across settings and response for exp 2 only.	Good setting gen, did not quantify response gen	VM + reinforcement (exp 1) VM + Self-management (exp 2)
Avcioglu (2013)	Different classroom	Gen across people & setting, but procedure was highly contrived	Very good	VM + reinforcement (verbal praise), instructions
Alzyoudi, Sartawi & Almuhiri (2015)	Resource room	Gen across setting	Very good	VM
Banda et al. (2010)	Special education classroom	Gen across items	None	VM & speech generating device
Cardon (2013)	University lab	No testing of stimuli gen. Tested response gen (new gestures)	Good for one participant only	VM on iPad. Practice session + verbal praise
Charlop & Milstein (1989)	Training room	Gen across settings, people and response	Great response variation. But criterion not met for setting and people	VM
Charlop-Christy, Le and Freeman (2000)	Clinic door	Gen across setting	Good	VM vs in-vivo
Marzullo-Kerth et al. (2011)	School office	Gen across people, stimuli, setting no response gen testing	Good for 3/4 participants	VM, reinforcement (tokens), prompts
Kroeger et al. (2007)	Did not specify	No gen tests conducted	N/A	Group intervention with direct teaching (VM)
Macdonald et al. (2005)	Preschool classroom	Tested for response gen No stimuli gen test	No unscripted play	VM
Macpherson et al. (2014)	Lawn area	Gen across item Response variation	Poor gen across activity. Great response variation	VM on iPad
Maione & Mirenda (2006)	Home	Response gen only	Very good	VM (phase 1) then VM + VF (phase 2)
Miltenberger & Charlop (2015)	Treatment room	Gen across people and setting	Good for 3/4 participants	VM (compared with iPad and TV)
Nikopolous & Keenan (2007)	Classroom	Gen across people only	Good	VM
Simpson, Langone & Ayres (2004)	Classroom	No gen tests	N/A	VM + computer instructions
Sherer et al. (2001)	Home (living room)	Gen across setting, people & response	Some gen occurred, but the tests were incomplete. Did not report gen response for 4/5 participants	VM vs VSM
Taylor, Leving & Jasper (1999)	Home	Response gen tested, but no stimuli gen test	No unscripted verbalisations in exp 1, but did occur in exp 2	VM, reinforcement and chaining

Seven out of seventeen studies demonstrated the VM intervention was clearly effective at increasing the target skill for all participants (Avcioglu, 2013; Charlop-Christy, Le & Freeman, 2000; Macdonald et al., 2005; Nikopolous & Keenan, 2007; Simpson, Langone & Ayers, 2004; Sherer et al., 2001; Taylor, Leving & Jasper, 1999). These studies demonstrated the intervention improved all the participants' social skill levels that met practical significance. For example, in Avcioglu's (2013) study, during baseline all the participants showed no greetings. Once intervention was introduced, the number of greetings increased to 100% by the third session for all participants. Meanwhile, nine out of seventeen studies demonstrated VM was moderately effective, as results showed not all participants demonstrated improvements in the target skills, or data during intervention was variable (Apple, Billingsley, Schwartz & Carr, 2005; Alzyoudi, Sartawi & Almuhiri, 2015; Banda et al., 2010; Cardon, 2014; Charlop & Milstein, 1989; Marzullo-Kerth et al., 2011; Macpherson, Charlop & Miltenberger, 2014; Maione & Mirenda, 2006; Miltenberger & Charlop, 2015). For example, Banda et al. (2010) taught two participants to make spontaneous requests. The results showed the VM intervention was effective for only one participant and ineffective for the other. Maione and Mirenda (2005) taught a child to make social initiations and responses with three toy sets. The results showed the intervention was effective for two out of the three toy sets.

Limitations in the VM studies

VM as a behavioural package. Seven out of sixteen studies added multiple components in addition to VM in the intervention. This can be seen in the Intervention column in Table 1. For example, Marzullo-Kerth et al. (2011) used reinforcement (tokens), prompts and VM to teach participants sharing. Taylor, Leving and Jasper (1999) added chaining, reinforcement (edibles) and VM to increase the number of spoken words See Table 1 for more examples of studies that used three or more components. Thus, it was difficult to tease apart

whether it was VM, the other components, or a combination of both, that contributed to the results.

Response generalisation. Eight out of the seventeen studies tested for response generalisation. The generalisation column from Table 1 depict the type of generalisation test(s) conducted in each study. Of the eight studies, only three found the occurrence of response generalisation across all participants (Charlop & Milstein, 1989; Macpherson, Charlop & Miltenberger, 2014; Maione & Mirenda, 2006). For example, Macpherson et al. (2014) trained compliment giving, and found a large increase in varied unscripted compliments. Whilst, Macdonald, Clark, Garrigan and Vangala (2005) tested for unscripted verbalisations but found none. Cardon (2013) found response generalisation with imitation of new gestures, but this only occurred for one out of three participants.

Training diversely can facilitate response generalisation (Stokes & Osnes, 1989). Using sufficient response exemplars is one approach to training diversely. With this method, during training the learner is presented with multiple examples of the target skill. For example, in Macpherson et al.'s (2014) study, various ways of delivering a verbal compliment were modelled: "Wow, that went far!", "That was a great kick!" and "That was a nice job". In the scripts used for Charlop and Milstein's (1989) study, different items were mentioned across the scripts. For example, one conversation was about a box and what was inside the box, while another conversation was about a barrel and what was inside the barrel. In Maione and Mirenda's (2005) videos, the actors used different languages in each clip. This included language that was already in the child's repertoire and language that was used infrequently. The two types of languages shown was to promote unscripted verbalisations. Results from all these studies demonstrated all children showed untrained responses after intervention. There were a number of other studies which incorporated scripts that trained diversely. Marzullo-Kerth et al. (2011) taught children sharing and multiple scripts were modelled, "Try this",

"Here, you try it" and "Do you want to try?" However, many of these studies, including Marzullo-Kerth et al. (2011), did not test for response generalisation.

Implementing current functional contingencies is another consideration when programming for response generalisation. This includes using least intrusive and natural positive consequences during intervention (Stokes & Osnes, 1989). The two studies that demonstrated response generalisation did not add artificial reinforcers. Instead, Charlop and Milstein's (1989) delivered naturally occurring comments such as "Yeah", "That's right" and "Uh-huh" contingent on the child demonstrating appropriate responses.

Stimuli generalisation. Eleven out of the seventeen studies tested for stimuli generalisation. Of the eleven studies, only five found the presence of stimuli generalisation across all the participants in the study (Apple et al., 2005; Avcioglu, 2013, Alzyoudi et al., 2015; Charlop-Christy et al., 2000; Nikopoulous & Keenan, 2007). However, these five studies found successful stimuli generalisation only with novel setting and/or people. None of the five studies tested generalisation with novel items. Moreover, these studies used only items and toys the participants were familiar with during intervention. In order to promote stimuli generalisation, training with multiple exemplars including the incorporation of different items is important (Cooper, Heron & Heward, 2007). Haring (1985) taught children with disabilities to play with different airplane toys. After the training, the children played appropriately with various types of planes. It is difficult to decipher whether training social skills with various unfamiliar toys or items is necessary for generalisation across novel items to occur, because majority of the studies used only items or toys that the participants were familiar with, and none of these studies tested for generalisation across novel items,

There are potential challenges and considerations when using multiple stimulus exemplars. It is important to identify when the target skill should and should not occur in

relation to the stimuli. For example, with compliment giving in Apple et al.'s (2005) study, incorporating non preferred stimuli ideally should not evoke compliments. Thus, the incorporation of non-preferred stimuli can further assess whether compliment giving is correctly generalised. However, depending on the target skill, selecting only stimuli that are reinforcing for the participant could be necessary. Charlop and Milstein (1989) used the participant's favourite toys to teach asking and answering questions. If additional stimuli are not preferred, the participant may not be motivated to ask questions and answers. Similarly, interactive play might not have occurred if Miltenberger and Charlop (2015) used toys and games that the participant did not prefer.

Research Aims

The current research will use VM combined with video embedded instructions to teach social skills to children with autism. In addition to this main purpose, this research will aim to: (a) focus primarily on VM and video embedded instructions as opposed to using a behavioural package that includes three or more components, (b) target four different types of social skills- respond to greetings, personal space, verbal requests and requesting a turn, (c) create videos that will maximise response and stimuli generalisation, and (d) conduct stimuli and response generalisation tests. The remaining chapter will be divided into four sections. Each section will focus on a specific social skill listed from above, and under each section, the four objectives mentioned above will be discussed with regards to other related studies. The first section will address greeting responses, followed by personal space, verbal requests then requesting a turn. Within each section, there will first be a review on other studies that also targeted the same social skill but used a behavioural package with three or more components. Next, there will be a comparison of the dependent variables targeted across different studies, as various topographies belonging to the same social skill have been addressed, e.g., greeting initiations versus greeting responses. Thirdly, whether other studies programmed for generalisation in

their videos and research procedure will be examined. Lastly, there will be a comparison of the generalisation results.

Greeting responses. There are limited studies that used VM to teach greeting responses. Charlop-Christy et al. (2000) to a child with autism greetings using VM and reinforcers in the form of verbal praise. Avcioglu (2013) taught greetings to children with ID and used a behavioural package including VM, reinforcement and coaching. The use of a behavioural package makes it difficult to determine whether it was the instructions from the experimenter, the social praise or the VM itself that contributed to the results. The current study will focus on using VM and instructions as the primary intervention and no specific reinforcers will be delivered.

In relation to the dependent variable, the greeting initiation taught in Charlop-Christy et al.'s study (2000) was "Hello, How are you?" For some individuals with ID, this phrase could be considered irrelevant and non-meaningful (Sicile-Kira, 2008). The current study will teach a participant to respond to greetings, which differs from greeting initiations. In addition, the phrase "How are you" will not be included.

The target skill of the current study differs from the above two studies as the participant will be taught to exhibit a simple greeting response to the other person's greeting, and without the additional "How are you?" phrase. Charlop-Christy et al. (2000) only modelled one greeting initiation ("Hello, How are you"). In contrast, models from Avcioglu's (2013) study demonstrated various greetings such as "Hello/Hi/ Good morning". To address the issue of response generalisation in the current research, more than one greeting response will be shown in the videos, similar to Avcioglu's (2013) scripts. In addition, the topography of the greeting response will be recorded to assess whether response generalisation occurs.

The testing procedure for generalisation across people in Avcioglu's (2013) study was contrived. The students were asked "What do we say when we meet people? Tell them in class now when you come up to your friend", and students were expected to greet one another. Generalisation testing was more realistic in Charlop-Christy et al.'s (2000) study, as probes were conducted at the front door of a restaurant. In the current study, testing generalisation across settings and people will be as natural as possible as the participant will be presented with natural opportunities to demonstrate greeting responses in ways similar to that of Charlop-Christy et al. (2000). In addition, to maximise stimuli generalisation, various places including an indoor trampoline, outdoor garden and doorway will be used for filming.

Personal space. Currently, there are no studies that employed VM to teach personal space. MacKay, Knott and Dunlop (2007) conducted a group work intervention with high functioning children with ADHD to teach them various social skills including personal space. The group intervention included games, role-plays and group discussions. Similar to the issue mentioned previously, it is difficult to decipher which aspect of the intervention was effective at improving personal space. In contrast, Tsui and Rutherford (2014) focused only on VSM to teach personal space to an adult with autism. The current study will be the first to use only VM and video embedded instructions to teach a child with autism personal space.

The dependent variables in MacKay et al.'s (2007) study were based on three key themes; conversational and social skills, emotional perspective taking and friendship skills. Personal space was taught under friendship skill along with many other concepts such as accepting rules. The dependent variable was the overall mean rating of social skills pre- and post- test. Despite there being a significant difference in the ratings between pre and post-testing, all three key themes were merged into one measure. Thus, it is impossible to determine whether the group work intervention was effective at teaching personal space specifically.

On the other hand, Tsui and Rutherford (2014) focused on measuring personal space only. In their study, the dependent variable was the proportion of time invading personal space before the intervention, as compared to afterwards. Although the authors reported a reduction in the proportion of time invading personal space after the intervention, the result does not bear any practical significance, as only 3/5 of staff reported improvements in personal space. Another issue with this study is that the dependent variable gives little insight into the extent of the personal space issue, compared to other measurement approaches such as the frequency of personal space invasion. Despite these two studies' attempts to teach personal space, there were no clear measures of personal space improvements. Figures depicting changes in personal space invasion before, during and after the intervention could be more meaningful. The current study will incorporate such a measure to determine whether VM can reduce personal space invasion to a socially significant level.

The videos from Tsui and Rutherford's (2014) study were filmed in one room only. The videos in the current study will be filmed in various settings and instead of one other actor, the video will show a child approaching various adults in order to maximise stimuli generalisation. Finally, generalisation across people and setting will be conducted which the studies mentioned above failed to incorporate.

Verbal requests. Various studies have used a wide range of techniques to teach individuals to make requests. Thiemann and Goldstein (2001) used a behavioural package including instructions delivery, text cues, pictures and video feedback to teach spontaneous requests. The results showed the intervention was effective at increasing request initiations. However, the intervention was labour intensive as each session lasted thirty minutes. Social validity, such as the ease of implementation was not assessed. Despite the positive results, this could indicate a shortcoming as the implementation could be too taxing on educators who are already confronted with heavy workload and stress in special education classrooms (Fore,

Martin & Bender, 2002). Wert and Neisworth's (2003) intervention was less intensive as only VSM was used to teach spontaneous requests to preschool children with autism. Results showed an increase in the frequency of spontaneous requests compared to baseline. Banda et al. (2010) was the only study that used VM to teach young adults with autism spontaneous requests through a speech-generating device (SGD). Similarly, the current study will only employ VM and video embedded instructions to teach spontaneous requests, and comparable to Wert and Neisworth (2003), the current study will require minimal efforts from the implementers.

Banda et al. (2010) tested generalisation across stimuli with the presentation of the second most preferred object (an edible) but generalisation did not occur. One reason could be that the item presented in the video was the same ones used for the test conditions and thus, the behaviour could have been under the stimulus control of the video, rather than the actual preferred item. Meanwhile, in the current study the items shown in the video differ from the stimuli used during intervention. In addition, the video will include various actors and will be filmed across different settings to maximise generalisation.

No generalisation tests were conducted in Wert and Neisworth's (2003) study. Even though Banda et al. (2010) conducted generalisation across stimuli, the procedure was highly contrived as the preferred item was placed directly in front of the participant. In the current study, generalisation across setting will be tested under natural contexts. Generalisation across people will be measured with different teachers and peers.

Requesting a turn. Similar to the other target social skills mentioned, limited studies have taught participants turn taking. Kroeger, Schultz and Newsom (2007) compared direct teaching versus play activities in teaching the participants various skills including turn taking.

Marzullo-Kerth et al. (2011) used a behavioural package that included VM to teach participants to initiate sharing.

Marzullo-Kerth et al. (2011) used a package of VM, reinforcement and prompting. During the intervention phase a token was delivered upon each sharing occurrence. Once the criterion was met, the reinforcement schedule was then thinned. A limitation in this study is that the experimental set up is contrived as tokens do not occur naturally in the environment, thus this can potentially inhibit generalisation. The current study will only use VM and video embedded instructions to teach a participant to request for a turn, similar to the direct teaching group who only received VM from Kroeger et al.'s (2007) study.

Kroeger et al. (2007) taught participants parallel play, ball play and taking turns. Even though results showed that the direct teaching group, which was taught by VM, was more effective than the play activity group, the results did not indicate the levels of turn taking. Rather, turn taking was blended in with other play behaviours and categorised under mean prosocial, interacting and responding behaviours. Thus, it is difficult to determine the impact VM had on turn taking. The dependent variable- percentage of trials with correct sharing initiations, from Marzullo-Kerth et al.'s (2011) study, better reflected the effectiveness of the intervention. The target skill differs slightly from the current study, as the participant will be taught to request for a turn. The dependent variable will be the percentage of requesting a turn, which is more specific unlike Kroeger et al.'s (2007) measures.

There was no mention of the video creation process nor generalisation tests in Kroeger et al.'s (2007) study. In contrast, Marzullo-Kerth et al. (2011) discussed the videos at length. Their videos showed two peers sharing an activity while demonstrating various ways of initiating sharing. For example, "Do you want to try?" or "Try this". Also, there was at least three different items (cookies, cars, crayons) used as stimuli sets. This is valuable, as one might

expect to see stimuli and response generalisation occurring, since multiple stimuli from the child's natural environment were incorporated, and the videos depicted multiple ways of demonstrating sharing. Marzullo-Kerth et al.'s (2011) found generalisation with novel people, stimuli and setting occurred for three out of four participants. However, response generalisation was not examined. In the current study, the videos will show various actors requesting a turn across different settings and with different stimuli. Also, different ways of requesting a turn will be shown, similar to Marzullo-Kerth et al.'s (2011) procedure. In addition to stimuli generalisation, response generalisation will be examined.

Method

Participants

The participants of this study were four boys aged between ten and fourteen years who had a diagnosis of ASD, as shown in Table 2. Ethics approval was obtained from the University of Auckland human participant's ethics committee (UAHPEC; 2015-013840). All the participants attended the same special needs school. Consent for this research to take place inside the school setting was obtained from the principal of the school. The principal and Board of Trustees identified the students and class that would benefit the most from this study. Once the class was identified, consent from the classroom teacher for themselves and their students to participate was obtained. Finally, consents from the students' caregivers and assents from the participants (all with ages under sixteen) were obtained. The caregivers, teachers, principal received a participant information sheet (PIS) which outlined all the information and detail regarding the study. A copy of the caregiver PIS and consent form is attached in Appendix A. The participants were selected due to their social skills deficits, ASD and their ability to attend to a video of at least three minutes long.

J.G. was a fourteen-year-old boy with diagnoses of ASD, ID and attention deficit hyperactivity disorder. J.G. had immediate echolalia, and did not regularly use three to five word sentences. J.G. showed echolalia and vocal stereotypy, and the only instances where appropriate words were spoken was when J.G. manded for items or made requests. For example, "Play dough!" and "No outside!" J.G.'s caregiver identified that learning to respond to other's greeting was a social skill, which J.G. could benefit from. T.B. was a twelve-year-old boy with diagnoses of ASD and epilepsy. T.B. regularly used three to five word sentences, e.g., "Are you in my class today?" and "Look at my picture!" T.B.'s caregiver identified personal space as a social skill, which T.B. would benefit from. B.M. was an eleven-year-old

boy whose only diagnosis was ASD. B.M. had the ability to use three to five word sentences, but only did so when B.M. was engaged in a highly preferred activity or was protesting. For example, “That’s not fair!” or “Can I have my lunch box please?” The teacher identified that verbal request was a social skill which B.M. would benefit from. D.B. was an eleven-year-old boy whose only diagnosis was ASD. D.B. regularly used three to five word sentences. For example “Hey check this out!” “It’s not good to hit someone”. The teacher identified turn taking as a social skill that D.B. would benefit from.

Table 2.
Participants’ characteristics

Participant	Age	Diagnosis	Use 3-5 word sentences regularly
J.G	14	ASD, ID, ADHD	No
T.B	12	ASD, Epilepsy	Yes
B.M	11	ASD	No
D.B	11	ASD	Yes

Setting

All of the video viewing sessions, baseline and test conditions, were held in the participants’ classroom. The class consisted of eight students, including the four participants, three teacher aides and one teacher. For all four participants, the participants' classroom was the main area for data collection during baseline and intervention. The foyer outside the classroom was also used to collect baseline and intervention data for J.G. and T.B. For generalisation sessions, data was taken in a different classroom for J.G. and T.B., and for D.B. in the foyer outside the classroom. To ensure the environment was minimally intrusive during data collection, the researcher stood approximately one meter away from the participant, which still enabled the researcher to hear the participant’s verbalisations. During the intervention phase, the videos were shown on the smart board during circle time, which was always at the start of the school day. All the students in the class viewed the videos at the same time

Stimuli/ Materials: Videos and video content

Four different videos were created for this study with each video targeting a specific social skill. A smart phone was used to film the videos, which were then edited on a MacBook using the program iMovie. The greetings video had two actors, the personal space and verbal request videos had four actors and the turn taking video had three actors. Each video showed the actors modelling various ways of displaying the target social skills. Further details of the actors' characteristics can be found in Table 3 as shown below.

The actors were typically developing volunteers who were recruited through an advertisement placed in community settings i.e., local community hall, restaurant and library. All actors were unknown to the participants.

Table 3
Actors' characteristics

Actor	Sex	Age	Ethnicity
S.L	female	12	Chinese
M.L	female	25	Chinese
J.J	male	25	Indian
J.W	male	30	European
J.P	male	55	Chinese

Each video was between two to four minutes long and was filmed either inside a house or at a school that were unknown to the participants. Each video contained a minimum of four clips, and showed two actors interacting with each other. Each clip began by the actors displaying the inappropriate social skill (behaviour commonly shown during baseline) followed by a freeze frame that was accompanied with a "boo" sound effect. Next, the actors demonstrated the appropriate social skill followed by a freeze frame that was accompanied by a "cheering" sound effect. After the cheering sound effect and still within the freeze frame, an adult voice delivered brief instructions regarding the appropriate social skill. Finally, the

appropriate social skill was repeated again and the clip finished with the “cheering” sound effect. The scripts and instructions delivered can be found attached in Appendix B.

Video for greeting response. In the video that was used to teach greetings, five short clips were put together. In the inappropriate greeting response scenes, actor B greeted actor A by saying either “Hi" , "Hey", "Hello", "Hello J.G." or "Good morning" . The actor A responded by saying either (a)" Go away" or (b) ignore and turn away from the actor making the greeting response. In the appropriate greeting scenes, actor B greeted actor A by saying either “Hi" , "Hey", "Hello", "Hello J.G." or "Good morning" and actor A responded by saying “Hi", "Hello" or "Good morning". In three of the clips, the greeting response was the same as the greeting initiation, while in two clips the greeting response was different.

Videos for personal space. Two separate topographies of personal space invasions were observed i.e., inappropriate approaches where T.B. made physical contact with the adult, and Hi-5s where T.B.’s palm was less than 30 cm away from the adult. Thus, two videos were required to address the two different topographies. Each video comprised of four clips, and the two videos alternated across sessions. Both videos started off with an adult female voice who delivered brief instructions about personal space, i.e., leaving an arm’s length between two people. Meanwhile, two actors stood facing each other and one actor raised her arm up to demonstrate what an arms length is.

In the inappropriate personal space scenes, actor A would either a) raise their hand for a Hi-5 and their palm was less than 30 cm away from the other actor, or b) made physical contact with actor B when they approached them. In the appropriate personal space scenes, actor A would either a) raise their hand for a Hi-5 and their palm was at least 30 cm away from actor B, or b) approached actor B and did not make any physical contact and remained at least 30 cm away from them.

Videos for verbal request. The video that was used to teach verbal requests comprised of four clips. In the non-verbal requests scenes, actor A presented a request to actor B such as wanting them to check their work, but actor A did not make any verbalisations. The requests in each of the four clips were different. In the appropriate verbal request scenes, actor A presented a request and also demonstrated a verbal request to actor B such as saying "Can you help me?" or, "Can I have a turn?"

Videos for turn-taking. The video that was used to teach turn taking comprised of five clips. In the inappropriate turn taking clips, actor B would be using an activity and actor A would approach them and take the activity off them without asking. In the appropriate turn taking clips, instead of performing the activity without asking, actor A would say "Can I try?" or "Can I have a go?" prior to performing the activity.

Dependent variables and data collection

All baseline, intervention, follow up and generalisation data for personal space and verbal requests were recorded on a smart phone using the Behaviour Observation Tool application. In addition, pen and paper were also used to record the verbalisations when verbal requests were made for generalisation analysis. Greeting responses and turn taking were recorded with pen and paper

Definitions of the four target social skills

Greeting responses. J.G. provided a correct greeting response when somebody made a greeting initiation directed at him. Examples of correct greeting response included; "Hello", "Hi", "Heya" or "Good morning". In each session, J.G. had three opportunities to provide a greeting response. The dependent variable was the percentage of appropriate greeting responses i.e.,

$$\frac{\text{Number of correct greeting responses}}{(\text{number of correct} + \text{incorrect greeting responses})} \times 100$$

Inclusion criteria:

- The greeting response spoken by J.G. can be identical to the greeting spoken by the other person. For example, the teacher said “Hello” and J.G. said “Hello” back.
- If J.G. provided an appropriate greeting response with no eye contact.

Exclusion criteria:

- If J.G. provided an appropriate greeting response followed with an echo of his own name. For example, an adult said “Good morning J.” And J.G. responded with “Good morning J”.

Appropriate personal space approaches. T.B. approached an adult, and stood at least 30 cm or more from the adult. Each instance was separated by 15 seconds. For each session, between three to five approaches were recorded and were marked as either appropriate or inappropriate personal space. Data was excluded on the days where less than three approaches were observed. The dependent variable was the percentage of appropriate personal space. i.e.,

$$\frac{\text{Number of appropriate approaches}}{(\text{number of appropriate} + \text{inappropriate approaches})} \times 100$$

Inclusion:

- If T.B. approached the adult and made physical contact with the adult.
- If T.B. raised his palm towards the adult for a Hi-5, and his hand was less than 30cm away from the adult.

Exclusion criteria:

- If T.B. was not facing the adult.
- If T.B. was hugging, or shook hands in an appropriate situation.
- If the adult approached T.B. and stood within 30 cm away from T.B.

Verbal requests. B.M. independently and verbally requested an action or item from another person without any assistance or prompts. For example, verbally requested someone to look at his work, requested to play with toys, or requested for an item. For each session, between three to five requests were recorded and marked as either a verbal or non-verbal request. Data was excluded on the days where less than three requests were observed. The dependent variable was the percentage of verbal requests made. i.e.,

$$\frac{\text{Number of verbal request}}{(\text{number of verbal} + \text{ non verbal requests})} \times 100$$

Inclusion criteria:

- B.M. made a one-worded verbal request such as “Token”, “Help”.
- B.M. made a verbal request directed to another person within the same room (e.g., made a verbal request directed at a teacher from across the room).
- B.M. made a verbal request, despite no one was listening to him (no consequence(s) was delivered after his request).
- B.M. made an independent verbal request to a peer.

Exclusion criteria:

- B.M. made a verbal request after an adult provided a prompt. For example, the teacher said “What do you say?” then B.M. verbalised “I need help”.
- B.M. used only motor behaviours directed at the other person without making any verbalisations. For example, pushed his work in front of the teacher, or pointed to his shoe lace (when laces were undone).
- B.M. made noises that were not words.
- Made verbalisations that expressed his problem e.g., “This doesn’t work” but did not explicitly ask for help.

Requesting a turn. D.B. approached a peer or teacher who was engaged in an activity, and D.B. requested for a turn. For example, “Can I have a turn?” For each session, D.B. had three opportunities to request for a turn and data were marked as either correct or incorrect

asking. Data was excluded on the days when there were less than three opportunities for turn taking. The dependent variable was the percentage of D.B. correctly requesting a turn. i.e.,

$$\frac{\text{Number of correct requesting a turn}}{(\text{number of correct} + \text{incorrect requesting a turn})} \times 100$$

Inclusion criteria:

- D.B. requested for a turn using other sentences such as “My turn?” “Can I have a go?”

Exclusion criteria:

- D.B. took the activity off the other person without making any verbalisations.

Procedure

Interviews. An interview was conducted with the teacher prior to data collection. The interview schedule consisted of questions regarding the participants’ background, social skills the participant struggled with, and the participant's preferences. The complete interview schedule can be viewed in Appendix C. Phone interviews were also conducted with the caregivers of two participants (J.G. and T.B.). The interview schedule for the caregivers was identical to the schedule used with the teacher. Each participant had a specific social skill which this study targeted, and these social skills were selected based on the caregiver’s and teacher's requests. For all four participants, the teacher also filled out a questionnaire extracted from Vineland Adaptive Behaviour Scales (Vineland II) in order to determine the participant’s social skill abilities prior to the intervention. The Vineland II questionnaire is designed to measure adaptive behaviours. The only domain that was assessed in this study was the socialisation domain. Under the socialisation domain, the questions evaluated the individual’s ability to interact with others, and how they used their leisure time. The questionnaire can be found in Appendix D.

Method

Experimental design. A non-concurrent multiple baseline design across participants and behaviours was selected to evaluate the effects of this intervention. The intervention was applied to the first participant with the most stable baseline. After a treatment effect was demonstrated, the intervention was introduced to the subsequent participant who had the most stable baseline, and so forth (Carr, 2005). A multiple baseline across participant design was selected because reversal or withdrawal of treatment was not feasible due to ethical reasons (Byiers, Reichle & Symons, 2012). In addition, this design enabled the demonstration of experimental control by evaluating if the intervention effects were replicated and verified across the four participants.

Baseline. J.G. was the first participant to receive intervention followed by T.B., B.M. then D.B. Baseline for J.G. was conducted inside the classroom. Either the researcher or the teachers approached J.G. and made a greeting initiation ("Hi", "Hello", Hello J" or "Good morning J"). J.G.'s response was recorded as either correct or incorrect. The researcher or teacher provided no other verbal responses following J.G.'s greeting response.

Baseline data for T.B. was collected inside the classroom or in the foyer outside the classroom. Data was collected when T.B. approached an adult (teacher, teacher aide or the researchers) and was recorded as either an appropriate or inappropriate approach. In each approach, regardless if it was appropriate or inappropriate, the adult responded to T.B., i.e., returned a Hi 5 or provided him with attention.

Baseline data for B.M. was collected inside the classroom. Data was recorded as either a verbal or nonverbal request. In every trial, the teacher or teacher aide responded to B.M.’s requests. If a non-verbal request was made, the teachers prompted B.M. to ask and then delivered the request. The only exception was if B.M. presented his work to the teacher for her

to check his work, the teacher would check his work without giving any prompts for B.M. to ask.

Baseline data for D.B. was collected inside the classroom. In each baseline session, D.B. was presented with three opportunities to request for a turn with either the teacher aide or a peer (B.M.). In every opportunity, the teacher aide or the peer had full control over the activity i.e., holding onto the remote control or playing with the toy car. Regardless of whether D.B. requested for a turn or not, the teacher aide or the peer would let go of the activity and passed it over to D.B.

Intervention

Video presentation. The video viewing sessions occurred at the beginning of the day during circle time. All participants, and the rest of the class, viewed the videos together. The participants sat in a semi-circle facing the smart board. In the first three weeks, the greetings video was shown daily. In weeks four and five, the personal space video was introduced and alternated with the greetings video. In weeks six and seven, the verbal request video was introduced and alternated with the other two videos throughout the week. In week eight, the verbal request video was shown daily for another two weeks. Finally, the turn taking video was shown daily for an additional two weeks.

Greeting response. After viewing the greetings video, a practice session was administered by the teacher as she greeted each student individually. No data was collected during the practice session. The process for data collection during intervention was identical to baseline. During VM 1 phase, either the researcher or teachers approached J.G. and said either “Hi”, “Hello”, "Good morning" “Hi J’ or “Hello J” and J.G.'s response was recorded. If J.G. echoed the greeting initiation i.e., said “Hi J” or “Hello J” an incorrect response was scored. VM 2 was identical to the VM 1 phase, but the researcher or teachers only initiated a greeting

with “Hi”, “Hello” or "Good morning". The mastery criterion was two consecutive sessions across two days where J.G. provided an appropriate greeting response on 100% of the opportunities.

Personal space. After viewing the personal space video, a practice session was administered by the teacher where she stood in front of the smart board and asked each student to stand up and give her a Hi 5. No data was collected during the practice session. The procedure for data collection during intervention was identical to baseline. The mastery criterion was two consecutive sessions across two days where T.B. made an appropriate approach on 100% of the opportunities.

Verbal request. Practice sessions were not administered after watching the verbal request video. The procedure for data collection during intervention was identical to baseline. The mastery criterion was two consecutive sessions across two days where B.M. made a verbal request on at least 80% of the opportunities.

Requesting a turn. Practice sessions were not administered after watching the turn taking video. The procedure for data collection during intervention was identical to baseline. The only difference was that hot wheels were used as the turn taking activity during baseline, while hot wheels and an iPad were used during intervention. The differences in the stimuli used between baseline and intervention were due to changes in D.B.’s preferences. The mastery criterion was two consecutive sessions across two days where D.B. requested for a turn at 100% of the opportunities.

Generalisation and maintenance. The procedure for collecting generalisation and maintenance data was identical to baseline and intervention for all four participants. Generalisation probes were taken when the corresponding video was not presented that

morning. For example, on days the verbal request video was not shown verbal request generalisation data was collected. Each generalisation probe was collected on separate days.

J.G.'s follow up and generalisation data were taken two months and two and a half months after the intervention was withdrawn. The procedure for collecting follow up and generalisation data were identical to VM 2. Generalisation across people was conducted with teachers who were not part of baseline or intervention. Generalisation across setting was conducted in a different classroom with the same teachers and researcher as VM 2.

T.B.'s follow up and generalisation data were taken three and four weeks after the intervention was withdrawn. Generalisation across people was conducted with teachers who were excluded from baseline and intervention. Generalisation across setting was conducted in a classroom that was not used during baseline and intervention.

B.M.'s follow up and generalisation data were taken one month and two months after the intervention was withdrawn. Generalisation across people was conducted with the researcher who was excluded from baseline and intervention. Generalisation across novel items was not examined, since there was great diversity in the items and actions requested by B.M. during intervention and baseline.

The first generalisation data for D.B. was collected on the day after the intervention was withdrawn, and the remaining five generalisation probes were collected over the course of five consecutive days. Follow up data was collected one month after the intervention was withdrawn. Generalisation across people was conducted with the researcher and a teacher who were excluded from baseline and intervention. Generalisation across setting was conducted outside the classroom with the same teacher aide during intervention. Generalisation across novel items was conducted with a game that was not used during baseline or intervention. The first generalisation probe with the novel game was conducted with the same teacher aide as the

intervention, and the second generalisation probe was conducted with the researcher and another peer who both were not part of baseline or intervention. Thus, in the second probe, generalisation across items and people was simultaneously tested.

Reliability

Procedural integrity and Inter-observer agreement. Procedural integrity consisted of a task analysis that was completed by the teacher aides in order to determine whether the videos were presented as described in the method section. The task analysis can be seen in Appendix E. During circle time, the teacher aides sat at the back of the class and completed the task analysis as the teacher presented the video. Procedural integrity was completed at a minimum of 30% of sessions across all the participants throughout the study. Procedural integrity was calculated by summing the percentages of correct steps across every session where procedural integrity was recorded, then dividing that by the total number of sessions where procedural integrity was collected, and then multiplying that number by 100.

Inter-observer agreement (IOA) for J.G. was conducted with a teacher aide. In the sessions where IOA were conducted, the teacher aide would independently record J.G.'s greeting responses. IOA was calculated by dividing the total number of identical greeting responses, by the total number of trials where IOA was conducted, and then multiplied by 100. IOA for T.B., B.M. and D.B. was conducted with another Master's student studying Psychology. The researcher and the Master's student independently recorded the data. IOA was calculated by dividing the number of agreements by the total number of agreements plus disagreements and then multiplying that number by 100.

Social validity

A questionnaire regarding this study's social validity was completed by the teacher and the caregiver of one participant. The questionnaire can be seen in Appendix F. The teacher

completed the Vineland II questionnaire before and after the intervention in order to track any changes between pre- and post-intervention.

Results

Results from the Vineland (II) questionnaire.

The teacher completed the Vineland (II) questionnaire before and after the study in order to identify potential changes in the participants' socialisation skills. The scores from the two socialisation subdomains (interpersonal relationships and leisure time) were compared against the standardised norm which was obtained from the same questionnaire. J.G.'s interpersonal and leisure time scores remained low at the start and at the end of the research. T.B.'s interpersonal and using leisure time scores were moderately low and low at the start, and then both scores improved to average. B.M.'s interpersonal and using leisure time scores were both low at the start of the research, and then both scores improved to moderately low. D.B.'s interpersonal and using leisure time scores were moderately low and low at the start, and then improved to average and moderately low. The results can also be seen below in Table 4.

Table 4.
Socialisation scores before and after intervention across all four participants

Participant	Interpersonal		Leisure time	
	Pre	Post	Pre	Post
J.G.	low	low	low	low
T.B.	mod low	average	low	average
B.M.	low	mod low	low	mod low
D.B.	mod low	average	low	mod low

Behaviour observation data

The percentages of the correct social skills shown during baseline, intervention, follow up and generalisation probes across all four participants can be seen in Figure 1. The percentages of scripted and unscripted verbalisations that were obtained from J.G., B.M., and

D.B. throughout all phases of the study can be seen in Figure 2. For all four participants, between six to eight intervention sessions were required.

Greeting responses.

For each baseline session, three greeting initiations were made over the course of one hour. In the first two baseline sessions, J.G. made one correct greeting response (see the first tier of Figure 1). For the remaining six baseline sessions no correct greeting responses were made. A decreasing trend in greeting responses was observed in baseline and it remained low and stable (M=8%).

Upon implementation of VM 1, there was a rapid change in the trend and level with regard to the percentage of correct greeting response. Compared to 0% in the last baseline session, J.G. made two correct greeting responses (67%) in the first VM 1 session. An increasing trend was observed during VM 1, and the level of correct greeting responses was higher than baseline (M= 46%; range=33%-66%), Due to variability in the data across the five sessions of VM 1, VM 2 was introduced. During VM 2 the greeting initiations excluded J.G.'s name (e.g., "Hello", "Hi", "Good Morning"). At the onset of VM 2, there was a rapid change in the trend and level in the percentage of correct greeting responses. Compared to two correct greeting responses (67%) in the last session of VM 1, J.G. made three correct greeting responses (100%) in the first session of VM 2. The level during VM 2 was higher than VM 1, and data remained stable throughout VM 2 (M=100%). The criterion of 2 consecutive sessions of 100 % correct greeting responses was met after the second session of VM 2. At follow up, the intervention effects were maintained with J.G. scoring 100% correct greeting responses over two consecutive sessions.

Generalisation. For generalisation across setting, people and response generalisation, two probes were conducted on separate days. J.G. made three correct greeting responses

(100%) then two correct greeting responses (67%) on the second probe for generalisation across people. J.G. also made three then two correct greeting responses (100% then 67%) for generalisation across setting. No response generalisation was observed as seen in Figure 2, but response variation was at 16%.

PEM visual analysis. Percentage of data exceeding a median (PEM) was used for visual analysis for all four participants. PEM involves; (1) finding the median value from the baseline data points (2) counting the number of data points during intervention, which exceeds the median. (3) Divide (2) by the total number of data points during intervention phase. (4) PEM is calculated by multiplying (3) by 100 (Rakap, 2015).

For J.G. the median during baseline was 0 as seen in Figure 3. The number of data points that were above the trend line during the two intervention phases was 7 and as there were data points in the intervention phases, this resulted in PEM value of 1.

Personal space

For each baseline session, between three to five approaches were recorded over the course of thirty minutes. During baseline, the trend in appropriate approaches was low and some variability was present throughout baseline as seen in the second tier of Figure 1 (M=22%; range=0-37%). Upon implementation of the intervention, there was a rapid change in the trend and level with regard to the percentage of approach approaches. T.B. showed 100% appropriate approaches in the first intervention session, compared to 12 % in the last baseline session. During intervention phase, the level of appropriate approaches was higher than baseline, and an increasing trend with some variability was evident (M=88%; range=75%-100%). The criterion of 100 % appropriate approaches in two consecutive sessions was met after the sixth intervention session. At follow up, the intervention effects were maintained with T.B. showing 100% appropriate approaches over two consecutive sessions.

Generalisation. For generalisation across setting and people, two probes were conducted on separate days. T.B. showed 100% appropriate approaches on both probes for generalisation across setting. T.B. showed 100% then 80% appropriate approaches for generalisation across people.

PEM visual analysis. For T.B. the median during baseline was 25% as seen in Figure 4. The number of data points that were above the trend line during the first intervention was 6 and as there were 6 data points in this phase, this resulted in PEM value of 1.

Verbal requests

For each baseline session, between three to five requests were recorded over the course of thirty minutes. In the first seven baseline sessions, the level of verbal requests was low and highly variable with a decreasing trend as seen in the third tier of Figure 1 (M=19%; range=0-60%). There was a break in data collection between sessions 7 to 19 during baseline as B.M. was absent from school. At the final stages of baseline, data was stable as verbal request occurred at 0% on two consecutive sessions and thus VM was introduced. At the onset of the intervention, there was a rapid change in the trend and level with regard to the percentage of requests made. B.M. showed 60 % verbal requests in the first VM 1 session, compared to 0% in the last baseline session. During VM 1, the level of verbal requests was higher than baseline and appeared relatively stable with an increasing trend throughout VM 1 (M= 61%; range= 50-67%). At the onset of VM 2, B.M. showed 75% verbal requests in the first VM 2 session, same as the last VM 1 session.

During VM 2, the trend of verbal request appeared similar to the trend in VM 1. The level of verbal requests was higher and less stable than VM 1 (M=85%; range=75-100%). The criterion of 80 % verbal requests across two consecutive sessions was met after the third VM

2 session. At follow up, the intervention effects were maintained with B.M. making 100 % verbal requests over two consecutive sessions.

Generalisation. For generalisation across people, two probes were conducted on separate days. B.M. made 75 % then 80% verbal requests for generalisation across people. Generalisation across setting was not conducted due to practical constraints. B.M.'s response generalisation was at 70% across the entire study as seen in Figure 2. This means that 70% of the total verbal requests made were unscripted. Response variation was also calculated and was found to be at 53% during VM 1 and VM 2.

PEM visual analysis. For B.M. the median during baseline was 0% as seen in Figure 5. The number of data points that were above the trend line during VM 1 and VM 2 was 8 and as there were 8 data points in both intervention phases, this resulted in PEM value of 1.

Turn taking

For each baseline session, D.B. had three opportunities to request a turn. No data was collected for D.B. until session 26 due to research difficulties and practical constraints. There was a slight increasing trend and the level of requesting was high with highly variable data, as seen in the fourth tier of Figure 1 (M= 75%; range= 33-100%). At the onset of intervention, D.B. requested a turn on 67% of the opportunities during the first intervention session, compared to 100% in the last baseline session. During intervention there was a slight increasing trend in the percentage of requesting a turn. The level during intervention was the same as baseline and the data remained variable especially with session 36 (M= 75%; range= 33-100%). The criterion of requesting a turn at 100% of the opportunities across two consecutive sessions was met after eight intervention sessions. At follow up, the intervention effects were maintained with D.B. requesting a turn 100 % of the opportunities over two consecutive sessions.

Generalisation. For generalisation across setting, people and items, two probes were conducted on separate days. D.B. requested for a turn on 100% of the opportunities, in all the probes for generalisation across setting and people. For generalisation across items D.B. requested a turn on 67 % then 100% on the second probe. Response generalisation was at 12%. This means that 12 % of the requests made for a turn were unscripted.

PEM visual analysis. For D.B. the median during baseline was 75% as seen in Figure 6. The number of data points that were above the trend line during intervention was 3 and as there were 8 data points in the intervention phase, this resulted in PEM value of 0.4.

Experimental control

Experimental control that is established by the multiple baseline design is described by the three elements of the baseline logic- prediction, verification and replication (Cooper, Heron & Heward, 2007; Carr, 2005). J.G. was the first participant exposed to the intervention. During VM 1 and VM 2, the level of greeting responses (average= 62%) was higher than the level predicted from baseline (0%). Meanwhile, the level of appropriate approaches shown by T.B., who was still exposed to baseline conditions, remain unchanged at an average of 23% throughout the verification period (see tier 2 of Figure 7). When VM 2 was introduced to J.G., the percentage of verbal request shown by B.M., who was also still in baseline conditions, remain low at an average of 0%.

After J.G. met the criterion, intervention was introduced to T.B. During intervention, T.B.'s level of appropriate approaches (average=88%) was higher than the level predicted from baseline (22%). Meanwhile, the level of verbal request shown by B.M., who was still in baseline conditions, remain low at an average of 0% throughout the verification period (see tier 3 in Figure 7).

After T.B. met the criterion, intervention was introduced to B.M. During VM 1 and VM 2, B.M.'s level of verbal request (average=72%) was higher than the level predicted from baseline (19%). Meanwhile, the level of requests for a turn shown by D.B., who was still in baseline conditions, was variable throughout the verification period ranging between 33%-100% (see tier 4 in Figure 7). After B.M. met the criterion, intervention was introduced to D.B. During the intervention phase for D.B., the level of requesting a turn was similar to the level predicted from baseline (75%).

IOA and procedural integrity

IOA was conducted at approximately 27% of the sessions for J.G., 22 % for T.B., 19 % for B.M., and 35% for D.B. IOA was 100% for J.G., 94% for T.B., 90% for B.M. and 100% for D.B. across all the sessions throughout all phases of the study. Procedural integrity was 88 % for J.G., and 100% for T.B., B.M. and D.B.

Time measure

Several time measures were recorded to assess the amount of time taken to create the videos, and the amount of time used for video viewing throughout the intervention. Details of the time measurements be seen in Appendix B. With regards to the videos, each video took approximately one hour to film, and each video took approximately one and a half hour to edit. The duration of the complete greeting response video was 2 minutes long, personal space was 1.5 minutes long, verbal request was 3 minutes long and requesting a turn was 2 minutes long.

With regards to the video presentations over the entire course of the study, the total viewing time was approximately 74 minutes for greeting responses, 45 minutes for personal space, 51 minutes for verbal request and 36 minutes for requesting a turn.

Social validity

One caregiver completed the social validity questionnaire at the end of the study. The caregiver rated that they strongly agreed with the procedures that occurred before the study (social skill assessments and interviews), the VM procedures, the results of this study, and the conduct of the researcher. The classroom teacher also completed the social validity questionnaire for all the participants. The teacher rated that she agreed with all the above features of the study.

Discussion

The current research sought to determine whether VM paired with video embedded instructions could be used to teach social skills to children with autism. Further to this study, four different types of social skills -responding to greetings, personal space, verbal requests and requesting a turn, were addressed for each participant. In addition, this study focused extensively on response and stimuli generalisation which many studies have neglected. The following discussion will be structured according to the above objectives. Firstly, there will be a discussion of the findings related to greeting responses, followed by comparisons of the current results with other studies that taught greetings but used a package with multiple components, and then a discussion of the generalisation findings. The same structure will be applied to the following sections in relation to personal space, verbal requests and requesting a turn. Lastly, there will be an overall discussion of the strengths, limitations and implications of this study.

Greeting responses

Overall, the results from the participant J.G. suggest VM combined with video embedded instructions was effective at teaching greeting responses. A phase change was introduced after the first VM phase since the criterion of 100% correct greeting responses on two consecutive sessions was not met. Follow up data was taken two months after the intervention was withdrawn, and the effects of the intervention were maintained.

Echolalia. J.G.'s immediate echolalia made it difficult to teach greeting responses. Prior to the intervention, the majority of J.G.'s incorrect responses where either "Go away" or meaningless sounds. In comparison, during VM 1, the combination of J.G.'s immediate echolalia coupled with greeting initiations that included his name ("Hello J"), resulted in mostly incorrect responses being direct imitations of the greeting ("Hello J"). Hence, during

VM 2, none of the greeting initiations included J.G.'s name. Since the discriminative stimulus (Sd) did not include J.G.'s name during VM 2, one might question whether all correct responses were simply echoes of the speaker's greeting initiation. That is, whether J.G.'s greeting responses were under the control of the speaker's verbal behaviour, or the modelled greetings from the video. The results showed there were some correct responses that were not echoes of the initiation. For example, the speaker said "Hi" and J.G. responded with "Hello". Thus, it is likely that the correct responses were influenced by the modelled greetings from the videos.

McMorrow and Foxx (1986) taught participants with severe echolalia to answer several questions appropriately. Answering correctly is similar to responding to greetings as both behaviours require a different verbalisation from the Sd presented. In their study, alternated modelling was presented whereby the trainer asked the model a question, the model answered correctly and received a positive consequence. The trainer then asked the participant the same question and provided a consequence for correct or incorrect response. McMorrow and Foxx's (1986) study was similar to the current study as some form of modelling was used. They found 100% correct responding after only three trials, which raises the question if the same results could be achieved with VM. It also suggests the potential importance of reinforcement as this was a component that was absent from the current study, and mastery was met faster in their study.

One way to overcome the issue of J.G. echoing his own name would be to train with additional exemplars, so that J.G. would learn to respond correctly even when his name was mentioned. This could entail showing multiple video clips with "Hello J" followed with the appropriate greeting response. In the current study, only one out of five video clips modelled "Hello J" since the issue of the participant echoing his own name had not been anticipated when the videos were made.

Effectiveness of VM and instructions versus a behavioural package. Avcioglu (2013) and Litras, Moore and Anderson (2010) both used videos and two other components to teach greetings to a child with autism. Comparing the results from this current study with those of Avcioglu (2013) and Litras et al. (2010), the current results suggest VM and instructions alone could be as effective. Avcioglu's (2013) thirty minute session comprised of VM, reinforcement in the form of social praise, additional instructions during video viewing and coaching, in order to teach greeting initiations to the participants. In addition, the intervention data was collected immediately after the participants viewed the video. With the intensive multi-component package, and the short temporal gap between video viewing and the opportunity to demonstrate the greeting initiation, one might expect to see better results in Avcioglu's (2013) study compared to the current study. Yet, the results from both studies are comparable. In both studies, the target behaviour, which was almost non-existent prior to the intervention, occurred rapidly at the onset of VM.

Litras et al. (2010) used social stories, prompts and VSM to teach greeting initiations. Their results showed verbal prompts were needed in order for the participant to reach 100% correct responding. In the current study, criterion was met faster compared to Litras et al. (2010) and no prompts were required for reaching mastery. The practical implications from comparing the results with Avcioglu (2013) and Litras et al. (2010) suggest the labour intensive VM packages might be unnecessary when teaching greeting responses, as VM combined with video embedded instructions yielded similar, if not better results.

Consistent with the current research, Charlop-Christy, Le and Freeman (2000) also highlighted the effectiveness of VM alone. At the onset of VM, greeting initiations instantly reached 100% correct. Despite improvements in greeting responses were made during VM 1 in the current study, a phase change was required for J.G. to reach criterion. The differences in the results from these two studies could be due the nature of the different target responses.

Since the participants from both studies had immediate echolalia and both studies predominately employed VM, greeting initiation might have been easier to teach than greeting responses. A greeting initiation is only under one Sd- the entering of a person. Meanwhile, a greeting response is under the Sd of the entrance of a person, and that person making a greeting.

Generalisation

Stimuli generalisation. In the current study, generalisation across setting and people was collected separately. This was in case J.G. did not generalise to either of the variables, and thus, one can tease apart which variable was not successfully generalised. The results showed successful generalisation to novel people and settings. These positive generalisation findings are similar to Charlop-Christy et al. (2000) and Avcioglu (2013) who both tested generalisation in a novel setting and with different people simultaneously. Both studies found successful generalisation. However, the procedure used in Avcioglu's (2013) study was highly contrived. The teacher asked the students "What do we say when we meet people? You tell them now in class when you come up against your friends" and data was collected immediately after the instructions were delivered. In comparison, in the current study, generalisation probes were collected as the teachers greeted J.G. under natural opportunities.

Response generalisation. J.G. showed no response generalisation when this was assessed. This was unexpected, as one might assume the participant with echolalia would have simply echoed the novel greeting. Instead, J.G. made either no responses or an inappropriate verbalisation, further supporting the fact that not all J.G.'s responses were echoes. Despite no response generalisation, J.G. showed response variation, as "Hello", "Good morning" and "Hi" were all spoken. Even though Avcioglu (2013) and Litras et al. (2010) taught multiple greetings such as "Hello/Hi/Good morning", none of the studies including Charlop-Christy et al. (2000), reported response variation or response generalisation.

Personal space

The results showed VM combined with video embedded instructions was highly effective at teaching T.B. personal space. Furthermore, T.B. successfully generalised appropriate approaches to different settings and with different people. The results were maintained at follow up which was one month after the intervention was withdrawn. Upon reflection on T.B.'s results, it would have been interesting if a functional analysis was conducted prior to the intervention to determine which variable(s) maintained the personal space invasion. One might suspect that the invasions were maintained by sensory reinforcement, since T.B. made physical contact with the adult in multiple inappropriate approaches. Interestingly, when T.B. made appropriate approaches there was no sensory reinforcement, yet he still learnt personal space. Another explanation for personal space invasions could be related to visual perception. Parsons, Mitchell and Leonard (2004) used virtual environment to test social appropriateness and personal space for individuals with ASD. The results showed some of the participants struggled to navigate themselves towards other people in a social setting. If virtual perception was an issue for T.B., the positive results from this study suggest the VM and instructions served as a salient prompt that reduced the invasions.

Effectiveness of VM and instructions versus a behavioural package. Due to limitations associated with conducting the research in an applied setting, VM and instructions were not the only interventions delivered for teaching T.B. personal space. The teachers delivered inconsistent reprimands (either verbal or physical) when T.B. showed inappropriate personal space. For example, the teacher would say, "Where is your space!" Hence, punishing effects could have contributed to the positive results. In addition, the practice sessions where each student gave the teacher a Hi-5 after the video presentation could also have influenced the results. However, the finding of increased appropriate approaches that did not consist of Hi-5s

were likely to be influenced by the intervention and not the practice sessions. An improvement upon this study could be to record separately the two topographies of the personal space invasions. That is, to record approaches that involved a Hi 5 and ones that did not. There are a couple of reasons as to why this separation could be beneficial. Firstly, there were a few instances where T.B. stood at an appropriate distance away from the other person but his raised hand (for a Hi-5) was too close to the person. If the data showed high levels of invasions with a Hi-5, a further improvement could be to provide more specific instructions in the video about keeping an appropriate distance during Hi-5s. Secondly, in order to tease apart the effects of the practice sessions from the intervention itself, if there were fewer invasions that involved a Hi-5, this could suggest the practice sessions had an impact on the results.

Despite the fact that VM and instructions were not the only interventions delivered, it was still less labour intensive compared to MacKay, Knott and Dunlop's (2007) study. MacKay et al.'s (2007) sessions were one and a half hours long and comprised of games, role play and group discussions. The authors taught a range of social skills including personal space. It is difficult to compare the results from the two studies since MacKay et al. (2007) reported only mean ratings of the participants' social skills. Furthermore, the ratings were an aggregate measure of other social skills including personal space. Nevertheless, MacKay et al. (2007) found only a moderate effect size between pre and post-test. Thus, the vast improvement obtained in the current study in teaching appropriate personal space demonstrates that the simple intervention could be just as effective compared to an intensive intervention.

Generalisation

Stimuli generalisation. This study was distinctive in that generalisation probes were conducted, as currently no other studies which tested generalisation of personal space are known to this researcher. Generalisation across setting and with different people was found in

this study. It was difficult to pinpoint which aspect of this research contributed to these findings since verbal reprimands and practice sessions were also administered. However, it was likely that the filming of the videos in various settings and with several actors contributed to the successful generalisation.

At present, there are no studies that have examined interventions to improve personal space out on the playground, as most interventions occurred inside classrooms. This is concerning as the lack of respect for personal space is one out of four other behaviours that discriminate a child with autism from other children on the playground (Amaral, Geschwind, & Dawson, 2011). Unfortunately, a limitation in this study was that generalisation could not be conducted on the playground since the participant preferred playing by himself, and was not motivated to approach other adults while he was on the playground. If practical constraints were not an issue, it would have been valuable to conduct generalisation probes at home and with the participant's family members. As it was, all the generalisation probes were conducted in school settings.

Verbal request

The results showed VM and video embedded instructions was effective at increasing participant B.M.'s verbal request, especially once VM 2 was introduced. During VM 1, the verbal request video was not presented daily because all three videos (personal space, greetings and verbal request) were rotated across the week. Thus, the verbal request video was shown only a maximum of two times per week. In contrast, when VM was introduced for the first two participants (greetings and personal space), the participants watched their videos at least 3 times per week. This raises an interesting question as to whether there is a treatment dosage effect, and if so, what is the threshold for the number of video presentations required in order for the intervention to be effective. When comparing the current findings across the three

participants, the results suggest a minimum of three viewing sessions per week is necessary for the intervention to be effective. When comparing across studies, Macpherson et al.'s (2014) "low dosage" intervention consisted of a video that was only twenty seconds long, and was presented once to twice a week. The results were variable, as only two out of five participants demonstrated the intervention was highly effective. This can be compared to Wert and Neisworth's (2003) "high dosage" intervention wherein the videos were five minutes long and presented five days a week. Results showed the VSM was effective for all participants. Despite each target skill and every learner's abilities being unique, determining the average amount of viewing sessions required for an intervention to be successful could be useful for intervention planning. The limitation of the verbal request video not presented daily was not captured in the procedural integrity, since the task analysis for procedural integrity focused only on the steps carried out during the video presentation. Nevertheless, this is a limitation associated with conducting research in an applied setting, as the researcher initially did not want to intervene with the class' preference and decision to rotate the videos daily.

Another limitation that could have also affected B.M.'s results was the inconsistency of the consequences delivered by the teachers. In most of the trials, the teacher delivered the assistance or item contingent on B.M.'s verbal request. However, there were a few trials where the teachers could not hear B.M.'s request and thus did not respond (the appropriate behaviour was not reinforced) or, the teachers delivered the assistance when a non verbal request was made (the inappropriate behaviour was reinforced). One might question whether the inconsistency of the teacher's consequences could have influenced the results during VM 1, where less than 80% of the total requests made were verbal. However, this is unlikely due to improvements made in phase 2 when the video was presented daily. Given the few incongruent consequences and the positive results during VM 2, this further highlights the effectiveness of

the intervention as it was unaffected by the operant conditioning that was unintentionally delivered by the teachers.

B.M.'s findings can be compared with Banda et al.'s study (2010) which also used VM to teach two participants to make spontaneous requests using a speech generating device. The intervention was effective for one participant, and ineffective for the other. One reason for their inconsistent results could be due to satiation. After watching the video, the preferred item that was presented in the video was also placed in front of the participant to evoke their request. In the current study, majority of the items shown in the video were absent in the classroom. In addition, unlike Banda et al.'s (2010) procedure, data was not collected immediately after the video presentation. Thus, satiation could not have affected the results.

Effectiveness of VM and instructions versus a behavioural package. Similar to the previous participant discussed, B.M. did not purely receive VM and instructions as the teachers typically delivered a verbal prompt when B.M. did not make a verbal request. Nevertheless, the intervention for B.M. was not labour intensive, as the teacher was satisfied with the procedures of this study. The positive findings from the current study can be compared against those of Theimann and Goldstein's (2001) study. In their study, they taught number of social skills, including initiating requests. The intervention was thirty minutes and consisted of instructions, social interaction and video feedback, which took place a period of nineteen weeks. In contrast, with the current study, the intervention lasted only three minutes every school day (during which the video was presented), over four weeks. When comparing the results between B.M. and Theimann and Goldstein's (2001) study, B.M.'s increase in verbal requests was more rapid at the onset of intervention, suggesting stronger experimental effects from the current study. One might predict better follow up results in Theimann and Goldstein's (2001) study due to the higher intensity and the multiple components involved. However, maintanence data was collected in the period during which the next social skill was introduced.

Thus, whether the effects were maintained beyond one month was not evaluated. In contrast, this study demonstrated that the effects from a simple VM and instructions intervention were maintained one month after the intervention was withdrawn.

Wert and Neisworth's (2003) study is similar to this research, except VSM was used to teach spontaneous requests to four preschool children with autism. Participants were taught to make spontaneous requests through discrete trial training prior to the study, but the behaviour occurred on a minimal basis. Similarly, B.M. already had verbal requests in his repertoire as demonstrated in baseline, yet verbal requests did not occur regularly.

The results from Wert and Neisworth's (2003) study were comparable to the current study as they also demonstrated VSM was highly effective at increasing spontaneous requests. Furthermore, the rate of change in the level of spontaneous requests between baseline and intervention was greater, compared to the current study. Additionally, no prompts were delivered. There are a couple of reasons that could explain the superior results in Wert and Neisworth's (2003) compared to the current study. In their study, data was collected during play time, and thus the participants could have been highly motivated to request for play materials. In comparison, data was collected during class time in this study, and thus B.M. could have been less motivated to request for class materials or the teacher's assistance. Secondly, the participants from Wert and Neisworth's (2003) study received explicit training on making spontaneous requests prior to the study, and thus the behaviour could have been easier to elicit during intervention relative to B.M. who received no pre-training.

Generalisation

Stimuli generalisation. Probes for generalisation across novel items were not required in this study since the participant showed great response variation. Over half of the requests made by B.M. involved a different stimuli or a different action from another person. A number

of factors could have contributed to the high response variation. Firstly, the phrase "Use your words", which was part of the instructions, is applicable across various contexts as supported by the teachers using this phrase in multiple occasions when a non-verbal request was made. Thus, this embedded instruction was transferred to various contexts involving different stimuli. Secondly, in the verbal request video multiple stimuli were used i.e., puzzles, exercise book and crafts material. Thus, using multiple stimuli (preferred and neutral items) shown in the videos could have contributed to the successful response variation.

Stimuli generalisation was not examined in Wert and Neisworth's (2003) study. However, since only favourite toys were shown in their videos, one might predict the absence of stimuli generalisation. Banda et al.'s (2010) findings support this hypothesis as only the most highly preferred items were shown in the video, and results showed both participants failed to generalise requesting to other items. In addition, the same items shown in the videos were also tested during intervention. In contrast, multiple items and requests were demonstrated in the videos from the current study and as hypothesised, B.M. demonstrated verbal requests across various items throughout the study.

The current results showed verbal requests were generalised to different people. At present, this is the only that tested generalisation across people. Employing multiple actors and involving multiple teachers during intervention is one variable that was conducive to the positive generalisation findings. This is aligned with Stokes and Osnes (1989) recommendation of training diversely and with multiple stimuli exemplars, which in this case was with multiple people.

Response generalisation. In the current study, the video demonstrated four different ways of making a verbal request, i.e., "Can I have some help", "Can you look at this?", "Can I have a turn?" and "Can you help me?". This is consistent with Stokes and Osnes (1989)

recommendation of using sufficient response exemplars in order to enhance response generalisation. The authors also discussed the importance of training other responses that fall under the same response class to achieve generalisation to other untrained responses. The results support Stokes and Osnes (1989) recommendation, as response generalisation occurred at (28/40) 70%. This means that of the total number of verbal requests made, 70% of these verbal requests were unscripted.

Requesting a turn

The results showed the intervention effects were questionable in teaching D.B. to request for a turn. Unlike the previous participants, there were two sessions where D.B. requested a turn on 100% of the opportunities during baseline. A confounding factor that could explain these high percentages during baseline could be because the two target behaviours, requesting a turn and verbal request were similar. To demonstrate experimental control in a multiple baseline across behaviours design, the target behaviours should be independent from one another. The learning that occurs in behaviour 1, should not transfer to behaviour 2 (Byiers, Richle & Symons, 2012). In the current study, the verbal request video was presented prior to D.B.'s intervention. Moreover, one of the clips from the verbal request video showed an actor asking for a turn, which was also categorised as a verbal request. Unfortunately, no baseline data of requesting a turn was taken prior to the presentation of the verbal request video. Thus, it is not certain if the high baseline data was influenced by the verbal request video, or if the behaviour was already strong in D.B.'s repertoire. However, at the beginning of the study the participant's teacher identified that requesting a turn was a skill that D.B. could benefit from.

During intervention, D.B. scored less than 70% correct in over half of the sessions. It should also be noted that the single data point of 33% during intervention can be explained by motivating operations, as data was collected on the first day back from a school holiday of two

weeks. D.B.'s performance appears to be poor relative to the other participants who typically scored above 80% correct in their target skill during intervention. However, majority of D.B.'s score of 66% translates to correct requesting in two out of three opportunities. Meanwhile, T.B. and B.M. had three to five opportunities to demonstrate their target skill. Only a maximum of three opportunities could be presented in each session for D.B. to prevent satiation with the activity. If more trials could be conducted per session, the percentages could potentially better reflect D.B.'s actual performance.

An interesting point to consider was that during the trials, no specific instructions were delivered to the peer or the teacher aide who took turns with D.B. This was to ensure that the sessions were the least intrusive as possible. In all the trials where D.B. exhibited an incorrect response, i.e., performed the activity without requesting a turn, the other person simply handed the activity over without any prompts or protests. In other words, incorrect responses continued to be reinforced as D.B. obtained the activity. Since the two choices (requesting a turn and not requesting) were reinforced in the same way, the matching law would predict more responses to be allocated to the less effortful choice i.e., not requesting (Fisher & Mazur, 1997). However, the results are contrary to the matching law predictions as D.B. requested for a turn on 83 % out of all the given opportunities. A confounding factor that could explain these findings was that the teacher aide asked for a turn at least once in each session. Hence, live modelling could have affected the results. This limitation was inevitable in order to create uncontrived opportunities for turn taking.

Effectiveness of VM and instructions versus a behavioural package. Marzullo-Kerth et al. (2011) used a behavioural package including VM, token reinforcement and verbal prompting to teach sharing to children with autism. Initially, a FR1 schedule was delivered for every sharing occurrence. The reinforcement schedule was then thinned to a VR 2 and then VR 5 schedule. Results showed the participants took longer to reach criterion compared to the

current study. This was unexpected, as one would hypothesise tokens delivered on such a rich schedule should facilitate rapid acquisition. The differences in the unexpected findings could be due to the nature of the target response. Requesting a turn could be more reinforcing than initiating sharing, since with the latter, the activity is removed from the individual (negative punishment).

Generalisation

Stimuli generalisation. The results from the current study showed successful generalisation across people, setting and stimuli. In comparison, Marzullo-Kerth et al. (2011) found poor generalisation results. However, because the authors measured all three dimensions (setting, people and stimuli) simultaneously, it is impossible to tease apart which dimension(s) the participants failed to generalise. Marzullo-Kerth et al.'s (2011) intervention and video creation procedures did not program for generalisation. In their videos, only two peers served as models and only one location was used in the six videos. During intervention, only the experimenter was present. In the videos of the current study, three actors of various age groups were shown in four separate locations (indoor and outdoor). Lastly, a peer and a teacher aide were involved during the intervention.

Response generalisation. In the current study, response generalisation was found at 24% (8/ 33). It is difficult to judge whether this figure reflects highly effective or average response generalisation as there are currently no criteria for evaluating the strength of response generalisation. Marzullo-Kerth et al. (2011) and Kroeger et al. (2007) taught skills related to turn taking but did not test for response generalisation, thus comparisons cannot be made. In the context of practical significance, almost one third (8/33) of the requests for a turn were unscripted which suggests this study was effective at promoting response generalisation. The presence of response generalisation in the current study could be attributed from the video

demonstrating multiple ways of requesting a turn. i.e., “Can I try?” “Can I have a turn?” “Can I play with you?”

Overall discussion

The main objective of this study was to use VM and video embedded instructions to teach social skills to children with autism. The results from this study demonstrated marked improvements in greeting responses, personal space and verbal request only when intervention was applied, providing evidence for the effectiveness of the intervention. Upon comparing the Vineland II scores before and after the intervention, three out of four participants appear to have demonstrated improvements in interpersonal skills and how they used their leisure time.

Thee intervention effects were replicated and verified across three participants, demonstrating strong experimental control in this study's design. In teaching requesting a turn, the improvement was not as pronounced compared to the improvements demonstrated by the other participants. With regards to the visual analysis and the interpretation of the PEM values, 0.9 to 1 reflects a highly effective treatment, 0.7 to 0.9 reflects a moderately effective treatment and a PEM less than 0.7 reflects not effective or questionable treatment (Wentd, 2009). In teaching greeting responses, personal space and verbal request, PEM values of 1 were obtained which indicates the treatment was highly effective. In teaching requesting a turn, the PEM value of 0.4 suggested the treatment was questionable.

The positive findings from the three participants suggest a simple intervention can produce outcomes that are just as efficient and effective compared to other studies that used a behavioural package consisting of three or more components. This study also focused extensively on generalisation which indicates a progression when compared to other studies. The intervention procedures and videos used in this study were designed and implemented in such a way that maximised generalisation. Both stimuli and response generalisation were

measured and results showed all participants demonstrated stimuli generalisation, and two out of three participants demonstrated response generalisation.

The current study required two hours to film the actors, and six hours to edit and create all the videos. Cost was not measured because all the actors were volunteers, and no additional equipment had to be purchased to create the videos, or to show the videos in the classroom. Charlop-Christy et al. (2000) also measured the time and costs required for their VM intervention. Across five participants, two hours was used to train all the models and to make all the videos. Actor training was not required in the current study, and the fact that Charlop-Christy et al. (2000) required significantly less time suggests they were more efficient in the video creation process. However, it should be noted that the researcher in the current study was a novice in using the video program and thus, extra time was required to familiarise with the program. Thus, the eight hours required for the video creation was largely inflated. If this study was to be replicated, time measures should also be reported in order to reflect a more realistic time frame.

Strengths. There are a number of strengths in this study. In addition to the quantitative increase in each of the participant's social skills, there were multiple anecdotal reports of unexpected and unplanned positive findings. For example, even though J.G.'s target skill was only greeting responses, J.G. spontaneously made a greeting initiation saying "Good morning" to the teachers on two separate known occasions. The script "Good morning" was also modelled in the video which illustrates the advantages of using multiple response exemplars. Spill over effects were another positive and unexpected finding. In one instance, when a student was too close to another participant whose target skill was not personal space, the participant responded by saying "Hey! Where is your gap?" This demonstrates the widespread and efficient effects of the intervention in a classroom setting.

Discussion

A persistent weakness among many studies that have trained social skills is the failure to demonstrate maintenance and generalisation of the learnt social skills (Gresham, Sugai & Horner, 2001). Another aspect in which this study contributed to the literature was the way in which the design and implementation together targeted the promotion of generalisation. Firstly, there was a great emphasis on using multiple stimulus and response exemplars in all of the videos and during the intervention. All the videos were created across multiple settings and items, with actors of various characteristics, and they modelled different ways of demonstrating the target skill.

In addition, multiple teachers were involved during the intervention phase. Secondly, Bellini and Akullian (2007) recommended that training each participant until criterion was met increased the likelihood of achieving greater generalisation. This was supported by the current findings as all participants met criterion before intervention was withdrawn, and both generalisation and maintenance was observed for all participants.

Finally, naturalistic observations were conducted, which holds distinct advantages compared to other methods for assessing social skills (Gresham, 1981). One of the greatest advantages, and the most relevant to this research, was that it enabled the programming of natural consequences in the child's environment during social interactions. Allowing the learner to contact natural consequences can enhance generalisation, which was evident in the current findings (Cooper, Heron & Heward, 2007). However, Gresham (1981) pointed out the importance of adding other types of social skills assessments. Solely using natural observations can raise a number of disadvantages, including the lack of predictive validity and potential biases. Hence, the social validity questionnaire that assessed the participant's progress, as well as the Vineland II questionnaire, were also incorporated in order to provide a holistic assessment of the results. In short, all the above three aspects of this research; using multiple stimulus and response exemplars, training until criterion was met, and conducting naturalistic

observations were likely to have contributed to the successful generalisation across all the participants.

Limitations. The primary reason that this study attempted to employ only VM and video embedded instructions was to minimise the effort required from the educators. Teachers working in special education are confronted with heavy workload and stress in special education classrooms (Antoniou, Polychroni & Walters, 2000; Fore, Martin & Bender, 2000). Hence, an intervention that was easy to implement and required minimal effort from the educators was a critical consideration when designing this study. However, during the actual study the teacher added components, which were initially not part of the method. For example, the practice sessions that were administered for teaching greeting responses and personal space was an addition to the original plans of the study. As a result of the researcher respecting the teacher's decisions and to be as least intrusive as possible, the practice sessions were included in the method section. Nevertheless, the teacher reported that they were satisfied with all the procedures of this study in the social validity questionnaire, which suggests the effort required from the teachers to implement this intervention was manageable.

Another limitation associated with conducting the research in an applied setting was the participants' absence and practical constraints. As a result, baseline data for B.M. and D.B. could not be collected over a number of sessions. Thus, with the incomplete baseline data, the intervention effects could not be fully verified especially with D.B.

The incorporation of instructions in the videos was another limitation, as this meant that this study could not determine the effectiveness of VM alone. Currently there are many studies that have used VM combined with other interventions to teach social skills. Thus, it would have been of great value if VM was to be employed alone to examine its effectiveness.

Discussion

Despite generalisation across settings being conducted, it was still within the school setting. In order to enhance external validity, conducting generalisation probes in other non-educational settings, and probes with family members would add tremendous value to this research. This was not permitted in the study due to time and practical constraints. Social validity questionnaires were sent to the participant's caregivers, in the hopes of assessing whether the caregiver felt the social skills were generalised to non-school settings. Unfortunately, only one out of four caregivers returned the social validity questionnaire. However, the caregiver who did return the questionnaire reported that they were highly satisfied with the results, which tentatively indicates the participant's social skill was likely to be generalised to other settings and with family members.

Future research. In addition to generalisation, future research could also focus on other responses of the same response class. Stokes and Osnes (1989) discussed how interventions applied to a specific target behaviour could increase or decrease the frequency of other behaviours of the same response class. Paine et al. (1982) taught a participant social skills and found a decrease in problem behaviours. Similarly, in the current study, problem behaviours (i.e., tantrums and other aggressive behaviours that were observed during informal observations) from two participants might have reduced after having mastered the target social skills. If data was collected on other undesirable behaviours and a reduction was found, this would also highlight the efficiency and widespread effects of the intervention.

Typically, social skills interventions have been applied to children who are at the higher functioning end of the autism spectrum, and have experienced some type of pre-training (Taras, Matson & Leary, 1998; Swaggart, et al., 1995; Kroeger, Schultz & Newsom, 2007). Meanwhile, this study incorporated participants without any prior training, had different levels of social skill abilities, and various types of social skills were trained. Future research could

use similar procedures to teach adults with autism and conduct the research in residential settings, in order to enhance external validity.

During the video presentations, the videos were played through a smart board as this was the only device that was available. Future research could carry out the same procedures on Tablets to enhance the usability of this treatment. Cardon (2013), Macpherson et al. (2014) and Miltenberger & Charlop (2015) have demonstrated the effectiveness of using VM via Tablets to teach social skills.

According to the United Nations (2006), it is critical to promote assistive technologies and devices that are suitable for all persons with disability, so that full realisation of human rights can be promoted. From a macro societal level, one avenue for state parties to achieve this responsibility could be to replicate this study in various settings and across different social skills. Unlike other interventions that incorporated reinforcers and/or prompts delivered by trainers, this simple yet effective intervention that required minimal assistance is likely to gain the educators' and the public's buy-in.

Conclusion

This study has used video modelling combined with video embedded instructions to teach four social skills to children with an autism spectrum disorder. The four social skills addressed in this study were greeting responses, personal space, verbal request and requesting a turn. Results showed the intervention was highly effective at teaching greeting responses, personal space and verbal request, and questionable at teaching requesting a turn. This study also focused on programming for response and stimuli generalisation. The results showed all participants demonstrated successful stimuli generalisation. Response generalisation was present in two out of three participants. Finally, strengths, limitations and future recommendations were also discussed.

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Figures

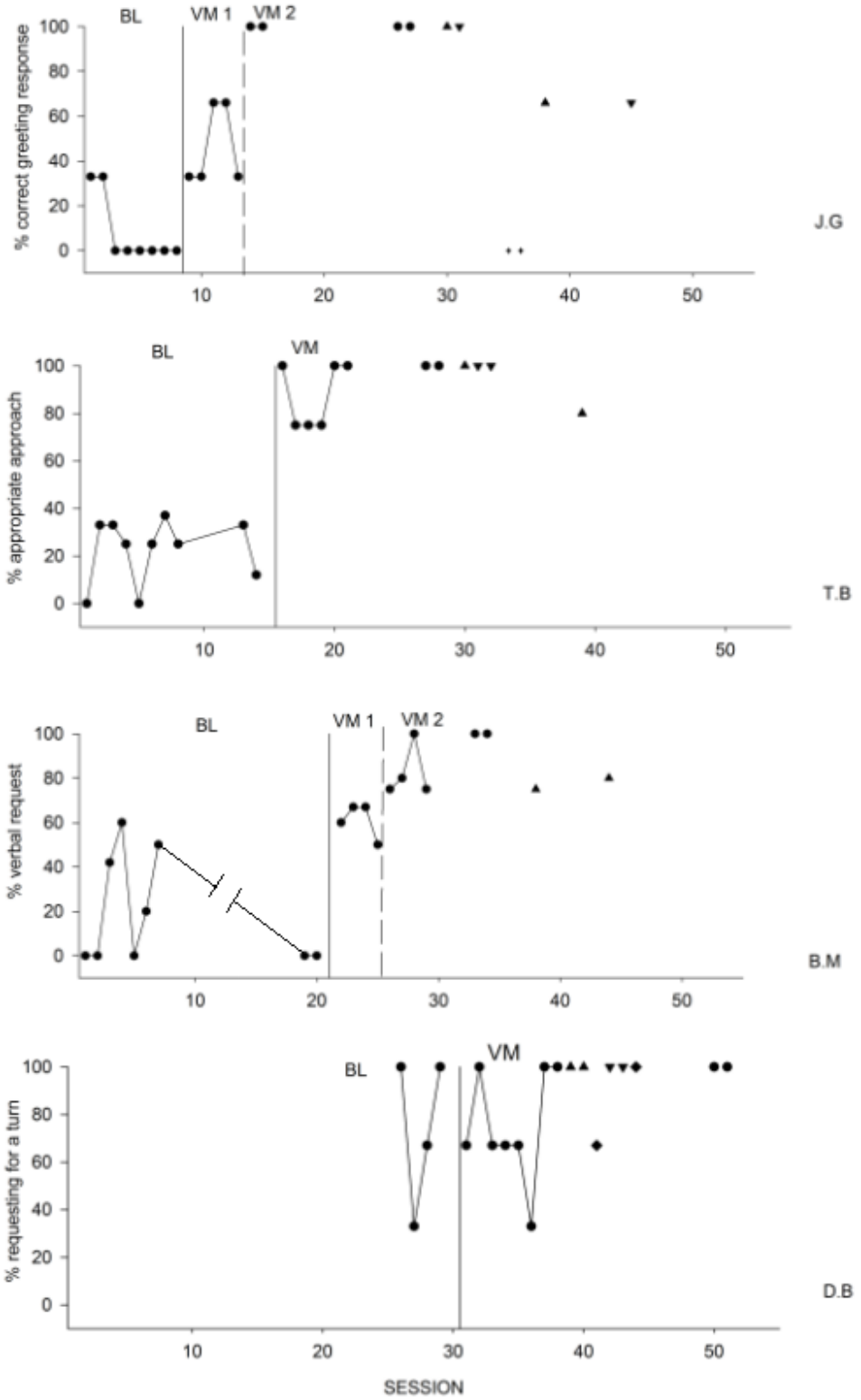

Figure 1. Percentage of the correct social skill during baseline, intervention, generalisation and maintenance results for all four participants.
Note: upright triangles represent generalisation across people, *inverted triangles* represented generalisation across setting, *diamonds* represent generalisation across stimuli probes and *crosses* represents response generalisation

Figures

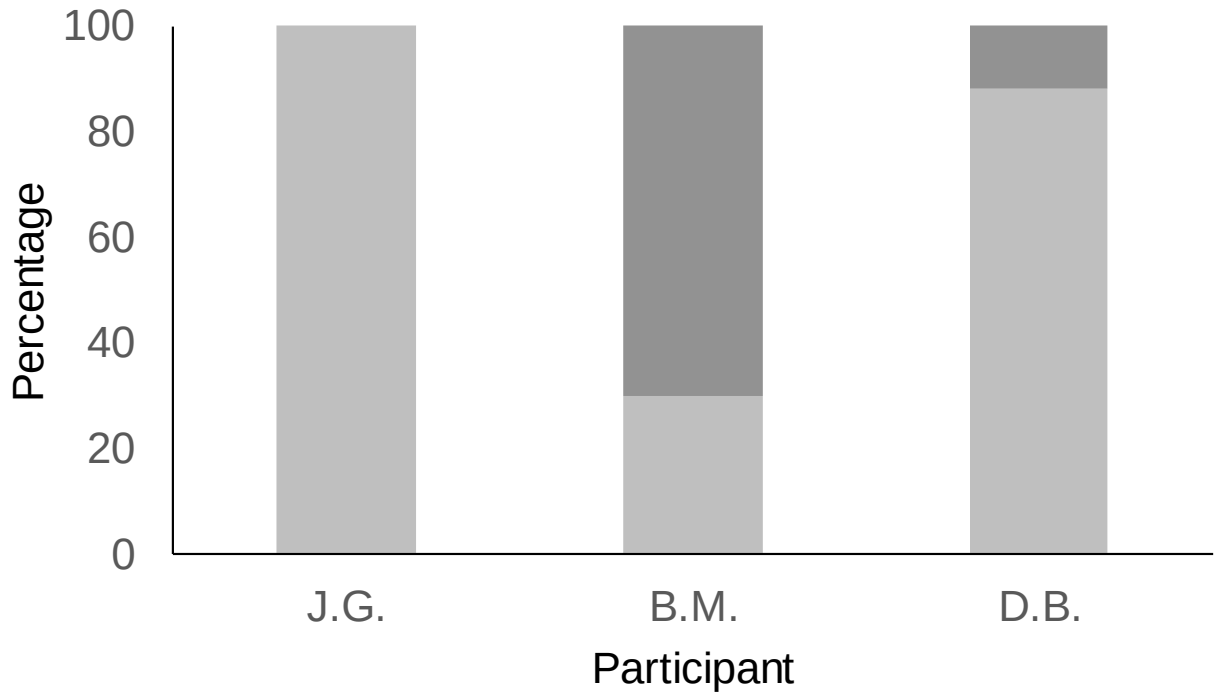

Figure 2. Percentage of scripted versus unscripted verbalisations for J.G, B.M and D.B.
Note: dark gray represents unscripted verbalisations and *light gray* represents scripted verbalisations

Figures

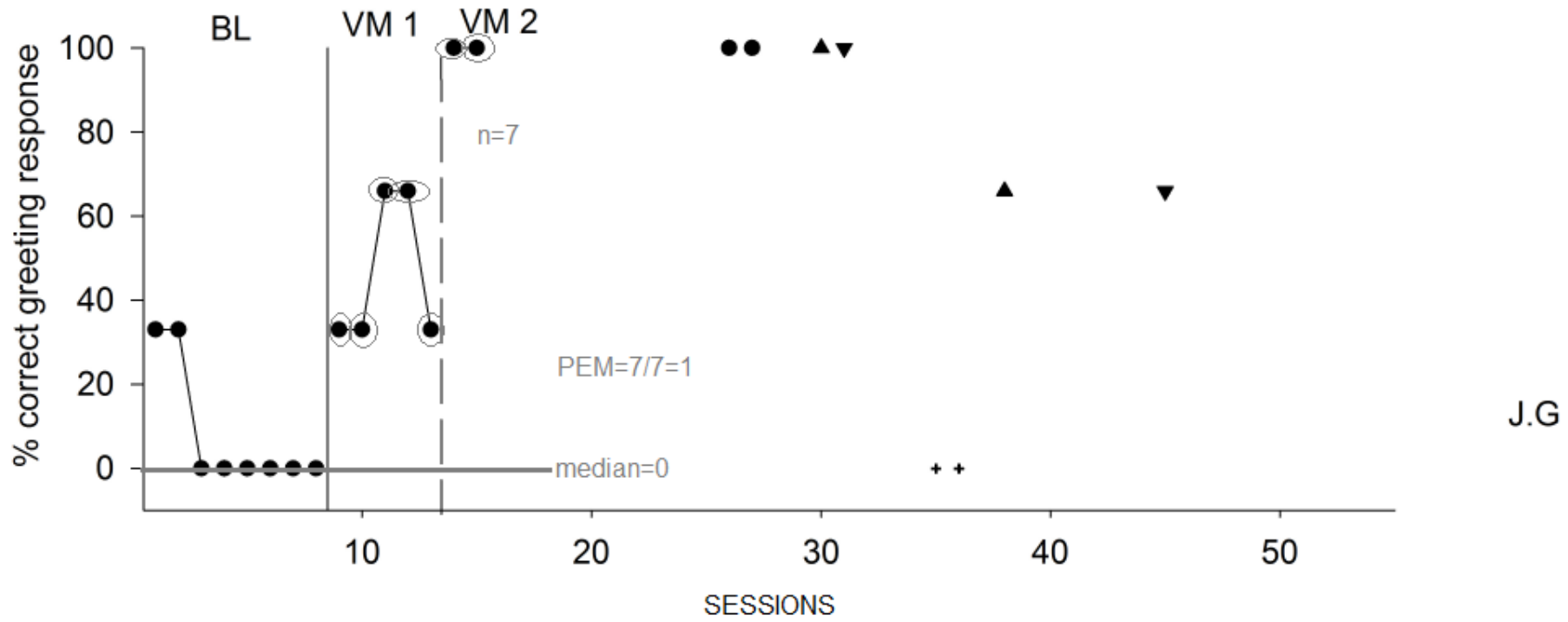

Figure 3. Percentage of correct greeting responses shown by J.G and PEM information illustrated in gray text.

Figures

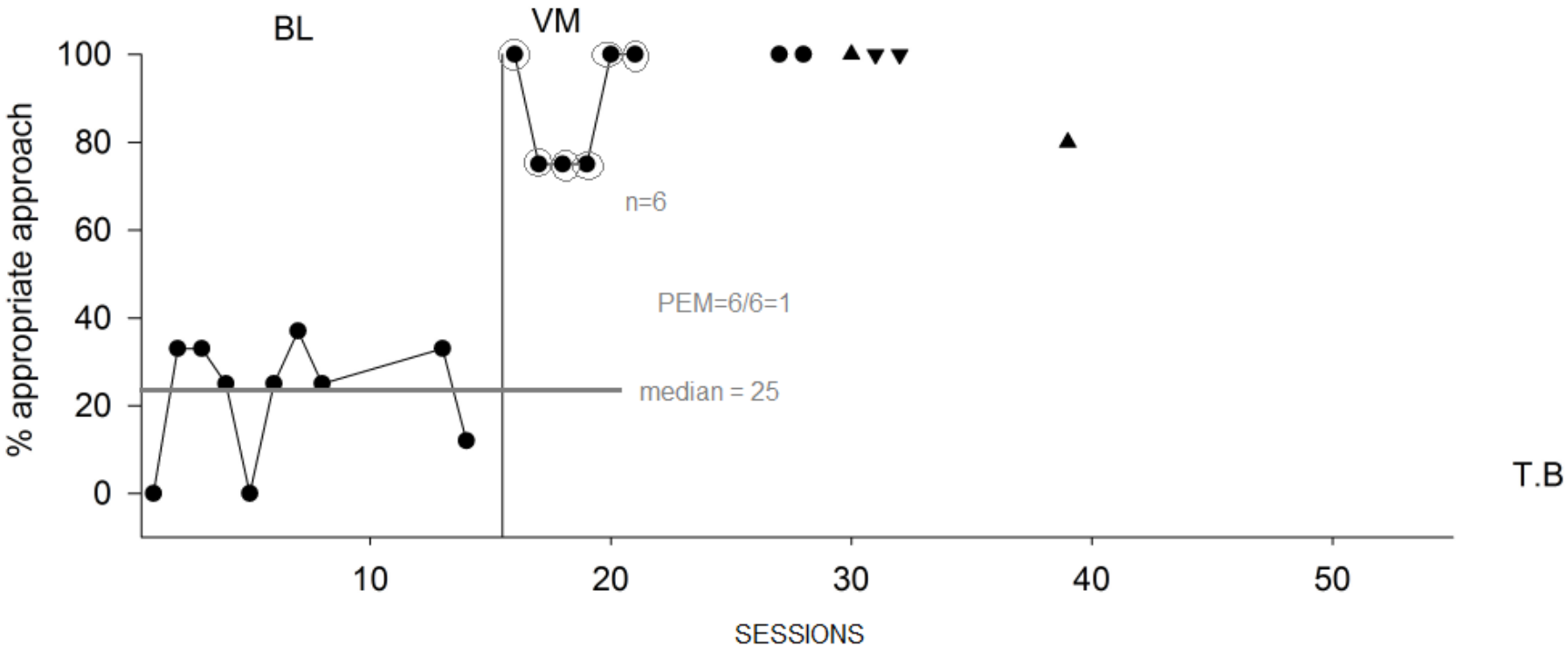

Figure 4. Percentage of appropriate approaches shown by T.B. and PEM information illustrated in gray text.

Figures

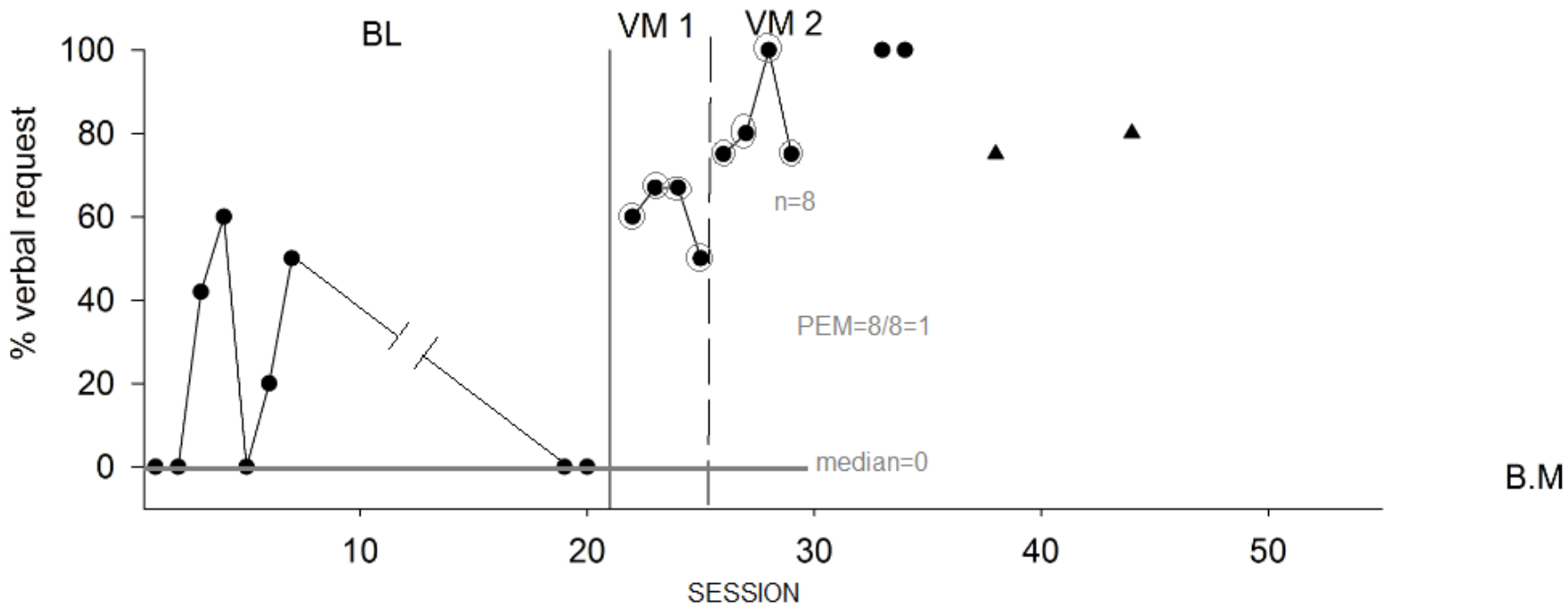

Figure 5. Percentage of verbal requests shown by B.M. and PEM information illustrated in gray text.

Figures

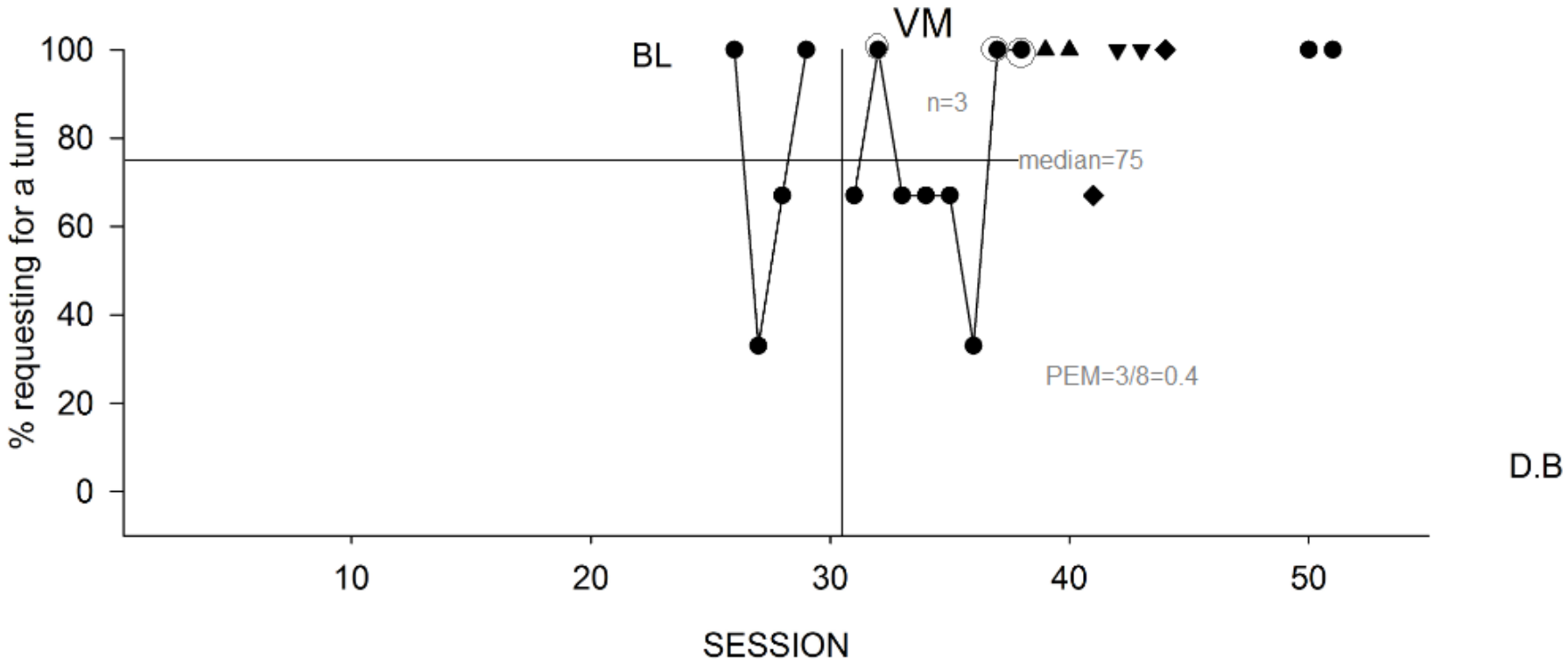

Figure 6. Percentage of requesting a turn shown by D.B. and PEM information illustrated in gray text.

Figures

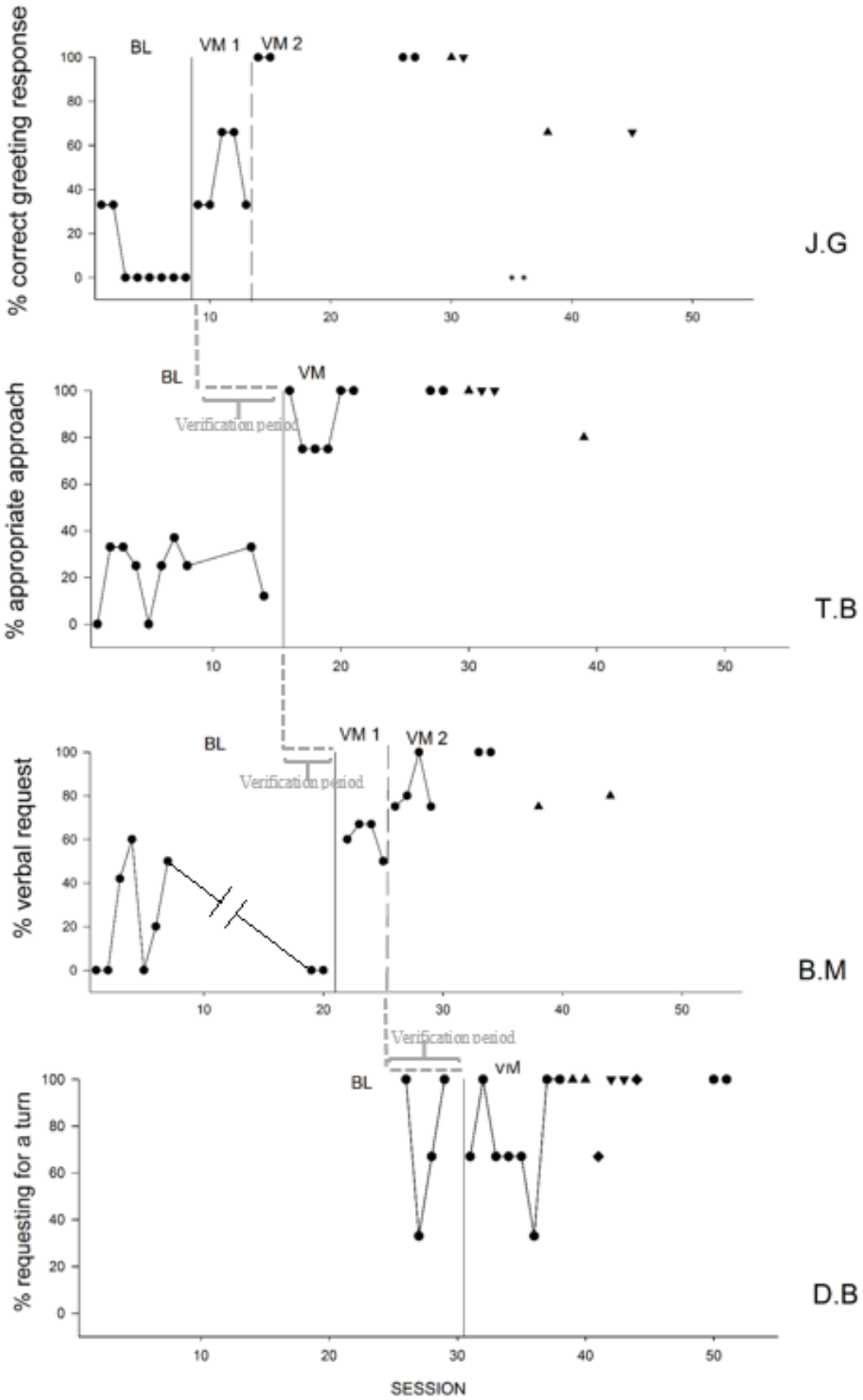

Figure 7. Figure 1 repeated but with the addition of verification periods illustrated in gray text.

Appendix A: Caregiver Participant Information Sheet and Consent Form

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
School of Psychology
Human Science Building, 10 Symonds Street
+64 9 373 7599

The University of Auckland
Private Bag 92019
Auckland, New Zealand

PARTICIPANT INFORMATION SHEET
(Child's caregiver)

Project title: Teaching children with autism social skills using video modeling
Names of Researchers: Joanne Wong and Dr. Angela Arnold-Saritepe

Researcher introduction
My name is Joanne Wong, I am a Masters student at the University of Auckland. My Master's degree specializes in Psychology and I am in my second year of the Applied Behaviour Analysis program, working with Dr. Angela Arnold-Saritepe, my supervisor. I am writing to invite you to discuss this research invitation with your child. If you give consent to your child to participate, the final decision typically will be that of your child.

You and your child are invited to take part in a study to increase your child's social skills by using video modeling. Whether you decide to take part is your choice. If you do decide to take part now but change your mind later, you can withdraw from the study at any time before 15th September 2016**.** If you do not wish to take part, you do not need to provide a reason. You and your child will not experience any disadvantages from the school and the researchers if you choose to decline or withdraw during the study.

This Participant Information Sheet will help you decide if you would like to participate in this research. It outlines why we are doing this study, what your participation would involve, and the benefits and risks that might be encountered.

If you agree to participate in this study, you will be asked to sign the Consent Form. You will be provided with a copy of the Participant Information Sheet and the Consent Form to keep.

Project description and invitation

My research is on video modeling and how this can help children with autism increase their social skills. Video modeling involves the child learning a skill from a video in which actors demonstrate the target skill(s). In my research, the primary objective is to increase the social skills of the children with autism, and there will be a specific emphasis on compliment giving and social initiations. Previous studies that have used video modeling only used a maximum of two actors and taught social behaviours that were not easily transferrable to other contexts. This study will employ various actors and scripts in the hopes of increasing targeted and non-targeted social behaviours, and to evaluate how this improved video modeling approach compares to traditional methods.

I am recruiting children who are on the autism spectrum, and whose social skills abilities are less than what one would expect from a child of their age. Permission for your child to participate in this study will not affect their current learning. The study will take place during their free time so their educational time will be affected. The Principal/ Board of Trustee has given assurance that your child's participation or non-participation will not affect their grades or relationship with the school.

Project Procedures

1) Complete a questionnaire in order to determine which social skills your child would benefit most from learning.
2) An interview will be conducted with you to obtain more information about your child's diagnosis, items or activities your child prefers, social skills your child is competent in, and social skills he/she is struggling with. This interview will not be recorded and I will use only pen and paper to record your answers.
3) I will then observe and record the number of social skills displayed by your child at school during free time to establish their level of social skills before showing your child the videos
4) During free time, your child will be escorted to an empty classroom to watch a maximum of three, three to five minute long videos. The video content includes actors interacting with each other while making social initiations and delivering compliments.
5) After watching the videos, I will record the number of social skills your child uses as they play in their natural environment.

If the number of social skills displayed remains low and/or your child does not attend to the videos, an incentive system may be put in place. Incentives are items or activities your child prefers, and could be used to motivate your child to display social skills- similar to a reward system. These items or activities will be identified earlier from the interview with you. Examples of incentives might include stickers or your child listening to his/her favourite music. The incentives selected for this study will be used only if both you and the teacher agree are appropriate and beneficial to your child. For example, your child can earn a sticker if they attended to the entire video session and/or if they made three social initiations after viewing the videos.

Also, I will ensure when your child receives the incentive, this will be done privately to minimize the chances of other non-participating students seeing your child's incentive.

6) Three to five follow up sessions, with each session lasting ten to fifteen minutes will be conducted at the school, three months after the video modeling sessions to see if the social skills taught from video modelling are maintained.
7) The same questionnaire you completed at the start of the study will be completed again, in order to compare your child's progress. You will also need to complete another brief questionnaire regarding the acceptability of the study.

In terms of time involvement, we estimate the study would require a maximum of ten hours maximum over six months for your child. In addition, we estimate the study would require a maximum of two hours over six months for you.

Possible benefits and risks in this study are
Risks:

a) Your child may not enjoy watching the videos. If this was the case, we might need to provide an incentive for watching the full video (using the student's preferred item or activity). For example, if your child likes to collect stickers as

identified from the interview, he/she will be rewarded with a sticker for attending to the full video.
b) Other children might not respond to your child's social behaviours.
c) There is a small chance your child might become upset during the research. In the unlikely event that this was to happen, the session will be stopped immediately and no further sessions will be conducted without discussions with you. Also, you will be provided with the contact details of the head of department, and my supervisor to discuss any adverse consequences. In addition, contact details for a counselor or GP will be made available to you and your child if needed.

Benefits:
a) Your child has better social skills.
b) Teaching your child how to make social initiations and deliver compliments.
c) Your child experiences better social relationships with their peers and potentially other adults.

Data storage/retention/destruction/future use

Consent Forms will confidential and be stored in a locked cabinet on University of Auckland premises and are only accessible by my supervisor and myself. The Consent Forms will be stored separately from the data for six years.

Data collected will be stored on a USB stick and secured in a physically safe location. The USB is only accessible to my supervisor and myself. The information and data will be stored for six years. After the study, I will destroy the original data, and the USB will be rewritten with 0s and 1s. However, the information that goes into the thesis will remain. You and your child's anonymity will be ensured in the reported findings as discussed in the section below.

Your child's results will be graphed in a comprehendible manner throughout the study. These results along with a written or oral explanation of the results can be made available at any time during the study at your request. Only you can access your child's results to ensure confidentiality.

Right to withdraw from Participation
The nature of your participation is completely voluntary. You have the right to decline from participating, or to withdraw from the research at any time without experiencing any disadvantages. If you choose to withdraw from the research, you also have the right to withdraw the data from the research up to September 15th 2016.

Anonymity and Confidentiality
You and your child's confidentiality will be ensured as only my supervisor and I will have access to you and your child's information, the Consent Form and results collected from this study. All information will be stored in a secure location at The University of Auckland.

In regards to the questionnaire that will be completed, the questionnaire given before and after the study will be kept confidential and only the researchers can access them. No information about you will be mentioned in the report in order to preserve your confidentiality.

You and your child's anonymity will also be ensured to the best of our abilities.

When the results are published, only your child's age, sex, diagnoses and social skill deficits will be mentioned. Also, falsified names will be given to your child making it impossible for a reader to identify your child.
There is a possibility that your child's peers, their caregivers and/or teachers of other classes may be may be able to identify your child participating in this study. However, we will ensure no private or potentially embarrassing information will be revealed. In addition, the study will occur during free time, making it harder for others to identify your child participating in this study.

Contact details
If you have any questions, concerns or complaints about the study at any stage, you can contact:

Joanne Wong, (Master student)
021 889 294
jwon127@aucklanduni.ac.nz

Dr. Angela Arnold-Saritepe (Supervisor)
+64 9 373 7599 ext 88518
a.arnold-saritepe@auckland.ac.nz

Professor William Gordon Hayward (Head of department)
+649 923 8516
w.hayward@auckland.ac.nz

For any queries regarding ethical concerns you may contact the Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Research Office, Private Bag 92019, Auckland 1142. Telephone 09 373-7599 extn. 87830/83761. Email: humanethics@auckland.ac.nz.

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 20/04/2015 FOR (3) YEARS REFERENCE NUMBER 013840.

Appendix A

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
School of Psychology
Human Science Building, 10 Symonds Street
+64 9 373 7599

The University of Auckland
Private Bag 92019
Auckland, New Zealand

CONSENT FORM
(Caregiver)

THIS FORM WILL BE HELD FOR A PERIOD OF 6 YEARS

Project title: Teaching children with autism social skills using video modelling

Names of Researchers: Joanne Wong and Dr. Angela Arnold-Saritepe

I have read the Participant Information Sheet, have understood the nature of the research and why I have been selected. I have had the opportunity to ask questions and have them answered to my satisfaction.

- I agree to take part in this research.
- I agree for my child, _____ (full name) to part in this research.
- I understand that I am free to withdraw participation at any time, and to withdraw any data traceable to my child and I up to September 15th 2016.
- I understand my child's participation may take up to ten hours over six months.
- I understand my participation may take up to two hours over six months.
- I understand and agree / do not agree with the research procedures regarding the use of video modelling for my child as stated in the Participant Information Sheet.
- I agree / do not agree to have this research take place in other settings including my home.
- I understand that there will be a report published about this research.
- I wish / do not wish to receive the summary findings.
- I understand the research will take place at school, at home or other settings if feasible
- I understand that my child's teacher will be informed if my child does not display a sufficient number of social skills and an incentive system needs to be implemented.
- I understand that no identifiable information regarding my child will be shared with anyone else.
- I understand that if I choose to withdraw my child and I from this study, the child's teacher and principal will be notified that the researchers no longer need to

observe my child.

- I understand that the research could result in the benefits and risks that were stated in the Participant Information Sheet and agree /do not agree to the ways proposed to manage the situation.

- I understand the Board of Trustee / Principal has given assurance that my child's participation or non-participation will not affect their grades or their relationship with the school.

- I understand this Consent Form and results collected of my child will be kept in a secure location for six years, after which they will be destroyed.

- I agree for the summary of my child's results to be emailed to: _____ (e-mail) or mailed to: _____ (address) at my request.

Name of caregiver _____
Name of child _____

Caregiver's signature _____Date _____

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 20/04/2015 FOR (3) YEARS REFERENCE NUMBER 013840.

Appendix B: Scripts Used in Videos

Greeting responses (2 actors- S.L. and J.W.)

Clip 1

S.L.: “Hello”
J.W.: no response
Instructions: “When someone says Hello to us, we can say Hello back”
S.L.: “Hello”
J.W.: “Hello”

Clip 2

S.L.: “Hello Jo”
J.W.: no response
Instructions: “When someone says Hello Jo, we can say Hello”
S.L.: “Hi Jo”
J.W.: “Hello”

Clip 3

S.L: “Hi”
J.W.: “Go away”
Instructions: “When someone says Hi, we can say hello”
S.L.: “Hi”
J.W.: “Hello”

Clip 4

J.W.: “Hey”
S.L.: no response
Instructions: “When someone says Hi, we can say Hi”
J.W.: “Hi”
S.L.: “Hi”

Clip 5

J.W.: “good morning”
S.L.: no response
Instructions: “When someone says good morning, we can say good morning”
J.W.: “Good morning”
S.L.: “Good morning”

Personal space (4 actors- S.L., J.W. J.J., & M.L.)
In the scripts described below for videos 1 and 2, only the inappropriate approach scenes were described. The appropriate approach scenes were almost identical to the scripts described in the inappropriate approach scenes, but no physical contact was made between the actors (except for the Hi-5s), and an appropriate space was left between the actors. Videos 1 and 2 started off with clip 1 which portrayed an adult female voice delivered the following instruction: “When we go up to a person, we should leave a gap between us and them. The gap we leave is if our arm is up. Just like the video”. Meanwhile, S.L. raises her arm to demonstrate what an arm’s length is with J.W.

Appendix B

Video 1

Clip 1
Instructions on personal space

Clip 2
S.L. approaches J.W. for a Hi-5 and her palm was less than 30 cm away from J.W.'s face.
Instructions: "If we go up to someone for a hi 5 we should still leave a gap between us and them"

Clip 3
S.L.: "Hey Dave come with me" while touching J.J.'s arm.
Instructions: "Did you see how there was a gap between Dave and Sarah?"

Clip 4
S.L.: "Come here" while pulling J.W.'s arm.
Instructions: "When we go up to somebody we should always leave a gap between us and them"

Video 2

Clip 1
Instructions on personal space

Clip 2
J.J.: "Hey Mel, can I show you something" while touching M.L.'s shoulder
Instructions: "Notice how when he went up to Mel he left a space between himself and Mel."

Clip 3
J.W approaches S.L for a Hi-5 and his palm is less than 30 cm away from her face.
Instructions: "When we want to give someone a hi 5 we should still leave a gap between us and them".

Clip 4
M.L.: "Hey Dave can I show you something?" while touching J.J.'s shoulder
Instructions: Did you see how that girl left a gap between herself and Dave?

Clip 5
S.L.: "Hi Mel can I play with you?" while touching M.L.'s arm
Instructions: "When we go up to somebody we should leave a gap between us and them".

Verbal request (4 actors- S.L., J.J., M.L., & J.W.)
The clips described below portray the correct verbal request scenes. The incorrect scenes are identical to the correct scenes, but actor A would present a request to actor B without making any verbalisations.

Clip 1 shows S.L. presenting a piece of paper and a pair of scissors to M.L.
S.L.: "Can I have some help?"

Instructions: “When we need help, we should use our words. Just like the video the girl asked can I have some help?”

Clip 2 shows S.L. approaching J.J. who was using the computer
S.L.: “Can I have a turn?”
Instructions: “When we want a turn we should use our words. In the video Sarah asked can I have a turn?”

Clip 3 shows J.J. presenting a packet of puzzles to M.L., which he could not open
J.J.: “Can you help me?”
Instructions: “When we need help we should just our words. The boy asked can you help me?”

Clip 4 shows S.L. presenting her exercise book to J.W.
S.L.: “Can you look at this?”
Instructions: “When we want someone to look at our work we should use our words. The boy asked can you look at this?”

Turn taking (3 actors; S.L, M.L, J.J)
The clips described below portray the correct requesting a turn scenes. The incorrect scenes are identical to the correct scenes, but actor A would take over the activity which actor B was engaged in without making any verbalisations.

Clip 1 shows M.L. approaching J.J. who was using the flying fox.
M.L.: “Hey Dave, Can I try?”
Instructions: “Mel asked can I try when she wanted a turn”

Clip 2 shows S.L approaches J.J who was using the scooter
S.L.: “Hi Dave, Can I have a turn?”
Instructions: “When we want a turn at something we can ask, can I have a turn?”

Clip 3 shows S.L approaches J.J who was using the computer
S.L.: “Hi Dave, Can I have a turn?”
Instructions: “When Sarah wanted a go she asked, can I have a turn?”

Clip 4 shows M.L approaches J.J who was using a basketball
M.L.: “Hey Dave, Can I play with you?”
Instructions: “If we want a turn, we can ask can I play with you?”

Appendix B

Video creation process

Total duration of the video creation process and the video presentations during intervention.

Social skill	Video filming	Video editing	Duration of each video	Total viewing time
Greeting	60	90	2	74
Personal space	60	90	1.5	45
Verbal request	60	90	3	51
Turn taking	60	90	2	36
Total	180	360		206

Note. The numbers displayed in the table are expressed as minutes, and are only rough estimates.

Appendix C: Interview Schedule

DEPARTMENT OF PSYCHOLOGY
Faculty of Science

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

INTERVIEW SCHEDULE FOR TEACHERS
Teaching children with autism social skills using video modelling

Participant codename:

Date:

Interviewer:

Demographic Information

Student's date of birth:

Student's gender:

Year level:

Has your student received any diagnosis from a medical professional?

If so, what was the student's diagnosis?

Social behaviour/ language information

Does the student regularly use 3-5 word sentences?

Who does the student interact with the most at school? (best friends? Teacher aide?)

Social skills are skills we use to interact and communicate with other people. These include verbal, non-verbal, body language and gestures. For example: making initiations like "Let's play" or getting someone's attention saying "Look!"

How would you describe the student social skills?

Are there situations or contexts where the student is more likely to display social skills? (e.g., free time, group activities, etc.)

What are some social skills the student can improve on?

What are social skills the student is strong at?

Appendix C

Preferences

What kind of activities/ toys does the student enjoy playing or doing at school? (or hobbies/ ask for 3)

Does the student enjoy any particular smells? (e.g., perfume, flowers, pine trees)

Does the student enjoy any particular sounds? (e.g., music, whistles, siren)

Setting

Possible for study to be conducted in classroom settings? i.e., set free times in class/ unstructured class time. Explain generalisation)

Other information

Physiological problems?

Feeding/ toileting/ medication?

Behavioural issues?

Appendix D: Questionnaire (Vineland II)

DEPARTMENT OF PSYCHOLOGY
Faculty of Science

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

Student's name:
Date:

Hi (teacher),
Thank you for taking the time to complete this questionnaire on (student's name) social skills. Please mark on the far right boxes with either a 2,1,0, or DK.

Response options: 2- Usually, 1- Sometimes or Partially, 0- Never, DK- Don't know

Relating to others	
Imitates simple movements (e.g., clap hands, waves good-byes, etc.)	
Uses actions to show happiness or concern for others (e.g., hugs, holds, hands, pats arm, etc.)	
Shows desire to please others (e.g., shares a snack or toy, tries to help even if not capable, etc.)	
Demonstrates friendship-seeking behaviour with others the same age (e.g. says "Do you want to play with me?" or takes another child by the hand, etc.)	
Imitates relatively complex actions as they are performed by another person (e.g., shaving, hammering nails, etc.)	
Answers when familiar adults make small talk (e.g. if asked "How are you?" says "I'm fine". If told " You look nice, " says: "Thank you", etc.)	
Repeats phrases heard spoken before by an adult (e.g. "Honey, I'm home")	
Uses words to express own emotions (e.g. "I'm happy", "I'm upset", etc.)	
Has best friend or shows preference for certain friends over others	
Imitates relatively complex actions several hours after watching some else perform them (e.g. shaving, hammering nails)	

Appendix D

Playing and Using Leisure Time	
Plays with others with minimal supervision	
Uses common household objects or other objects for make-believe activities (e.g. pretends a block is a car, a box is a house, etc.)	
Protects self by moving away from those who destroy things or cause injury (e.g., those who hit, throw things, etc.)	
Plays simple make-believe activities with others (e.g., plays dress-up, pretends to be superheroes, etc.)	
Seeks out others for play or companionship (e.g., plays with others on the playground, invites others home, etc.)	
Takes turns when asked while playing games or sports	
Plays informal, outdoor group games (e.g. tag, jump rope, catch, etc.)	
Shares toys or possessions without being asked	
Follow rules in simple games (e.g., relay races, spelling boxes)	
Takes turns without being asked	
Plays simple card or board game based only on chance (e.g., Go fish, Crazy eights, etc.)	
Goes places with friends during the day with adult supervision (e.g. to a shopping mall, park, etc.)	

Appendix E: Procedural Integrity

Task Analysis for procedural integrity

Steps	Yes	No
1. The participant is seated at circle time and facing the smart board		
2. The teacher plays the video on the smart board		
2a. If the participant faces away from the board for more than 5s, the teacher or the teacher aides provides a verbal prompt e.g., “D.B. please look at the board”		
4. When the video finishes, the teacher exits window media player and resumes circle time.		
Total number of correct steps =_____ Percentage of correct steps = _____		

Appendix F: Social Validity

THE UNIVERSITY OF AUCKLAND
NEW ZEALAND
School of Psychology
Human Science Building, 10 Symonds Street
+64 9 373 7599

The University of Auckland
Private Bag 92019
Auckland, New Zealand

SOCIAL VALIDITY QUESTIONNAIRE
(Teacher and caregiver)

Where you satisfied with the following aspects of the study:

1) I am satisfied with the procedures for assessing my child/ the student's social skills

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

2) I am satisfied with the teaching method (video modelling) used with your child/ your student

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

3) I am satisfied with the goals of the study

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

4) I am satisfied with the information I received about the study

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

5) I am satisfied with the target phrases selected for teaching (social skill)

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

6) I am satisfied with the results from this study

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments:

7) I am satisfied with the conduct of the researchers

Strongly agree	Agree	Neutral	Disagree	Strongly disagree
☐	☐	☐	☐	☐
+2	+1	0	-1	-2

Comments: