The use of packaged video modelling and video self-modelling techniques to facilitate conversational interactions for adolescents with autism, who use AAC

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LIST OF ABBREVIATIONS

Abbreviations	Expansions
AAC	Augmentative and Alternative Communication
ASD	Autism Spectrum Disorders
CI	Confidence Interval
CP	Communication Partner
DSM	Diagnostic and Statistical Manual Mental Disorders
EBP	Evidence-based Practice
ICD	International Classification of Diseases
IOR	Inter-observer Reliability
IRD	Improvement Rate Difference
PDD	Pervasive Developmental Disorders
PDD-NOS	Pervasive Developmental Disorder-Not Otherwise Specified
PECS	Picture Exchange Communication System
PODD	Pragmatic Organisation of Dynamic Display
PoVM	Point-of-view Modelling
PPVT	Peabody Picture Vocabulary Test
R-IRD	Robust Improvement Rate Difference
SA	South Australia
SGD	Speech Generating Device
VM	Video Modelling
VSM	Video Self-Modelling

ABSTRACT

The aim of this study was to determine and compare the effectiveness of packaged video modelling (VM) and video self-modelling (VSM) interventions in promoting reciprocal conversational interactions for adolescents with ASD who use augmentative and alternative communication (AAC) systems.

The research questions were addressed in three separate studies: (a) a pilot study, (b) Study 1, and (c) Study 2. The studies were conducted using single-case research designs, namely multiple baseline and alternating treatments designs. Five participants with ASD who used AAC aged between 10 and 18 years participated in the studies. Four scripts (two for video modelling and two for video self-modelling) were used during intervention for the pilot and main intervention studies. One script was used to assess generalisation in the pilot study, while four additional scripts were used to assess generalisation in the main intervention studies. The independent variable was the type of packaged video-based modelling interventions: (a) video modelling plus instructional prompts and (b) video self-modelling plus instructional prompts. The dependent variables were (a) the number of prompted answers and turns during scripted conversations, and (b) type and number of prompts required in each intervention session. The robust improvement rate difference (R-IRD) measure was used to determine the size of the intervention effect.

Following the pilot study, changes were made in the conversation scripts used during the intervention and generalisation measures in the main intervention studies. The conversation scripts used in the main intervention studies reflected shorter scripts with more generalisable turns.

The overall results demonstrated that the VM and VSM were successful to facilitate conversation skills for this group of participants when used in conjunction with least-to-most prompts. Without the additional instruction, VM and VSM yielded small effects in four participants, and moderate effects in one participant. The R-IRD estimates indicated moderate to large treatment effect sizes in four of

five participants for prompted conversational interactions. The findings also demonstrated prompts were necessary to elicit interactions for this group of participants. Differential effects were noted between VM and VSM, for two participants, where VSM with prompts demonstrated larger treatment effects. Both, VM and VSM with prompts were equally effective for two others. Neither intervention package was effective in eliciting interactions for one participant.

This research provides preliminary findings and implications for clinical practice and research on the use of packaged video-based modelling intervention to develop conversation skills in adolescent AAC users with ASD. Further research using a greater number of participants and different aspects of video-based modelling (i.e., point-of-view modelling) is recommended.

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university, and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed: Date: 11 April 2017

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CHAPTER 1: INTRODUCTION

Social and communication impairments have been recognised as primary features of Autism Spectrum Disorder (ASD) since ASD was first identified in 1943 (Kanner, 1943). Social and communication impairments include (a) failure to engage in back-and-forth conversation (i.e., poor turn taking); (b) lack of initiation and response to social interaction; and (c) reduced sharing of interests and feelings (American Psychiatric Association, 2013), all of which are essential constituents of relationship development and preservation (Hartup, 1992).

In typical child development, peer relationships start to take precedence in adolescence—an intermediary period between childhood and adulthood. The quality of friendships and peer relations in adolescence thus become more intense, intimate and influential (Shucksmith, Hendry, Love, & Glendinning, 1993; Shulman, Laursen, Kalman, & Karpovsky, 1997). Friends and peers are seen as sounding boards and constitute benchmarks against which adolescents evaluate personal experiences, develop self-identity and cultivate values that mould later attitudes (Connolly, 1989; Schunk & Meece, 2006; Woodhouse, Dykas, & Cassidy, 2012).

Although individuals with ASD follow a different developmental trajectory than typically developing individuals (Lange et al., 2015; Stoner et al., 2014; Wang, Kloth, & Badura, 2014), research has shown that individuals with ASD demonstrate positive characteristic changes and increased social interest as they approach and progress through adolescence (McGovern & Sigman, 2005; Mesibov, 1983; Mesibov & Handlan, 1997; Rutter, 2005). Research has shown that individuals with ASD continue to report higher levels of loneliness, even with friends, indicating that they struggle to develop intimate and meaningful peer relationships (Bauminger & Kasari, 2000; Bauminger, Shulman, & Agam, 2003; Chamberlain, Kasari, & Rotheram-Fuller, 2007). There is also evidence to suggest that compromised social skills leads to lack of adequate relationship quality and increased social isolation (Locke, Ishijima, Kasari, & London, 2010).

Social and communication skills share a dynamic and reciprocal relationship. Social interaction is driven by effective communication, while adequate communication skills are developed within the context of social interaction (Bellini, 2007). Furthermore, effective social interaction is said to promote not only social skills, but also emotional and cognitive development (Bellini, 2007; Caspi, Elder, & Bem, 1988; McClelland, Morrison, & Holmes, 2000; Riley, San Juan, Klinkner, & Ramminger, 2007). Through social interactions, social relationships are formed and social networks expanded (Bellini, 2007; Cobb, 1976). These social networks act as a social support system, by which a foundation for future social and career opportunities are established (Bellini, 2007; Blackstone, Williams, & Wilkins, 2007).

The lack of a robust social support system may be an indication of negative psychological states including lack of self-efficacy, anxiety, depression, social withdrawal and isolation (Bellini, 2007; Blackstone et al., 2007; Cobb, 1976; Cohen, 2004). In contrast, research has demonstrated that adequate social support promotes resilience, physical health and well-being (Blackstone et al., 2007; Cobb, 1976; Cohen, 2004).

Therefore, the core focus of many ASD specific interventions has been on improving social skills of individuals with this disability (Reichow & Volkmar, 2010). Furthermore, with increased knowledge of evidence-based practice (EBP), health professionals and educators are likely to incorporate research findings within their practice (Odom et al., 2005; Ratner, 2006).

One intervention that has emerged as part of EBP in ASD is video modelling (VM) (Wong et al., 2015). VM is based on the Social Learning Theory introduced by Bandura (1971), who argued that in most circumstances, learning occurs through the observation of actions and their consequences within specific social contexts. VM thus exemplifies Social Learning Theory. The learner watches video clips of targeted behaviours with the expectation that these behaviours will be learnt and later reproduced.

Despite being widely researched, the majority of studies using VM techniques has focused on discrete communication components such as responding, requesting and greeting, whereas research targeting more complex conversation skills remains limited. Conversation, being the "central medium for human socialization" (Goodwin & Heritage, 1990, p. 289), should be the nucleus of social communication and interaction interventions, as facilitating conversation encourages the development of communication skills (to greet, compliment, request), and promotes social interaction.

Matters relating to self, including identity and self-esteem, also emerge during adolescence and lay the foundations for future adult relationships (Erikson, 1994; Marcia, 1980). Since self-esteem is influenced by the way we perceive ourselves, it can be enhanced by increasing the perception of self-competence (Harter, 1993), also known as self-efficacy (Bandura, 1986). Such a perception of positive self-portrayal is believed to increase self-efficacy (Bandura, 1986). Bandura (1986) found that the success of engagement and performance of a learner is increased when the model resembles self. The use of video self-modelling (VSM)—a specific application of VM in which the learner is also the model—stemmed from this view of positive self-portrayal (Dowrick, 2000).

Given the relative complexity of producing self-modelling video clips (time, labour and technical proficiency), the current use of VSM in intervention settings is relatively low. However, with recent advances in video technology and the increased availability of easy-to-use editing software, the use of VSM is on the increase (Bellini & Akullian, 2007).

Research significance

The latest national statistical data in Australia showed that close to 50% of school-aged children (5-18 years old) with ASD have communication difficulties, and about 70% have difficulties fitting in socially (Australian Bureau of Statistics, 2014). Given the importance of social skills and the central role conversational abilities play in social interactions, a systematic review was conducted, as part of this thesis, to better understand the effectiveness of VM and VSM techniques to develop conversation

skills for individuals with ASD. Nine studies met the inclusion criteria and the findings showed that VM and VSM were moderate to largely effective in promoting reciprocal conversation skills for verbal children with ASD. The findings from the systematic review highlighted: (1) a low number of adolescent and adult participants, and (2) the absence of individuals with ASD who have complex communication needs.

Firstly, the majority of participants were young children below eleven years of age. This is not surprising given the advancements in neuroscience, the impact of early intervention on brain development (Konrad, Firk, & Uhlhaas, 2013; Pierce, 2011) and potential for early intervention to improve future outcomes (Eldevik et al., 2009; Fein et al., 2013; Harris & Handleman, 2000; Howlin, Goode, Hutton, & Rutter, 2004; Howlin, Magiati, Charman, & MacLean, 2009; Matson, 2007; Reichow, 2012; Reichow & Wolery, 2009; Rogers, 1998). However, given that logic, it becomes essential to re-introduce an intensive intervention focus in adolescence, since the extent of growth and development in adolescence is second only to that of infancy (World Health Organisation (WHO), 2016). Increasing evidence shows that physiological and psychological changes in adolescence reflects change in the adolescent brain (Giedd et al., 1999; Huttenlocher & Dabholkar, 1997; Konrad et al., 2013; Perrin et al., 2008), which "goes through a new phase of plasticity in which environmental factors can have major, lasting effects on cortical circuitry" (Konrad, Firk & Uhlhaas, 2013, p. 429).

Secondly, no participants in the 10 studies had complex communication needs. Given that about 30% of individuals with ASD have complex communication needs (Ganz, 2015; Mirenda & Iacono, 2009; Tager-Flusberg, Paul, & Lord, 2005a) and require the use of augmentative and alternative communication (AAC) systems, the research on VM is not representative of this group. The AAC research, including participants with ASD and complex communication needs, has generally focused on behaviour regulating communication skills such as requesting (Banda, Copple, Koul, Sancibrian, & Bogschutz, 2010; Cihak, Smith, Cornett, & Coleman, 2012; Copple, Koul, Banda, & Frye, 2015;

Sigafoos, Didden, & O'Reilly, 2003; Smith, Hand, & Dowrick, 2014) as opposed to conversational skills. While requesting is an important early communication skill, requesting alone is not sufficient to maintain social interactions and promote social relationships. Overall, most individuals with ASD face social challenges in their daily lives. However, when confronted with the additional challenges associated with complex communication needs, the barriers to participation in all aspects of life, including education, employment, independent living, relationship development and social acceptability, is further exacerbated (Beukelman & Mirenda, 2013; Mirenda & Iacono, 2009).

Based on the results of the systematic review (to be described in Chapter 2), it became apparent that there was a gap in the literature, concerning adolescents with ASD who use AAC. The findings of the systematic review showed that there was a clear need for intervention research to focus on the conversational skills of adolescents with complex communication needs.

Research aim

The overall aim of the current study was to investigate the effectiveness of VM and VSM to facilitate reciprocal conversation in adolescents with ASD who also had complex communication needs. Specifically, this research aimed to answer the following questions:

- What is the effectiveness of video-based modelling techniques implemented as a packaged intervention with least-to-most prompting?
- Is one of the two (VM or VSM) more effective to facilitate conversation in youths with ASD and complex communication needs?

Thesis layout

This purpose of this thesis is to describe and detail the procedure and findings of the three individual studies that were conducted as a part of this research. In Chapter 2, the literature pertaining to the main research fields will be described. The method and results of the pilot study will be presented in Chapter 3. Chapter 4 will include information about the changes made in the Method and procedures

of the main intervention studies (1 and 2), following the pilot study. The specific Method and results of the main intervention studies will be presented separately in Chapters 5 and 6 respectively. The discussion of key findings within the context of the current literature will be presented in Chapter 7. In Chapter 8, the concluding chapter, the quality and limitations of the current investigation as well as the research and practical clinical implications will be presented.

CHAPTER 2: LITERATURE REVIEW

The purpose of this chapter is to present a review of the literature on the use of video-based modelling interventions, specifically, the use of video modelling (VM), video self-modelling (VSM) and point-of-view modelling (PoVM) to facilitate conversation skills in individuals with Autism Spectrum Disorder (ASD). Firstly, an overview of ASD will be provided to establish the context of the present study. Secondly, a more detailed description of social communication, and the dynamic and intertwined relationship between social communication and social interaction will be described. A review of the use of video-based modelling techniques to develop conversation skills will be discussed and finally, a systematic review conducted as a part of this thesis will be presented.

Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) refers to a lifelong, pervasive neurodevelopmental condition characterised by marked impairments in social communication and interaction, and accompanied by inflexible and repetitive patterns of behaviour and interest. ASD has an early onset and is typically diagnosed between two and four years of age when behavioural symptoms are discernible (Barbaro & Dissanayake, 2009, 2010; Landa, Holman, & Garrett-Mayer, 2007; Volkmar, Chawarska, & Klin, 2005). The latest development in neuroscience research offers better prospects of pre-symptomatic diagnosis of ASD as early as six months old, specifically for at-risk infants (Hazlett et al., 2017). The neurobiological basis for ASD has been well established (Abrahams & Geschwind, 2008). Twin and sibling studies (Bailey et al., 1995; Hallmayer et al., 2011; Ronald, Simonoff, Kuntsi, Asherson, & Plomin, 2008) have clearly implicated genetic factors as a possible cause of ASD; however, the exact neuropathology continues to be investigated.

ASD Diagnosis

Despite the early identification of ASD as a distinct disorder in 1943 by Leo Kanner, ASD was not officially recognised as a separate nosology until the ninth edition of the International Classification of Diseases (ICD-9) in 1979, and the third edition of the Diagnostic and Statistical Manual of Mental

Disorders (DSM-III) in 1980. ASD is recognised as a social communication disability in both international psychiatric classification systems (American Psychiatric Association, 2013; World Health Organisation (WHO), 2016). Since then, the classification of ASD and its diagnostic criteria have been revised and expanded to reflect a more structured diagnosis, with concrete and observable behaviours. For example, in the DSM-III (American Psychiatric Association, 1980), ASD was classified as infantile ASD, with six defining characteristics, including broad criteria like pervasive lack of responsiveness to people, gross deficits in language development, etc. However, due to inconsistencies and unclear diagnostic criteria, the DSM-III was revised, and the amended version was published as the DSM-III-R in 1987. Here, infantile ASD was changed to autistic disorder, and the diagnostic criteria included 16 characterising features of more concrete and observable behaviours, such as deficits ranging from abnormal social approach to failure to engage in back-and-forth conversations.

Further changes to the diagnostic criteria were introduced in the DSM-IV (American Psychiatric Association, 1994), in which ASD was recognised as a spectrum disorder, with a severity ranging from mild to severe. Here, autistic disorder was categorised under the umbrella of pervasive developmental disorders (PDD). Within this category, other related disorders including, Asperger's Syndrome, Rett's Disorder, Childhood Disintegrative Disorder and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS) were listed. This version identified ASD as a triad of impairments characterised by (a) qualitative impairments in social interaction (e.g., lack of seeking shared enjoyment by showing or pointing to objects of interest or people, failure to develop peer relationships); (b) qualitative impairments in communication (e.g., delay or lack of spoken language, marked impairments in initiating and sustaining conversation); and (c) restricted, repetitive and stereotyped patterns of behaviour, interests and activities (e.g., inflexible adherence to specific, non-functional routines, hand or finger flapping, preoccupation with parts of objects). An updated version of the DSM-IV was subsequently published as the DSM-IV-TR in 2000, yet the diagnostic criteria for ASD were not altered (American Psychiatric Association, 2000).

The current standards in the DSM-V were published in 2013 with major changes. The DSM-V defines ASD based on (a) persistent deficits in social communication and social interaction; and (b) restricted, repetitive patterns of behaviour, interests, and activities. Previously distinct categories such as Asperger's Syndrome and Childhood Disintegrative Disorders were absorbed under the umbrella term, Autism Spectrum Disorder. It is important to note that the participants in this project were adolescents (aged between 10-18 years) with ASD, who were diagnosed based on the DSM-IV criteria, as described above. The differences in the diagnostic criteria from DSM-IV to DSM-V are detailed in Table 2.1.

Table 2.1: Diagnostic criteria for ASD based on the DSM

Feature	**DSM-IV/DSM- IV-TR**	**DSM-V**
Known as	***Pervasive Developmental Disorder***	***Autism Spectrum Disorder***
Criteria for diagnosis	• Onset prior to the age of three • **Qualitative impairments in social interaction** o Marked impairment in the use of multiple non-verbal behaviours, e.g., eye-gaze, facial expression, etc. o Failure to develop peer relationships appropriate to developmental level o Lack of spontaneous seeking to share enjoyment, interests or achievements with other people o Lack of social or emotional reciprocity. • **Qualitative impairments in communication** o Delay in or total lack of the development of spoken language o Marked impairment in the ability to initiate or sustain conversation with others (for those with adequate speech) o Stereotyped and repetitive use of language or idiosyncratic language o Lack of varied spontaneous make-believe play or social imitative play appropriate to developmental level. • **Restricted, repetitive and stereotyped patterns of behaviour, interests and activities** (same as DSM-V)	• Onset in early childhood • **Persistent deficits in social communication and social interaction** o Deficits in social-emotional reciprocity, including abnormal social approach to lack of engaging in reciprocal conversation o Deficits in non-verbal communicative behaviours used for social interaction, e.g., abnormal eye contact, body language, etc. o Deficits in developing, maintaining and understanding relationships, e.g., adjusting behaviour to suit social contexts, engaging in imaginative play, making friends, etc. • **Restricted, repetitive patterns of behaviour, interests and activities** o Stereotyped or repetitive motor movements o Insistence of sameness o Highly restricted, fixated interests.

ASD and co-occurring disabilities

The clinical presentation of ASD is highly heterogeneous. For example, ASD may be present in isolation or co-occur with intellectual, behavioural, language and medical disabilities, or a combination of any of these (Bauman, 2010; Kohane et al., 2012; Levy et al., 2010; Posserud, Hysing, Helland, Gillberg, & Lundervold, 2016). Studies have shown that between 70-90% of individuals with ASD may have at least one co-occuring disability and more than 20% present with two or more co-occurring disorders (Bauman, 2010; Boulet, Boyle, & Schieve, 2009; Doshi-Velez, Ge, & Kohane, 2014; Kohane et al., 2012; Levy et al., 2010; Memari, Ziaee, Mirfazeli, & Kordi, 2012; Posserud et al., 2016; Simonoff et al., 2008, 2010). Intellectual disability is reported in about 40% of individuals with ASD (Bauman, 2010; Elsabbagh et al., 2012) and is linked with a higher risk of spoken language deficits (Hewitt et al., 2012). As ASD may occur at all levels of cognitive ability, and because the severity of symptoms is also highly variable, ASD is defined by the manifestation of collective behaviours and severity of their presentation (American Psychiatric Association (APA), 2000; 2013).

Prevalence and rate

The latest worldwide epidemiological survey found that the median prevalence rate for ASD was 62/10000 (i.e., 1:161.3) (Elsabbagh et al., 2012). In the USA, the reported prevalence is 1:68 children (Christensen, 2016), and the most recent prevalence data in Australia from 2014 estimated that 0.5% of the population have ASD (i.e., 1:200). This is a 79% rise in the number of individuals diagnosed with ASD within a three-year time span (2009–2012) (Australian Bureau of Statistics, 2014). Consistent with findings across the globe, ASD is more prevalent in males than females (Australian Bureau of Statistics, 2014; Barbaro & Dissanayake, 2010; Christensen, 2016; Elsabbagh et al., 2012). Since this research was conducted with school-age children in Australia, country-specific prevalence estimates are provided below to demonstrate ASD trends in Australia.

ASD in Australia

The latest census in Australia estimated that 23.4% of school-aged children with ASD also have

intellectual disability (IQ < 70) and 60 % have learning difficulties (Australian Bureau of Statistics, 2014). The data revealed that only 5% of children with ASD (aged 5-20) attended schools without any educational restrictions. About 6% of children with ASD did not attend school at all due to the challenges imposed by their disability. The remaining children attended special schools or classes within mainstream schools (with or without additional personal and equipment support). In Australia, the main criterion for children to gain attendance to special schools is the presence of intellectual or multiple disabilities. Table 2.2 displays the type of schooling for individuals with ASD in Australia. For children with ASD, the most commonly reported challenges at schools include fitting in socially (68.6%), learning difficulties (60%) and communication problems (47.5%) (Australian Bureau of Statistics, 2014). Less than 2% of individuals with ASD are graduates from universities, while 80% do not have a formal post-school qualification. Approximately 57% of individuals with ASD in Australia are not in the labour force (Australian Bureau of Statistics, 2014).

Table 2.2: Schooling restrictions for school-aged individuals with ASD in Australia (Australian Bureau of Statistics, 2014)

Schooling status	**% of students (aged 5-20)**
No educational restrictions	5.6
Unable to attend school	6.8
Special classes within mainstream schools	24.9
Special schools	26.1
At least one day off from school	12.0
Additional person-based support (school support officers) (including individuals attending special schools or classes within mainstream schools)	65.3
Special modifications at school (including individuals attending special schools or classes within mainstream schools)	24.6

Overall, there has been a steady rise in the number of people diagnosed with ASD globally

(Australian Bureau of Statistics, 2014; Buckley, 2007). This increase may be due to changes in the diagnostic criteria and overall increased awareness (Fombonne, Quirke, & Hagen, 2009; Rutter, 2005). Additionally, a consistent rise in the symptoms associated with ASD has been reported (Rice et al., 2010), suggesting increased awareness and diagnostic changes may not be solely responsible for the upsurge.

Social communication and social interaction

Social and communication impairments are the main hallmarks of ASD. Thus, to some extent, these skills are expected targets for intervention. In the last 15 years, there have been steady advancements in the development and implementation of social communication interventions (Bellini & Akullian, 2007; Matson, 2007; Reichow & Volkmar, 2010).

Social communication is a vast domain that encompasses verbal (e.g., speech) as well as non-verbal (e.g., facial expression, body language) communicative behaviours used in social interaction (American Psychiatric Association, 2013; Landa, 2007; Landa et al., 2007; Robertson, Tanguay, L'Ecuyer, Sims, & Waltrip, 1999; Wetherby, Watt, Morgan, & Shumway, 2007). Social and communicative behaviours are closely intertwined and influence one another. For instance, effective social communication skills often elicit positive reactions from peers and consequently encourage further social engagement (Bellini, 2007). Social interaction in turn provides a platform for the acquisition of appropriate social communication skills (Bellini, 2007; Bellini, Akullian, & Hopf, 2007; Hauck, Fein, Waterhouse, & Feinstein, 1995).

Impaired social communication may lead to challenges regarding social interaction. This can result in difficulties in making friends and building peer networks, which in turn could lead to social withdrawal and isolation (Bellini, 2007; Chow, Ruhl, & Buhrmester, 2016). Increased social isolation has been linked to intensification of mental health issues such as anxiety and depression (Ginsburg, La Greca, & Silverman, 1998; La Greca & Harrison, 2005; La Greca & Lopez, 1998; Rubin & Burgess, 2001; White, Oswald, Ollendick, & Scahill, 2009). Figure 2.1 depicts the dynamic and

reciprocal relationship between social communication and social interaction.

Impairments in social communication and interaction are universal across individuals with ASD, regardless of their cognitive abilities (Carter, Davis, Klin, & Volkmar, 2005; Howlin, 2005). These impairments are often evident within the first year of life (Landa, 2007) and they are the earliest indicators of ASD (Barbaro & Dissanayake, 2009; Hutman, Chela, Gillespie-Lynch, & Sigman, 2012; Wetherby et al., 2007). Moreover, social difficulties are the single most distinguishing factor to differentiate ASD from other developmental disorders (Sigman, Dijamco, Gratier, & Rozga, 2004; Sigman & Ruskin, 1999).

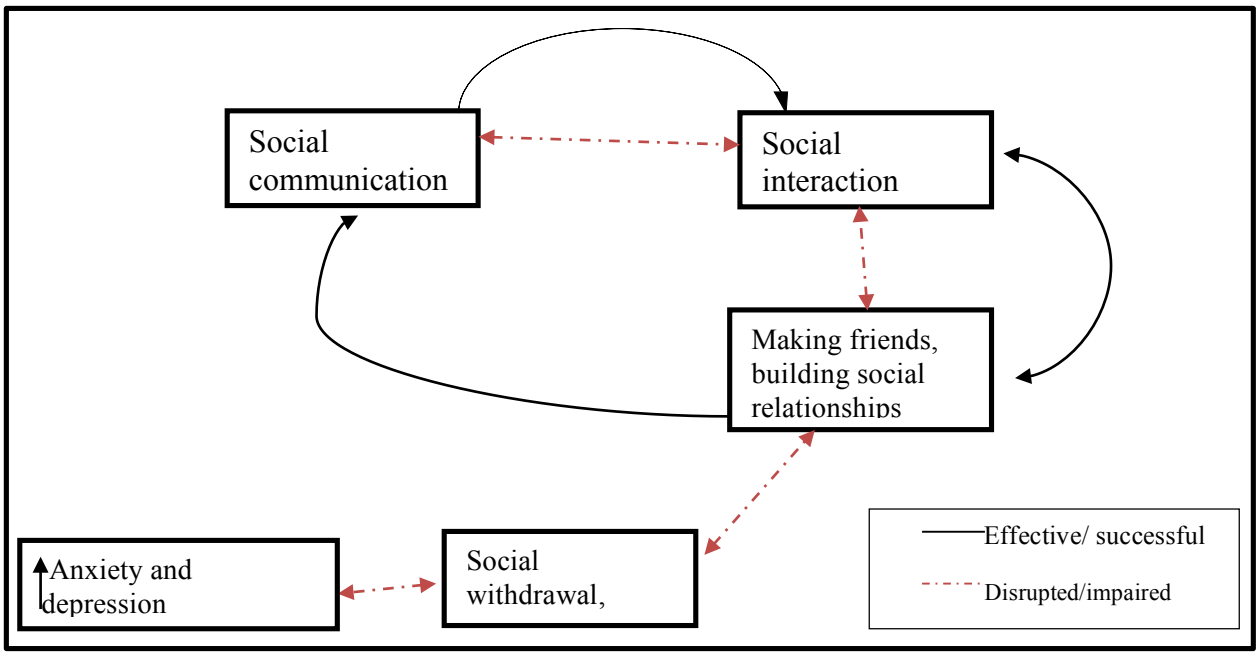

Figure 2.1. Dynamic and reciprocal relationship between social communication and social interaction

Typically developing children acquire critical social and communication skills naturally through exposure and interaction with people around them (Bellini, 2007; Hume, Loftin, & Lantz, 2009; Lee, 2015; MacDuff, Krantz, & McClannahan, 2001). Even before the development of speech and language, children without disability show innate understanding of the social disposition of human beings. They seek interaction by exhibiting smiling, seeking social attention by establishing

appropriate eye contact, visually tracking partners' gaze and gestures, imitating or orienting to their name call (Landa et al., 2007; Paul, 2007). These early socio-communicative behaviours represent the building blocks required for engaging socially and building relationships (Mundy, 1995; Mundy, Sigman, & Kasari, 1994; Sigman & Ruskin; Travis & Sigman, 1998; Vaughan Van Hecke et al., 2007).

Social communication impairments in ASD

Children with ASD do not follow similar developmental trajectories. Based on retrospective videotape analyses and parental reports, children with ASD do not typically seek shared enjoyment through social interaction with their caregivers. They often show reduced or abnormal visual tracking, eye contact and joint attention behaviours, as well as overall decreased social attention and relatedness (Barbaro & Dissanayake, 2009, 2010; Shumway & Wetherby, 2009; Tager-Flusberg, Paul, & Lord, 2005b; Wetherby et al., 2007). The difficulties with joint attention and imitation may limit their capacity to learn solely through incidental observation, and subsequently may decrease the overall spontaneity of their independent skill demonstration (Bellini & Peters, 2008; Hume et al., 2009; MacDuff et al., 2001).

Individuals with ASD tend to display more explicit deficiencies in understanding context-dependent social rules and demands as they grow older, thus making social interaction beyond their immediate family members an arduous task (Travis & Sigman, 1998). Individuals with ASD also exhibit unusual non-verbal and verbal communication patterns, such as abnormal eye contact when talking, engaging in a non-reciprocal conversation style, being preoccupied or fixated on their topics of interest, showing poor understanding of body language and facial expressions and failure to recognise cues that their communication partner may not be engaged (Denning, 2007; Travis & Sigman, 1998; Wetherby et al., 2007). These social communication peculiarities could affect their ability to successfully participate and interact in social situations, which may lead to ostracism and isolation from their peers (Van Roekel, Scholte, & Didden, 2010). A lack of social acceptability may

have long-term, adverse impacts on the development and preservation of relationships and lifelong implications for psychosocial and emotional well-being (Beukelman & Mirenda, 2013; Chow et al., 2016; Cohen, 2004; La Greca & Lopez, 1998; Prizant & Laurent, 2011; Reichle, 2007; White et al., 2009). While for some, the social deficits could also be explained by a lack of social interest (Wing, 1997); for others, this is not the case (Howlin, 2005). There are individuals with ASD who show a desire to engage socially and build social relationships, yet their social and communication impairments result in social rejection (Bauminger & Kasari, 2000; Chamberlain et al., 2007).

Heterogeneity within the core deficits of ASD and how it impacts research and clinical outcomes are well recognised. Many researchers have attempted to further subgroup intra-deficit features (Grzadzinski, Huerta, & Lord, 2013; Ingram, Takahashi, & Miles, 2008; Klopper, Testa, Pantelis, & Skafidas, 2017; Lai, Lombardo, Chakrabarti, & Baron-Cohen, 2013; Ousley & Cermak, 2014; Wing, 1997). For instance, Wing developed a subgrouping system specifically based on types of social impairment in ASD. Wing described four subgroups of social impairment in ASD: (a) aloof; (b) passive; (c) active but odd; and (d) loners (Wing, 1997, 2012).

This system describes the range of social impairment in ASD, varying between (a) individuals who only seek human interaction to express needs and wants (aloof), (b) individuals who respond to social overtures by others, but do not seek to prolong or maintain interactions (passive), (c) individuals who make active social approaches without due attention to the needs of their communication partners (active but odd), and (d) individuals who have no social interest, prefer solitude and rote learn social conventions, despite possessing fluent speech and language capabilities (loners).

Evidence-based intervention for developing social skills in ASD

There is substantial evidence demonstrating that well-structured, evidence-based intervention may have positive implications for the long-term outcomes of individuals with ASD (e.g., Speech Pathology Australia, 2010; Wong et al., 2015). Evidence-based practice (EBP) refers to the decision-

making process that involves the integration of clinical expertise with high-quality research evidence and clients' values and clinical goals (American Speech-Language-Hearing Association, 2005; Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996; Speech Pathology Australia, 2010).

Researchers, expert groups and professionals in organisations, such as SPA and ASHA, have developed models of EBP that describe levels of evidence, ranging from expert opinion to meta-analyses and systematic reviews (see Figure 2.2). The qualification of EBP is determined on the basis of the significance and practicality of treatment outcomes for individual participants, contexts, and activities (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Odom et al., 2005; Simpson, 2005).

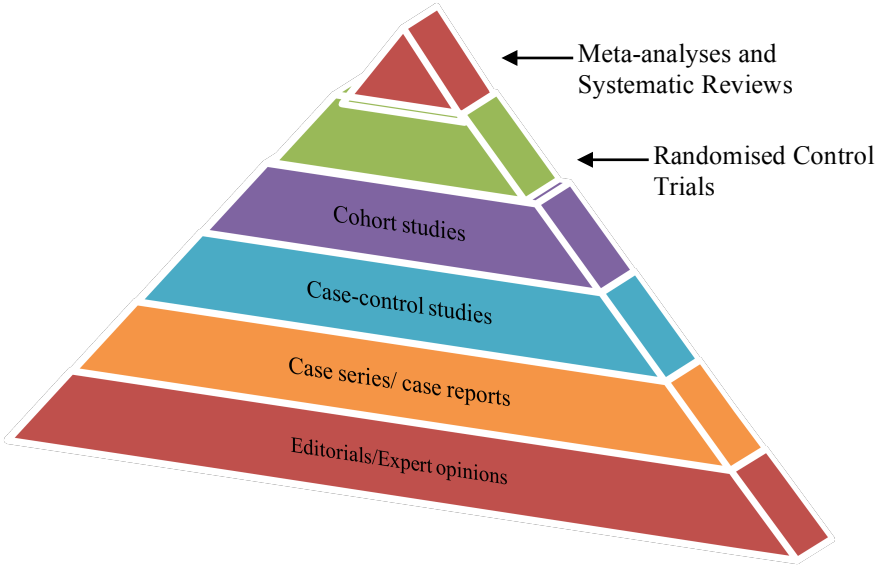

Figure 2.2. Example of an EBP model that describes levels of evidence

There are different standards for identifying EBP. For example, the National Professional Development Centre on Autism Spectrum Disorders developed criteria for EBP based on the standards proposed by other researchers and professional organisations (Wong et al., 2015). Their proposed criteria include (a) two high quality or quasi-experimental design studies conducted by two different research groups; or (b) five high-quality single-case designs conducted by three different research groups, involving 20 participants across studies; or (c) a combination of one high quality experimental/quasi-experimental studies, three high-quality single case designs, conducted by one research group. Of the 456 accepted studies included in their review, 27 intervention strategies met

the criteria for EBP including modelling and video modelling (Wong et al., 2015).

Modelling

Modelling refers to a teaching approach where the targeted behaviour is demonstrated in a naturalistic context (Charlop, Schreibman, & Tryon, 1983; Wong et al., 2015). The person displaying the expected behaviour is referred to as a model, who could be a familiar or unfamiliar adult or peer. Modelling strategies have been found to further promote the maintenance and generalisation of learnt skills (Charlop et al., 1983; Dowrick, 2000; Egel, Richman, & Koegel, 1981; Ergenekon, Tekin-Iftar, Kapan, & Akmanoglu, 2014; Gena, Couloura, & Kymissis, 2005; Odluyurt, 2013). Charlop et al. (1983) investigated the effects of receptive labelling of items using modelling techniques to four children aged between four and 14 years old with ASD. The investigators stated that modelling might foster the development of other behaviours, including social behaviours that were not specifically targeted in the modelling interventions. They found that modelling also facilitated (more) appropriate eye contact, greetings and affectionate actions such as hugging and smiling, which were not overtly targeted in the intervention. The investigators reported this to be a serendipitous advantage of the technique, as it indirectly facilitates the development of social difficulties inherent of ASD. Modelling, also known as observational learning, stems from the precepts of Social Learning Theory (Bandura, 1971).

Social Learning Theory

Social Learning Theory (Bandura, 1971) posits that learning is largely a by-product of observing behaviours and their outcomes in social contexts. Before the seventies, traditional learning theories were founded on the belief that people's behaviours were products of personal and direct experience. However, these theories were often criticised on the basis that they lacked predictive capability (Bandura, 1971). It became apparent that the capacity to learn by observation enabled an individual to acquire and integrate patterns of behaviours by example, without the need to reinvent the wheel. Bandura (1971) showed that "under most circumstances, a good example is….a much better teacher

than the consequence of unguided actions" (p. 5).

Early behavioural theorists hypothesised that imitative learning was reliant on specific stimulus-response connections (Miller & Dollard, 1941; Skinner, 1953). However, this explanation did not fully account for how certain behaviours were learnt and performed in the absence of reinforcements. Upon further analysis, Bandura (1971) postulated that four cognitive sub-processes regulate observational learning: (a) motivation; (b) attention; (c) retention; and (d) motoric reproduction. Bandura's Social Learning Theory (Bandura, 1971) posits that the success of observational learning is dependent upon the learner attending to, remembering and imitating the demonstrated/observed behaviour.

Attention

As in any learning process, the learner's attention is a primary driving force for observational learning. In addition to executive functioning, the ability to gain and maintain attention is also reliant on the desirability of the demonstrated example. Millar and Dollard (1941) explained that unless the modelled behaviour is intrinsically motivating, it is likely the learner is not going to attend to the behaviour, and at which point learning is halted. Bandura (1971) posited that certain forms of modelling are inherently more gratifying than others. For example, on-screen demonstration of behaviours may be more successful in attracting attention than live modelling. Bandura, Grusec and Menlove (1966) investigated the effects of incentives (e.g., reinforcement/reward) on observation learning in a study with 72 children. The models in this study were presented in movie form. Their findings showed that the performance of the non-incentive group (i.e., those who were not rewarded for their performance) was comparable to the incentive group, indicating that models presented in televised form were effective in capturing the learner's attention regardless of the presence of rewards or reinforcements (Bandura, Grusec, & Menlove, 1966). Furthermore, interpersonal attraction to the model qualities may be another factor in drawing one's attention. Bandura (1971) reported that the learner is more likely to engage or attend to a model that closely resembles the learner in physical appearance and developmental level.

Retention

Mere exposure and attention are not sufficient to encourage learning. For learning to occur, one must also have the capability to process, store and retrieve the symbolic representation of the learnt material. Bandura (1971) stated that the retention process is also influenced by desire/motivation. Unless one is motivated by the demonstration of the stimuli, the likelihood of its preservation in the memory is lesser. Furthermore, retention is affected by the 'use it or lose it' principle (i.e., the learner is more likely to forget the learnt behaviour without adequate practice opportunities).

Motoric reproduction

The third function governing observational learning is related to physical reproduction of the observed behaviours. For this function, the learner needs to possess adequate and appropriate physical characteristics or skills to be able to imitate the modelled example. Learning cannot occur if one does not have sufficient physical and cognitive skills or environmental allowance to reproduce the model. For example, one may attend to and retain a symbolic representation of how to play the piano, but if one's feet cannot reach the pedals, one may not be able to imitate (or learn) the modelled example.

Motivation

The success of observational learning is dependent upon the integration of these three learning regulators to produce, retain, retrieve and reproduce a symbolic representation of the targeted behaviour. One feature overarching all the previously described governing functions is motivation or desire to engage. For example, unless the demonstrated behaviour or the model displaying the behaviour is desirable to the learner, the likelihood of the learner attending to the model, or retaining the observed behaviour is low, subsequently affecting the ability to reproduce the observed example. As previously mentioned, the desire to engage may be influenced by the type of model presented and the medium. Televised or digital modelling may present as an intrinsically rewarding form of observational learning.

Video-based intervention

In a world where many aspects of human lifestyle are driven by digital technology, video-based

instruction has emerged as an efficient medium for observational learning. Video modelling is a variant of the modelling approach, where the modelled behaviour is transmitted through a video medium. By nature, in addition to adult or peer models, video-modelling allows for animation or self as models. Video modelling presents with several benefits over live modelling techniques, in particular for individuals with ASD. This method is found to capitalize on the individual's learning strengths, while simultaneously eliminates the drawbacks of live modelling, such as social apprehension and stimulus over-selectivity (Bellini & Akullian, 2007; Charlop et al., 1983; Corbett & Abdullah, 2005; Hine & Wolery, 2006; Rayner, Denholm, & Sigafoos, 2009). Furthermore, video modelling allows for a uniformed presentation of targeted behaviours with repetition of the same instruction across and within participants.

Video-based intervention can be implemented as the primary instruction mode [video modelling (VM) (Charlop & Milstein, 1989), video self-modelling (VSM) (Sherer et al., 2001) and point-of-view modelling (PoVM) (Hine & Wolery, 2006)] or as a supplement to the main intervention [video prompting (Mechling & Gustafson, 2008), video priming (Schreibman, Whalen, & Stahmer, 2000), video feedback (Robinson, 2011)]. The video instruction could be presented from a first- or third-person perspective. For example, PoVM is shown from a first-person perspective, whereas, VM and VSM are presented from a third-person perspective. The following sections will focus solely on video-based interventions that are used as the primary intervention mode including (a) VM, (b) VSM and (c) PoVM.

Video modelling

Video modelling (VM) involves the learner watching video clips of targeted behaviours performed by others with the expectation that these behaviours are learnt and later reproduced (Ayres & Langone, 2005; Bellini & Akullian, 2007; Charlop et al., 1983; Corbett & Abdullah, 2005). The actor demonstrating the targeted behaviour in the VM clips could be an adult, a peer or even an animation character. VM techniques can be implemented as a sole intervention or as part of a packaged treatment

(i.e., in combination with other instructions such as prompting and feedback). As mentioned earlier, VM is listed as an EBP for individuals with ASD (Wong et al., 2015).

Video self-modelling

Video self-modelling (VSM), as the name suggests, relies on the learner acting as their own model (Dowrick, 2012). In addition to the speculation about the learner's intrinsic attraction for models who resemble themselves, Bandura (1986) hypothesised that watching successful self-portrayals may enhance the individual's perceived self-efficacy. He reported that self-modelling increases self-motivation and self-belief by providing the opportunity to recognise one's potential in reaching the target or goal (Dowrick, 2012). Compared to VM, VSM requires additional preparation due to the need for (a) prompting and guiding the learner to perform the targeted behaviour, (b) capturing ample footage of the learner performing the target skill, and (c) editing the video vignette to delete all prompts and errors. However, the evolution in digital and technology spheres has simplified the process of recording and editing video clips, making it accessible to caregivers and educators to produce instructional self-modelling clips (Mason, Davis, Ayres, Davis, & Mason, 2016; Mechling & Hunnicutt, 2011).

There are two types of self-modelling: feedforward and positive self-review. Feedforward refers to combining existing, discrete components of skill(s) to form a new or advanced skill. The production of video clips for this technique requires the actor/learner to be supported and prompted to exhibit the necessary skills, as they are yet to demonstrate targeted behaviour accurately. This method reflects a more antecedent based procedure, as it enables the learner to view successful skills completion as a whole and their potential future performance (Dowrick, 2012). Positive self-review involves improving already developed skills to produce the best performance or increase the frequency of the behaviour (Dowrick, 2012). This technique involves capturing footage of the learner demonstrating the targeted skills in various settings and situations.

Both VSM techniques have been implemented when targeting different behavioural domains

including compliance, communication, social, and academic skills as well as independent living (Bellini & Akullian, 2007; Mason et al., 2016). Positive self-review has been used more frequently to facilitate the development of compliant behaviours, whereas feedforward has been used more often to target social communicative skills (Mason et al., 2016). Overall, feedforward has been implemented more often than positive self-review (Mason et al., 2016), probably due to the time factor. The production of the positive self-review video is more time-consuming, as it could take hours to gather adequate exemplar footage to create the required video vignette (Dowrick, 2000; Mason et al., 2013b). VSM techniques can be implemented solely or as part of a treatment package.

Point-of-view modelling

Unlike the previous two methods described above, point-of-view modelling (PoVM) is taken from a first person perspective. That is, the video clip is shown from the vantage point of the viewer who will be executing the task (Mason, Davis, Boles, & Goodwyn, 2013a; Shukla-Mehta, Miller, & Callahan, 2010). PoVM can be implemented as a prompting technique (Sigafoos et al., 2005), priming method (Hine & Wolery, 2006; Schreibman et al., 2000; Tetreault & Lerman, 2010) or a combination of both (Sancho, Sidener, Reeve, & Sidener, 2010; Tereshko, MacDonald, & Ahearn, 2010). The prompting technique involves step-by-step demonstration and completion of each component within a larger task. On the other hand, the priming method involves the learner watching the entire behaviour in a video clip, before attempting to imitate the action or skill observed.

The added advantages of PoVM over VM or VSM are (a) the production of exemplary clips is simpler and less time consuming, and (b) the extraneous stimuli can be eliminated as the clip focuses on the exact components or features required for the completion of the particular task (Shukla-Mehta et al., 2010). Despite these benefits, PoVM has been researched to a lesser degree than VM and VSM (Lee, 2015; Mason et al., 2013a). In general, these three video-based modelling techniques may be used as a primary intervention method or as part of a packaged treatment to facilitate the development of a range of skills and behaviours.

Systematic review

In reviewing the extant literature, there were numerous systematic reviews and literature reviews that focused on the efficacy of VM, VSM, and/or PoVM intervention for individuals with ASD. The general consensus was that these techniques were effective in promoting the acquisition, maintenance and generalisation of various tasks for individuals with ASD (Bellini & Akullian, 2007; Delano, 2007; Kagohara et al., 2010; Lee, 2015; Mason, Ganz, Parker, Burke, & Camargo, 2012a ; Mason et al., 2016; Mason et al., 2013a; Mason et al., 2013b; McCoy & Hermansen, 2007; Qi & Lin, 2012; Shukla-Mehta et al., 2010; Wang, Cui, & Parrila, 2011). To date, however, no reviews have focused on determining the effects of video-based modelling interventions solely on conversation skills. Hence a systematic review was conducted to specifically evaluate the use of video-based modelling for facilitating conversation skills in individuals with ASD.

Conversation

Conversation is a vital component of social communication and social interaction (Goodwin & Heritage, 1990). Generally speaking, conversation is a broad concept and has many definitions. More specifically, in essence, conversation can be described as a joint social activity, including a to-and-fro dialogue pattern between at least two people, around shared topics of interest (American Psychiatric Association, 2013; Clark, 2001; MacDonald & Gillette, 1985). The systematic review conducted as part of this thesis has a specific focus on conversation skills due to the critical role they play in the development of social relationships and the associated difficulties for persons with ASD, namely that:

- Conversational deficits are specifically highlighted in the diagnostic criteria for ASD: failure of normal back-and-forth conversation (American Psychiatric Association, 2013).
- It is “the central medium for human socialization” (Goodwin & Heritage, 1990, p. 289).
- While there are reported cases of disinterest in social interaction and conversation among

individuals with ASD (Wing, 1988), there are individuals on the spectrum who are socially keen and desire to fit in (Howlin, 2005).

- The ability to engage in reciprocal conversation allows individuals not only to initiate interaction but also to maintain such engagement; this is particularly challenging for individuals with ASD (Bauminger, 2002; Bauminger & Kasari, 2000; Bellini & Akullian, 2007; Lee, 2015).

- Facilitating reciprocal conversation targets the further development of discrete components of social communication, such as initiation, response, greeting, commenting (MacDonald & Gillette, 1985; MacDonald & Gillette, 1986)

Aim

The aim of the systematic review was to answer the following questions:

- What is the reported effectiveness of VM, VSM and PoVM to facilitate conversation skills, specifically conversational turn-taking in individuals with ASD?

- Do the different types of video-based modelling techniques yield differential effects on the treatment outcome?

- Do the different implementation protocols (with and without additional instruction) yield differential effects on the treatment outcome?

Method

Literature search

Electronic databases [ERIC (PROQUEST), ERIC (OVID), Google Scholar, PSYCINFO, MEDLINE, CINAHL and SCOPUS] and individual journals (*Focus on Autism and Developmental Disabilities, Journal of Autism and Developmental Disabilities, Research in Autism Spectrum Disorders, Journal of Special Education Technology and Journal of Positive Behavior Interventions*) were searched

using specific key terms to obtain potential studies.

Procedure

Search strategies, such as the Pearl Growing Strategy and Building Block Strategy (Schlosser, Wendt, Bhavnani, & Nail-Chiwetalu, 2006) were used to formulate the search terms used in the systematic review. The studies were then evaluated according to predetermined inclusion criteria (see Results and Discussion section below).

The studies that met the eligibility criteria were included in the systematic review and were then appraised for quality using the Evaluative Method for Determining EBP in Autism (Reichow, Volkmar, & Cicchetti, 2008). This tool was designed specifically for evaluating efficacy research in ASD. The intervention effect size was also calculated, using the robust-improvement rate difference (R-IRD) estimate (Parker, Vannest, & Brown, 2009). (Details of the IRD and R-IRD calculation method are described in Chapter 3.) Inter-observer agreement measures were conducted at three points: (1) initial selection of studies based on the inclusion criteria; (2) quality appraisals of included studies; and (3) effect size calculation.

Results and discussion

Overall, 10 studies met the following inclusion criteria:

- Studies dated between 1980 and December 2014. Before 1980, most research using VM focused on observational learning for athletes or teaching activities of daily living for individuals with a disability;

- Participants aged three years old and above with the primary diagnosis of ASD (Autistic Disorder, Asperger's Syndrome and Pervasive Developmental Disorder-Not Otherwise Specified). Individuals with a combined diagnosis (ASD and intellectual disability or chromosomal disorders) were also included. For studies that included participants with a range of different diagnoses (Ogilvie, 2008), only the results for those with ASD were included and assessed in the current systematic review;

- Studies that were published in English;

- The independent variable was VM, VSM, and/or PoVM. Studies in which video instruction was used as an accessory to the primary focus of the intervention like video prompting or video feedback were excluded;

- Dependent variables included conversation skills including turn-taking during conversational interactions. For studies with combined outcome measures, only data pertaining to conversational outcomes were included. As such, studies in which discrete components of social communication were targeted, such as initiation alone (Banda et al., 2010; Bellini et al., 2007; Buggey, 2005; Buggey, 2012; Buggey & Hoomes, 2011; Cihak et al., 2012; Nikopoulos & Keenan, 2003; Nikopoulos & Keenan, 2004; Wert & Neisworth, 2003), responding alone (Hart & Whalon, 2012), giving compliments alone (Apple, Billingsley, Schwartz, & Carr, 2005; MacDonald, Clark, Garrigan, & Vangala, 2005) or pretend play (MacDonald et al., 2005), were excluded from the review.

Table 2.3 displays a descriptive summary of the studies reviewed. A total of 23 participants were included from 10 studies. The majority of participants (43.5%) were aged between six and 10 years of age. Six participants (26.1%) were aged between two and five, five aged between 11 and 17 (21.7 %) and the remaining two (8.7%) were above 18 years of age. All participants had a diagnosis of ASD. Only one study (Ogilvie, 2008) reported the IQ levels of participants, with two participants' IQs below 70. Sherer et al. (2001) reported participants' mental age based on the Stanford-Binet Intelligence Scale (Thorndike, Hagen, & Sattler, 1986). VM interventions were implemented in eight out of the 10 studies. VSM was compared with VM in one study (Sherer et al., 2001) and PoVM was used in another study (Tetreault & Lerman, 2010). Video-based intervention was implemented exclusively in 70% of the reviewed studies, and three studies investigated it as part of a packaged intervention (Ogilvie, 2008; Sansosti & Powell-Smith, 2008; Tetreault & Lerman, 2010). Two out of the 10 studies (Ogilvie, 2008; Sansosti & Powell-Smith, 2008) reported treatment fidelity and four studies (Charlop-Christy, Le, & Freeman, 2000; Charlop & Milstein, 1989; Ogilvie, 2008; Sansosti & Powell-Smith, 2008) reported social validity.

Table 2.3. Summary of each study included in the systematic review

STUDY	PARTICIPANT				METHOD						VIDEO-BASED MODELLING			OUTCOME
	#	*Age range*	*Comm Exp*	*Dx*	*Design*	*Setting*	*FID*	*IOR*	*G*	*M*	*Social. Validity*	*Implementation*	*Type*	*Model*	**Quality**
Charlop & Milstein (1989)	3	6;10-7;10	Verbal	HFA	MBD	Clinical	X	√	√	√	√+	Solo	VM	Adult (familiar)	Weak
Charlop et al. (2000)	1	11;3	Verbal	ASD	MBD	Clinical	X	√	√	X	√+	Solo	VM	Adult (familiar)	Adequate
Charlop et al. (2008)	2	8;0-9;0	Verbal	Mid-High ASD	MBD	Clinical	X	√	√	X	X	Solo	VM	Adult	Weak
MacDonald et al. (2009)	2	5;0-7;0	Verbal	ASD	MPD	Clinical	X	√	X	√	X	Solo	VM	Adult	
Mason et al. (2012)	2	19;0-26;0	Verbal	AS	MBD	University	X	√	X	√	X	Solo	VM	Peer	Weak
Ogilvie (2008)[1]	2*	12;0-14;0	Verbal	Mild-Mod ASD; PDD-NOS	MBD	School	√	√	√	√	√+	Solo	VM	Peer	Strong
Ogletree et al. (1995)	1	5;9	Verbal	HFA	MBD	Clinical	X	X	X	X	X	Packaged	VM	Animation	Weak
Sansosti et al. (2008)	1*	8;10	Verbal	ASD	MBD	Naturalistic	√	√	√	√	√+	Packaged	VM	Peer	Strong
Sherer et al. (2001)	5	3;11-11;2	Verbal	4ASD; 1PDD-NOS	MBD+AA	Naturalistic; Clinical	X	√	√	√	X	Solo Solo	VM VSM	Adult Self	Adequate
Tetreault & Lerman (2010)	3	4;0-8;0	Verbal	ASD	MBD	Clinical	X	√	√	√	X	Packaged	PoVM	Adult	

+ Measured one or two levels of social validity
1 dissertation
* only reviewed participants
MBD = Multiple Baseline Design; MPD = Multiple Probe Design; ATD = Alternating Treatment Design; ASD = Autism Spectrum Disorder; AS = Asperger's Syndrome; HFA = High-functioning Autism; IOR = inter-observer reliability; G = Generalisation; M = Maintenance; FID = Treatment Fidelity

The Robust Improvement Rate Difference (R-IRD) was calculated for each participant, activity or behaviour, based on the type of model. The average R-IRD scores for the type of model used are: (a) VM = 0.69 (moderate effect); (b) VSM = 0.76 (large effect); and (c) PoVM = 0.48 (small effect). The estimates for VSM and PoVM must be interpreted with caution because of the limitations imposed by the small number of studies reviewed, which implemented these types of modelling techniques (i.e., one study respectively). The individual effect size estimates for each participant, activity or behaviour are listed in Table 2.4. These estimates showed high variability. The scores ranged from -0.15 to 1.00, demonstrating the potential effect of moderating factors, corresponding with the findings of Mason et al. (2012, 2013a, 2013b, 2016). The effect size could not be calculated in three studies due to (a) lack of visual clarity of the graphs (Charlop, Gilmore, & Chang, 2008; Charlop & Milstein, 1989), and (b) absence of visual representation of data (MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009). The exclusion of R-IRD calculation for these three studies may have impacted overall R-IRD estimates.

Table 2.4. Effect size calculations using the IRD estimate for each participant

Intervention implementation	Study no.	Author (year)	DV (Act)	Activity		IRD	R-IRD
Alone	1	Charlop & Milstein (1989)	1 (7;6)	Conversation A	VM	N/A	N/A
				Conversation B	VM	N/A	N/A
				Conversation C	VM	N/A	N/A
				Conversation D	VM	N/A	N/A
				Conversation E	VM	N/A	N/A
				Abstract	VM	N/A	N/A
			2 (6;10)	Conversation A	VM	N/A	N/A
				Conversation B	VM	N/A	N/A
				Conversation C	VM	N/A	N/A
				Conversation D	VM	N/A	N/A
				Conversation E	VM	N/A	N/A
				Abstract	VM	N/A	N/A
			3 (7;10)	Conversation A	VM	N/A	N/A
				Conversation B	VM	N/A	N/A
				Conversation C	VM	N/A	N/A
				Conversation D	VM	N/A	N/A
				Conversation E	VM	N/A	N/A
				Abstract	VM	N/A	N/A
	2	Charlop et al. (2008)	Gary (9;0)	A	VM	N/A	N/A
				B	VM	N/A	N/A
				C	VM	N/A	N/A
				D	VM	N/A	N/A
			Connor (8;0)	A	VM	N/A	N/A
				B	VM	N/A	N/A
				C	VM	N/A	N/A
				D	VM	N/A	N/A
	3	MacDonald et al. (2009)	Colin (7;0)	Airport toy set	VM	N/A	N/A
				Zoo toy set	VM	N/A	N/A
				Grill toy set	VM	N/A	N/A

			Alden (5;0)	Airport toy set	VM	N/A	N/A
				Zoo toy set	VM	N/A	N/A
				Grill toy set	VM	N/A	N/A
	4	Mason et al. (2012b)	Caleb (26;0)	Turn-taking	VM	0.92	0.71
			Sam (19;0)	Turn-taking	VM	1.00	1.00
	5	Ogletree et al. (1995)	J.M (5;9)	Topic maintenance	VM	0.17	0.13
			Luke (5;11)	Conversation	VM	0.93	0.90
				Conversation	VSM	1.00	1.00
			Sam (7;1)	Conversation	VM	0.92	0.93
				Conversation	VSM	1.00	1.00
	6	Sherer et al. (2001) (the GS, GP, GM was not included at baseline)	Joey (4;0)	Conversation	VM	0.61	0.46
				Conversation	VSM	0.38	0.42
			Jack (11;2)	Conversation	VM	0.63	0.68
				Conversation	VSM	0.88	0.89
			Chuck (9;0)	Conversation	VM	0.79	0.66
				Conversation	VSM	0.68	0.49
	7	Tetreault & Lerman (2010)	Zhane (5;5)	Share a toy (exchanges)	PoVM	0.89	0.84
			Randall (8;2)	Share a toy (exchanges)	PoVM	0.07	-0.15
			Janet (4;4)	Share a toy (exchanges)	PoVM	0.67	0.75
	8	Charlop-Christy et al. (2000)	Greg (11;3)	Conversation 2	VM	1.00	1.00
Packaged Intervention	9	Ogilvie (2008)	1 (14;0)	Conversation	VM	0.70	0.60
			2 (12;0) ID	Conversation	VM	0.45	0.39
			3 (12) ID	Conversation	VM	0.29	0.48
	10	Sansosti et al. (2008)	Santino (8;10)	Conversation	VM	0.76	0.97

The findings of the current systematic review demonstrated that video-based modelling interventions were effective, at varying levels, to facilitate conversational turn-taking for individuals with ASD. The obtained effect sizes were similar to those in previous reviews by Mason et al. (2012a, 2013a, 2013b, 2016). For VM, the R-IRD scores for reviewed participants and/or activities varied between -0.15 to 1.00, demonstrating that this method was very effective for some participants or activities, and ineffective for others. This result is consistent with the findings of Qi and Lin (2012) who also found considerable variation in effect sizes (ranging from -0.22 to 1.00). Because only one study had examined the effects of VSM (Sherer et al., 2001), it is premature to draw any conclusions concerning its effectiveness in promoting conversational skills for individuals with ASD. Clearly, more research is needed.

The findings from the meta-analyses (Mason et al., 2013b) indicated that overall, VM were relatively more effective than VSM techniques. However, further analysis of the moderating factors showed that while VM with adults as models elicited greater effects than VSM, the latter yielded larger effects than VM with peers as models. Conversely, the modelling study by Charlop et al. (1983) showed that for individuals with ASD, who also had intellectual disabilities; peers as models yielded more promising treatment outcomes compared to previous modelling intervention research conducted with adults as models (Hewett, 1965; Varni, Lovaas, Koegel, & Everett, 1979). It should be noted that these studies implemented the modelling technique in a live intervention context.

It is important to note that the previous qualitative reviews did not distinguish between individuals with ASD who also had an intellectual disability and those without. Furthermore, these investigations focused on overall social skills outcomes and did not delineate the effect size for conversation skills (Bellini & Akullian, 2007; Mason et al., 2012a ; Mason et al., 2016; Mason et al., 2013a; Mason et al., 2013b; Qi & Lin, 2012; Wang et al., 2011). Some reviews also imposed restricted age limits that may have impacted overall effect size estimates. For example, Qi and Lin (2012) restricted the scope of their review to focus on two to eight-year-olds, whereas Wang et al. (2011) targeted four to 15-

year-olds.

The systematic review also aimed to understand the differential effects of using VM and VSM alone or as part of a larger treatment package. Generally, the review found that VM implemented alone yielded greater effects (R-IRD_M = 0.72) compared to implementation as a part of a package (R-IRD_M = 0.61), which is consistent with the findings of Mason et al. (2013b). However, this finding should be interpreted with caution. Firstly, the studies that implemented VM in a packaged intervention employed different additional instruction approaches. Ogilvie (2008) used peer mentoring, while Sansosti et al. (2008) used computer presented social stories as supplemental instructions. Furthermore, the study by Sansosti et al. (2008) showed very large treatment effects (R-IRD = 0.97), whereas the average effect size for participants in the Ogilvie (2008) study was small (R-IRD_M = 0.44).

This systematic review highlighted two additional points. Firstly, data extraction from studies reviewed in the literature revealed lower numbers of adolescent and adult participants. In other words, the majority of reviewed studies involved younger children aged between three and 10. This pattern is consistent with the findings of previous literature reviews on video-based modelling interventions focusing on social skills outcomes (Bellini & Akullian, 2007; Lee, 2015; Mason et al., 2012a ; Mason et al., 2016; Mason et al., 2013a; Mason et al., 2013b; Shukla-Mehta et al., 2010). Secondly, none of the reviewed studies included individuals with complex communication needs, although approximately 30% of individuals with ASD are unable to use speech functionally throughout their lifetime (Ganz, 2015; Mirenda & Iacono, 2009; Tager-Flusberg, 2006). The following paragraphs will expand on the implications of the highlighted findings for (a) adolescents with ASD, and (b) individuals with ASD and complex communication needs.

Adolescence in ASD

Adolescence is an emotionally challenging phase being the intermediary period between childhood and adulthood. The start of adolescence is marked by the onset of puberty and typically ranges

between 10 to 19 years of age (World Health Organisation (WHO), 2016). WHO characterises the immensity of development during adolescence to be second only to that in infancy (World Health Organisation (WHO), 2016). Adolescents undergo significant biological, physical and psychological growth. These changes are shown to influence adolescent neuroplasticity in ways that permanently shape the cortical circuitry (Giedd et al., 1999; Huttenlocher & Dabholkar, 1997; Konrad et al., 2013; Perrin et al., 2008). Peer relationships start to take precedence in adolescence, as they are the primary source of social support and companionship (Marsh, 2012; Orsmond, Krauss, & Seltzer, 2004). Peers play an influencing role in moulding one's identity including shaping thoughts and ideas (Shucksmith et al., 1993).

This developmental phase poses additional challenges for adolescents with ASD, who are often ostracised and the target of bullying, due to their lack of, and peculiar, social communication skills. This may hinder social development and adjustment (Van Roekel et al., 2010). Research has shown that as they approach and progress through adolescence, individuals with ASD demonstrate characteristic improvements and increased social interest (McGovern & Sigman, 2005; Mesibov, 1983; Mesibov & Handlan, 1997; Rutter, 2005; Schall & McDonough, 2010). This may be explained by a recurrence of intense brain development that takes place during adolescence (Konrad et al., 2013). Despite reported positive changes, social communication remains substantially impaired and continues to be a challenge for social interactions (Seltzer, Shattuck, Abbeduto, & Greenberg, 2004). As such, individuals with ASD continue to report higher levels of loneliness, even among friends, demonstrating that they struggle to develop intimate and meaningful peer relationships (Bauminger & Kasari, 2000; Bauminger et al., 2003; Chamberlain et al., 2007).

The majority of video-based modelling interventions with adolescent participants have targeted independent living skills such as meal preparation, purchasing items, using the ATM and working the microwave (Alexander, Ayres, Smith, Shepley, & Mataras, 2013; Allen, Wallace, Greene, Bowen, & Burke, 2010a; Allen, Wallace, Renes, Bowen, & Burke, 2010b; Day, 2015; Haring,

Kennedy, Adams, & Pitts-Conway, 1987; Smith et al., 2016). The few studies that focused on social skills were aimed at social initiations (Nikopoulos & Keenan, 2003), spontaneous requesting (Banda et al., 2010), perspective taking (LeBlanc et al., 2003) and conversation (Mason, Rispoli, Ganz, Boles, & Orr, 2012b; Ogilvie, 2008; Sherer et al., 2001). The impact of VM interventions on conversational skill development in adolescents with ASD will be discussed in the following section.

Impact of VM interventions

Mason et al. (2012b) evaluated the effectiveness of VM as a sole intervention when teaching social communicative skills to two college students aged 19 and 26 respectively, with ASD. This study employed a multiple baseline design across behaviours. Five minutes before each social interaction activity, the participants were required to watch a one- to two-minute video clip showing a peer (aged 21-31 years old) demonstrating the targeted behaviour. Following video viewing, both participants engaged in a conversational turn-taking activity with each other and two additional conversation partners. Findings of the study were positive overall for all targeted behaviours, including conversational turn-taking. With respect to this particular skill, the average IRD estimate was 0.96, indicating a large effect for the intervention.

Ogilvie (2008) investigated the impact of video modelling and peer mentoring on five social skills (i.e., greeting a peer, participating in conversation, asking a question, following directions and tracking the talker) using a multiple baseline design. Three adolescent participants aged between 12 and 14 were paired with an aged-matched peer mentor. Following viewing of the targeted behaviour in video clips, the participants practised the relevant skills with the peer mentor before moving on to the next clip. The findings of the study were mixed, ranging from IRD = 0.29 (a small/negligible effect) to IRD = 0.70 (a moderate effect). The author concluded that the combination of peer mentoring and VM yielded positive results. However, she also reported having difficulty distinguishing which component (peer mentor vs. VM) produced the greater impact.

One of the five participants in the study conducted by Sherer et al. (2001) was an 11-year-old male with ASD. Sherer and colleagues compared the effects of VM and VSM and found both to be useful to facilitate reciprocal conversation in speaking individuals with ASD. This study used a combination of two single case research designs, including multiple baseline design and alternating treatments design. However, individual differences were reported. Sixteen conversational scripts were trained using VM and VSM techniques (eight for VM and VSM respectively). Each participant was required to watch the video clips three times, alternating between the peer and self as the model each night before sleeping. They were subsequently assessed on the trained scripts the following day. No additional instruction (e.g., prompts) was provided to elicit answers or turns during the assessment. For the 11-year-old participant with ASD, VSM showed a larger effect (IRD = 0.89) than VM (IRD = 0.68).

Complex communication needs and ASD

The findings of the systematic review also highlighted the absence of participants with ASD who had complex communication needs. Complex communication needs describes the lack of functional speech to meet daily communication needs (Beukelman & Mirenda, 2013). This condition is not exclusive to individuals with ASD. In the United States, approximately one million children (not limited to ASD) are reported to have complex communication needs (Light & McNaughton, 2012). The latest prevalence data in Australia, conducted in 2004, indicated that approximately 1:500 people in Victoria have complex communication needs (Perry, Reilly, Cotton, Bloomberg, & Johnson, 2004). Approximately 10% of individuals with complex communication needs also have ASD (Perry et al., 2004).

As mentioned earlier, there seems to be a relationship between intellectual disability and the lack of spoken language in persons with ASD (Hewitt et al., 2012). The estimate for intellectual disability in ASD is approximately 40% (Bauman, 2010; Elsabbagh et al., 2012). However, it is important to emphasise that not all individuals with ASD and intellectual disability have complex communication

needs, nor does every individual with complex communication needs with ASD have intellectual disability (Barbeau, Soulières, Dawson, Zeffiro, & Mottron, 2013; Dawson, Soulières, Gernsbacher, & Mottron, 2007; Eagle, 2003).

Nevertheless, the added complexity of limited speech or an absence of speech exacerbates the barriers to participation and acceptability in all aspects of life including education, employment, relationship development and independent living. This subsequently increases the risk of social/emotional and mental health problems. Therefore, it is crucial to provide adequate access and support to communication for individuals with complex communication needs. Their communicative competence can be improved through augmentative and alternative communication (AAC) systems and intervention.

AAC intervention

The following section will define and describe AAC and discuss some common AAC instructional strategies. The primary aim of AAC intervention is to provide access and the power of communication to individuals who are unable to use speech for everyday communication (Beukelman & Mirenda, 2013; Light & Drager, 2007; Mirenda & Iacono, 2009). AAC embodies a range of unaided and aided communication modalities. Unaided systems are communication techniques that rely on the use of body parts to communicate including body language, facial expressions, gestures, and manual signing. Aided communication refers to methods that rely on external, supplementary systems that either function without technological support such as writing/drawing, using picture communication, or with the use of advanced technology and applications, such as speech generating software and devices (SGD).

The positive effects and benefits of AAC for persons with ASD have been established (Ganz, 2015; Iacono, Trembath, & Erickson, 2016; Logan, Iacono, & Trembath, 2016; Reichle, Ganz, Drager, & Parker-McGowan, 2016; Schlosser, Sigafoos & Koul, 2009; Wendt, 2006). Logan et al.

(2016), for example, conducted a systematic analysis of published systematic reviews on AAC interventions for ASD and concluded they were effective to highly effective for individuals with ASD. Research has also shown that AAC benefits are not limited to facilitating communicative functions, but extend to the promotion of distinct linguistic segments (i.e., semantics, syntax, morphology), language comprehension and literacy skills, as well as the reduction of challenging behaviours (Beukelman & Mirenda, 2013; Iacono et al., 2016; Light & McNaughton, 2012; Logan et al., 2016; Schlosser & Koul, 2015). Furthermore, past fears and apprehension about the potential impediment to natural speech development have been dismissed, and current evidence suggests that AAC interventions promote rather than hinder spoken language development for some individuals with complex communication needs (Millar, Light, & Schlosser, 2006; Romski, Sevcik, Adamson, & Cheslock, 2006; Schlosser, 2003; Schlosser & Wendt, 2008).

Although there are many forms of AAC systems, the aptness of any communication modality for a given person is contingent upon the integration of intrinsic factors (i.e., the individual's preference, abilities, values, expectations) and extrinsic factors (i.e., the communication partner, communication context and goals) (Mirenda, 2003). For example, due to motor planning difficulties in ASD (Fournier, Hass, Naik, Lodha, & Cauraugh, 2010; Landa & Garrett-Mayer, 2006; Mody et al., 2017), aided AAC systems are considered more suitable than manual signing for many individuals with ASD (Ganz et al., 2012; Iacono et al., 2016; Mirenda & Iacono, 2009). Nonetheless, manual signing has received due research attention and is regarded as an emerging communication treatment for persons with ASD (Schlosser & Wendt, 2008; Shield, 2014; Wendt, 2006).

Picture-based communication, either presented with or without technological assistance (i.e., communication boards, picture exchange communication versus speech generating applications), is also considered a preferred choice because the pictorial representations (a) correspond more closely with its referent, (b) have a more concrete and lasting presence to refer to (versus manual signs, which are more transient) (Ganz et al., 2012; Iacono et al., 2016), and (c) are decipherable by a wider

range of communication partners. Moreover, recent advances in mobile technology have made available portable, off-the-shelf mobile devices (iPad®, iPod®, Android® tablets) that can be easily converted to speech generating devices using readily available picture-based communication applications (e.g., Proloquo2Go™, Touchchat™, Sonoflex™). The affordability and application of these devices have made SGDs more accessible to relevant stakeholders (i.e., individuals with complex communication needs, carers, and educators).

The mere presentation of an AAC system to an individual with complex communication needs is insufficient for the development of communicative competence. For AAC users, communicative competence is defined as a dynamic, interpersonal construct centred on functionality and adequacy of communication knowledge, judgement, and skills (Light, 1989). Light (1989) has described four independent and somewhat unique features of alternative communication that should be mastered as a step towards achieving communicative competence. They are:

Linguistic competence: Since communication is a two-way street, AAC users must understand and master the language and linguistic codes (phonology, morphology, semantics, syntax) of the AAC system as well as the speaking community.

Operational competence: As AAC users employ alternative communication modalities, they require appropriate knowledge and skills about how to access as well as transmit communicative expressions. For example, an AAC user who uses a speech generating device must have adequate technical skills to operate the communication machinery (i.e., turning the device on/off, controlling the volume) as well as the navigational skills to access the appropriate vocabulary.

Social competence: Just like speaking individuals, AAC users also need to have adequate understanding about the time, place and manner of speaking (Hymes, 1972).

Strategic competence: Unlike spoken language, communicating through AAC has limitations, especially in regards to speed and accuracy of message transmission. Although technological

advances have somewhat reduced this barrier (i.e., the use of predictive language, abbreviations of expressions), the challenge regarding the speed of communication remains. Hence, AAC users must develop compensatory strategies to overcome this challenge. For example, some AAC users have a written or pre-stored message to explain their condition/situation, and the time it may take for them to communicate to their communication partners.

However by nature, the communicative competence of AAC users are governed not just by the cognitive and motor processes mentioned earlier, but also psychosocial factors, such as motivation, attitude, confidence and resilience (Light, 2003) as well as environmental constraints and allowances (Light & McNaughton, 2014).

Based on this definition, the purpose of an AAC system (i.e., attainment of communicative competence) is defeated without the appropriate integration of the required knowledge and skills. Furthermore, as communication is a dynamic and reciprocal construct, the AAC user is only as proficient as the external environment allows them to be (i.e., communication partner's attitude, knowledge and skill based on the AAC system). Therefore, AAC intervention should be viewed as a multi-component approach, encompassing not just communication modality, but also effective teaching strategies to promote the development and integration of relevant proficiencies (i.e., linguistic, operational, social and strategic) to achieve communicative competence. While some AAC systems, such as the Picture Exchange Communication System (PECS), inherently comprise instructional components, others are implemented in conjunction with additional teaching strategies such as discrete trial training or naturalistic approaches.

AAC instructional strategies

To date, the majority of AAC studies in which communication skills were targeted, implemented naturalistic teaching strategies (Ganz et al., 2012; Lorah, Parnell, Whitby, & Hantula, 2015; van der Meer & Rispoli, 2010). The term 'naturalistic teaching' refers to any approach in which teaching is

embedded in naturally occurring opportunities within the learner's daily routine (Halle, 1982). Therefore, these approaches rely on intrinsic reinforcements generated by typically available items and activities within this natural environment (Paul, 2008). In the latest systematic review by Lorah et al. (2015) the majority of AAC interventions using tablet-based computing devices (i.e., iPad ®) and portable media players (i.e., iPod ®) implemented variants of prompting and prompt-fading strategies. Prompts and prompt-fading strategies seem a logical approach, especially when the attainment of the targeted behaviour is also reliant on acquiring appropriate operational skills to control (e.g., turning the device on/off, adjusting the volume) and navigate through folders to access the appropriate vocabulary. The most commonly used prompting strategies were: (a) least-to-most prompting (Achmadi et al., 2012; Couper et al., 2014; Kagohara, Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012; Sigafoos et al., 2013; Van der Meer et al., 2013); (b) graduated guidance (Achmadi et al., 2014; van der Meer et al., 2012a; van der Meer et al., 2012b; van der Meer, Sutherland, O'Reilly, Lancioni, & Sigafoos, 2012c); and (c) time or prompt delay (Achmadi et al., 2014; Kagohara et al., 2010; Lorah et al., 2013; McMillan & Renzaglia, 2014a, 2014b; van der Meer et al., 2012a; van der Meer et al., 2011; van der Meer et al., 2012c).

Video-based modelling interventions

Despite the appealing prospect of combining video-based modelling interventions with AAC techniques, the use of video modelling techniques to teach conversation skills to AAC users with ASD has rarely been investigated. There have been few investigations in which video-based interventions have been used to facilitate communication skill development for individuals with ASD and complex communication needs. These studies implemented VM procedures either exclusively or in conjunction with naturalistic teaching approaches (Banda et al., 2010; Cihak et al., 2012; Copple et al., 2015). Consistent with the majority of AAC research (Ganz et al., 2012; Ganz et al., 2014; Schlosser & Koul, 2015; van der Meer & Rispoli, 2010; Wendt, 2006), these VM studies have largely targeted requesting skills (Banda et al., 2010; Cihak et al., 2012; Copple et al., 2015). By nature,

behaviour-regulating communicative functions, such as requesting, provides a natural platform for reward or reinforcement (i.e., the learner will attain what is asked), thus making it a relatively easier skill to teach and learn (Iacono et al., 2016).

Banda et al. (2010) investigated the use of VM techniques to facilitate spontaneous requesting of three separate (preferred and non-preferred) objects using speech generating devices (SGDs). The participants included a 17-year-old male adolescent and 21-year-old adult male. The intervention involved the participants watching a 10 to 15 second video clip demonstrating an adult using an SGD to request a targeted object. Following that, the participants were assessed to determine whether they could request the same object. After a correct request was made, the participants were given the requested object. An absent or incorrect request required them to watch the video clip once more. The findings showed that VM was effective to facilitate spontaneous requesting using a SGD, for one participant. The intervention was halted for the other participant due to challenging behaviours. Neither participant demonstrated generalisation of the learnt task across stimuli, assessed at one week and three weeks post intervention.

Copple et al. (2015) systematically replicated the study by Banda et al. (2010), involving pre-school children aged between 1;8 and 3;8 years. The authors calculated the effect size for each participant using the percentage from the non-overlapping method. Their findings were mixed. VM was effective (75%) to facilitate requesting behaviours for one participant (aged 1;8 years), and was very effective (100%) for two participants (aged two and three years respectively). None of the participants demonstrated generalisation of the learnt task across stimuli, post intervention.

Cihak et al. (2012) evaluated the effectiveness of VM interventions in combination with Picture Exchange Communication System (PECS) instruction to teach independent requesting to four, three-year-old children with ASD. During the VM intervention, the participants watched three separate video clips of a peer model requesting a desired item using PECS. Subsequently, they were taught using PECS to request preferred objects. Findings demonstrated that participant acquisition increased

following the VM plus PECS instruction condition, compared to when the PECS instruction was implemented alone.

Overall, these studies showed that VM was effective to facilitate communication skills in individuals with ASD and complex communication needs, who use AAC systems. However, these studies did not focus on conversation skills deemed essential in the maintenance of longer interaction and a pre-requisite for the development of quality social relationships (MacDonald & Gillette, 1985). And only one of the studies involved adolescents (Banda et al., 2010).

Significance of the current research

The findings to date revealed a gap in the literature and a need to investigate conversation skills intervention for non-verbal individuals with ASD who use AAC systems. Adolescence is an impressionable phase, during which friendships or lack thereof, profoundly impact the social/emotional well-being of young people. The ability to participate in reciprocal conversation is a key factor to successful social interaction and friendship development. It is evident that speaking individuals with ASD face challenges engaging socially and for those without speech, these challenges are far greater. Widely held misconceptions about ASD continue to stifle social acceptance and participation of individuals with ASD in society as a whole (Robertson, 2009). The obstacles to participation, employment, relationship development and independent living for individuals with ASD and complex communication needs may place them at greater risk of ostracism, reduced employability, poor relationships and dependent living (Farley et al., 2009; Howlin et al., 2004; Marriage, Wolverton, & Marriage, 2009). As such, it is important that research moves beyond the limited scope of foundational communication functions for persons with ASD, and into the realm of reciprocal symbolic communication and conversation.

Video-based modelling interventions were deemed to be most fitting for facilitating conversation skills for this group of participants given the reported benefits and advantages. This research uses video models shown from a third-person perspective (VM and VSM), as it was considered vital for

the learner to view the whole picture, including the model using the SGD and the conversation partner. Furthermore, given that viewing oneself engaging in a positive behaviour may increase self-efficacy and diminish the need for external reinforcement (i.e., positive self-portrayal can improve self-competence) (Bandura, 1986), VSM was deemed apt, particularly for adolescents. Given that previous VM research with AAC users demonstrated the importance of providing additional prompts during interventions (Copple et al., 2015), this investigation was conducted using VM/VSM in conjunction with least-to-most prompting.

Research aim

The objectives of the current research study were to:

(a) Determine the effectiveness of VM and VSM implemented with least-to-most prompting to develop conversational skills in adolescents (aged between 10 and18) with ASD and complex communication needs.

(b) Determine the (potential) differential effects of the model type (other versus self as model) on the intervention outcome.

CHAPTER 3: PILOT STUDY

A pilot study was conducted to inform the planning and implementation of the packaged VM and VSM interventions in the main intervention studies, 1 and 2. This was undertaken as there is very little research information on implementing VM and VSM to teach conversational skills to adolescents with ASD, who have complex communication needs. The purpose of this chapter is to present the Method, results and discussions of findings for the pilot study. First, the Method will be described. Next, the results and discussion of findings, including the social validity outcomes, will be presented. Finally, the challenges and directions for the main studies will be reported.

Method

Ethics approval was obtained from three different agencies: (a) Social and Behavioural Research Ethics Committee, Flinders University, South Australia; (b) Professional Practice Committee, Autism SA, South Australia; and (c) Catholic Education South Australia.

Design

A single-case research design was used in conducting the pilot study. The rationale for using single case research design was firstly to assess the effectiveness of an intervention at an individual level, without compromising methodological rigour (Murphy & Bryan, 1980). Secondly, single case research designs offer the flexibility and capacity to combine multiple single case designs to address research questions regarding the effectiveness of specific intervention techniques (Kazdin, 2011; Kratochwill & Levin, 2014). Hence, this design was used to address the research questions of this investigation.

Alternating Treatments Design

The alternating treatments design (Barlow & Hayes, 1979) was used to study the relative strength and effect of different treatment approaches (Gast & Ledford, 2014; Kratochwill & Levin, 2014). Figure 3.1 represents an example of an alternating treatments design. As can be seen, both treatments are

introduced to the participant simultaneously. Baseline measure is not a mandatory component of the alternating treatments design (Kennedy, 2005); however, as with most single-case research designs, inclusion of a baseline phase is encouraged and was implemented in the pilot study.

A distinctive element of this design is the alternating order of intervention implementation. The order in which each intervention is applied is alternated and counter-balanced across the intervention period to ensure each intervention is implemented an equal number of times and in similar settings.

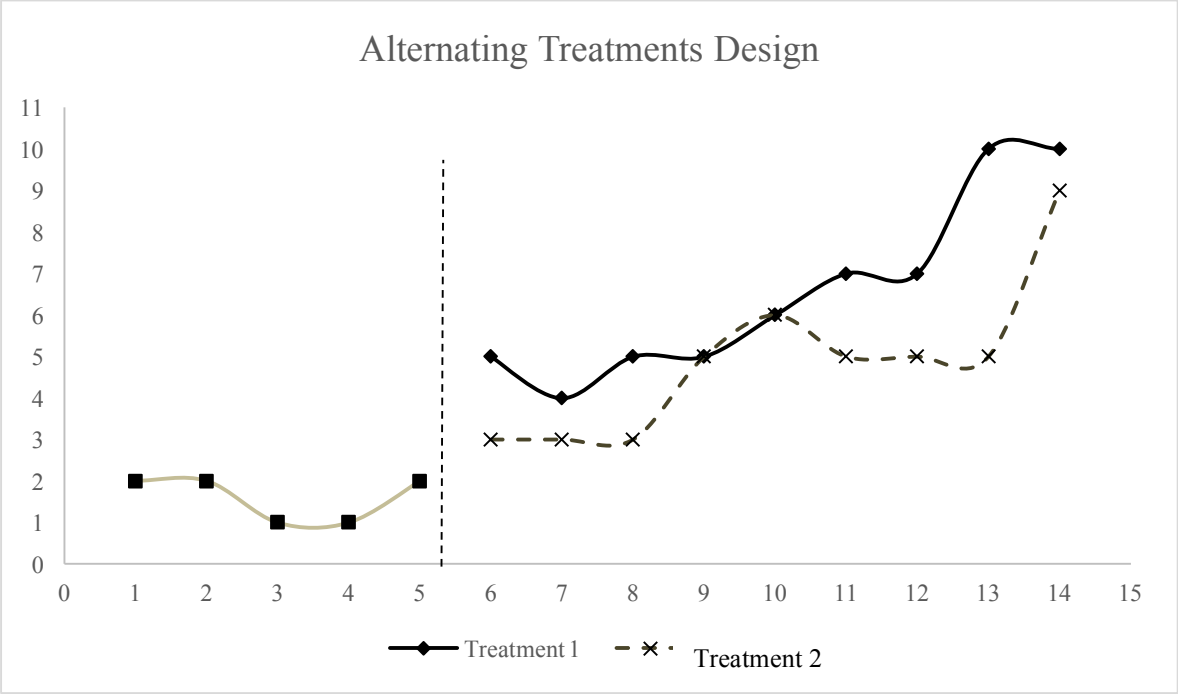

Figure 3.1. Hypothetical data for alternating treatments design

For example, on day one VM is presented before VSM, while on day two VSM is presented before VM. The presentation order is also alternated to eliminate potential practice effects or fatigue, etc. For example, if treatment 2 always precedes treatment 1, it will be difficult to conclude that the effects of treatment 2 did not influence the effect of treatment 1. This is one threat to external validity. The order of interventions could be randomly or systematically alternated. In the pilot study, the order of treatments was randomly alternated.

Participants

The participants with ASD and complex communication needs were selected based on the following

inclusion criteria: (a) aged between 10-18 years; (b) diagnosed with ASD, according to DSM-IV. (The DSM-V was released after the call for participants was advertised. Furthermore, because this study focuses on adolescents, potential participants were diagnosed using the DSM-IV.); (c) uses aided AAC system/s, preferably a SGD; (d) symbolic communicators – either context-dependent or independent as determined by their speech pathologist or teachers; (e) able to recognise and discriminate between self and others in a set of photos; (f) able to understand and follow simple instructions; (g) showing an interest in watching videos; and (h) having no objections to being filmed.

Participant recruitment

An expression of interest was advertised on the Autism SA[2] website and Facebook page. Some schools also advertised the project in their school newsletters. School teachers/principals identified potential participants that matched the inclusion criteria to be included in the study. Introduction packs containing a letter of introduction, information brochure and consent forms (Appendix 1) were given to the identified potential participants by the teachers. For participants whose native language was not English, translated brochures were sent to their families. The participant recruitment process took up to one year for all three participants.

Three participants met the eligibility criteria to participate in the pilot study. However, the third participant withdrew from the project due to challenges related to his behaviours of concern and high levels of anxiety. The second participant's data could not be accurately scored due to difficulty with his communication system, which also occasionally led to increased challenging behaviours (i.e., head-banging). At the time of the intervention, participant two had just started using the Proloquo2Go™, and he was still learning the linguistic symbols and the navigational pathways to access the appropriate vocabulary. These factors made it difficult to provide the intervention and

[2] Autism SA is a South Australian organisation that provides supports in relation to education, respite, community, early intervention and clinical sectors for individuals with autism and their significant others.

measure the performance as initially proposed.

Therefore, one participant, Nina[3] participated in the pilot study. (Her demographic information is summarised and presented in Table 3.1.)

Nina

Nina was 13 years and 4 months old. She was diagnosed with ASD when she was three and a half years old. She was of Vietnamese descent. Nina had limited spoken language, mainly one-word utterances. According to the PPVT-4 (Dunn & Dunn, 2007) assessment scores, Nina's language age was equivalent to 2;10 years. Her main communication modes were non-verbal gesturing and aided communication systems using English.

Nina used two types of aided communication systems: (a) Pragmatic Organisation of Dynamic Display (PODD) (Porter, 2007), a non-electronic communication book, and (b) Proloquo2Go™ (Sennott & Niemeijer, 2008), a speech generating application on her personal mini iPad. According to the school speech pathologist, Nina had been using the PODD for about six years before using the Proloquo2Go™. At the time of the intervention, she had been using the Proloquo2Go™ for about three years. Her Proloquo2Go™ user profile was set up as a basic vocabulary template in a 4X4 grid. The profile contained individual words, phrases and folders. While the Proloquo2Go™ was her main communication modality at the time of the intervention, she did revert to using the PODD book whenever she could not locate the appropriate vocabulary in the electronic application.

Nina did not receive individual speech pathology input during the study, but she participated in the social skills training group at her school. This group was managed by the school's speech pathologist, and up to four students participated in the group. The speech pathologist ensured that conversational turn-taking was not targeted in the social skills training group for the duration of the pilot study. From observation, Nina seemed interested in social interactions. For instance, she

[3] Pseudonym.

actively approached staff and students during recess breaks and class periods. Her topics of interests, as reported by her class teacher, were jewellery, shopping, church, magazines and food.

Setting

The intervention sessions were conducted in Nina's school meeting room, located away from the classroom. There was a round table and chairs in the room. This room was adjacent to the school reception area, which was generally a quiet space, and the door remained ajar during sessions as per the school's safety policy.

Table 3.1. Participant characteristics – Pilot study

Participants	Age	Sex	Language Age equivalence[#]	Self-recognition	AAC	Other communication characteristics
Nina[3]	13;4	F	2;10	100%	• Proloquo2Go™ in a mini iPad: Basic vocabulary, 4X4 grid • PODD	• Vocalisations • Echolalia • Gestures, such as pointing

[#] Language age derived from the age-equivalence score from Peabody Picture Vocabulary Test-4 (PPVT-4) (Dunn &Dunn, 2007) (Form B).
[3] Pseudonym.

Materials

Materials used in this study included:

(a) Assessments

- Self-recognition assessment using photos
- Receptive language assessment: Peabody Picture Vocabulary Test-4 (PPVT-4) (Dunn & Dunn, 2007)

(b) Conversation topics and scripts presented in video vignettes of exemplary interactions for each topic.

(c) Video camera: Sony HDR-C240

(d) Video editing software: Sony Play Memories©

(e) iPad retina display for playing the video-model clips to the participants during the intervention

Assessments

Self-recognition

There are no established assessments available to measure self-recognition. Hence, photographs were used to determine the participants' ability to recognise and discriminate self from others. This was an important assessment to permit the comparison between VSM and VM. If there was no self-recognition or ability to discriminate self from others in the video clips, VSM would have become VM.

Photographs of all other students in the class were used as distractors to assess Nina's self-recognition. There were eight students in her class. She was requested to identify and choose her photograph from the collection of photos and place it next to her name on the SMART Board. This assessment was conducted twice, on two separate days.

Receptive language: Peabody Picture Vocabulary Test-4

The Peabody Picture Vocabulary Test-4 (PPVT-4) (Dunn & Dunn, 2007) was used to assess the participants' receptive vocabulary repertoire and their ability to follow basic instructions (i.e., point to the…). This assessment was selected because non-verbal responses were required from participants. This was deemed important given that all participants in this study were functionally non-verbal. (see Table 3.1 for the PPVT scores for Nina.)

Video vignettes of exemplary interaction

The intervention involved training four scripted conversations. The scripts comprised of two topics. Each topic had two videos: one for VSM and one for VM. The VSM clips involved the participant as the primary model, and the VM clips involved the gender and age-matched peer as the primary model. The main researcher acted as the communication partner in all the video clips.

The final video clips for VSM and VM were produced with all prompts and cues provided during recording removed. The final product showed a smooth interaction between the communication partner and the participant (VSM) or the peer (VM). Each video clip was between five to six seconds long.

Peers

One peer matched for age and gender represented the model in the VM clips. The peer was a thirteen-year-old, neurotypical Caucasian female who used a speech-generating app on an iPad for communication in the video clips.

Conversation scripts

For the purpose of this research, conversation was defined as a to-and-fro dialogue pattern between the researcher and the participant. This included initiating a topic by asking a question, responding to the preceding question, asking a follow-up question in line with the topic and responding to the

preceding question (see Figure 3.2).

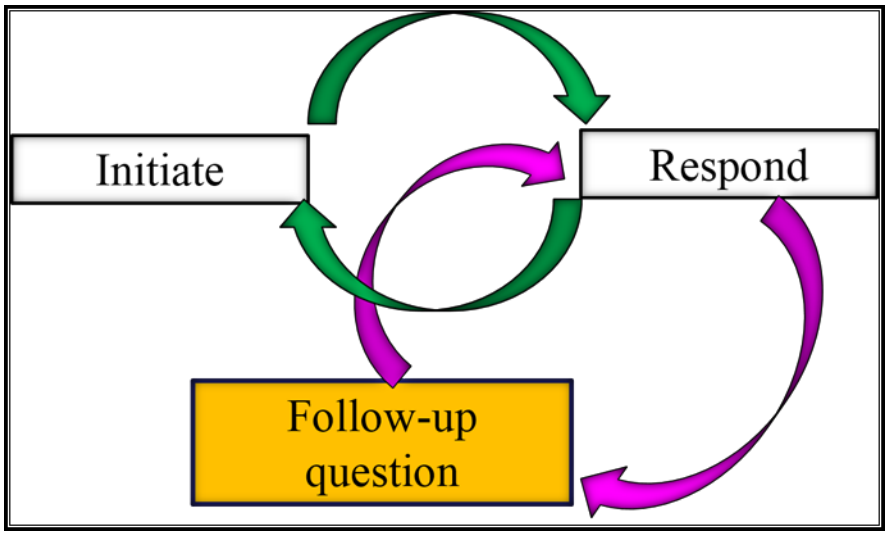

Figure 3.2. Dynamic and reciprocal nature of conversational interaction.

This definition of conversation was formulated on the basis of its description from various sources. For example, the DSM-IV-TR defined reciprocal conversation as the ability to initiate and sustain interaction (American Psychiatric Association, 2000). The DSM-V states that interaction is sustained through the process of turn-taking, rephrasing the message when misunderstood, and knowing how to use verbal and non-verbal cues to regulate interaction (American Psychiatric Association, 2013). Additionally, conversation is also described as a social-based joint activity that has clear beginnings and transitions from one speaker to the next, based on predetermined and continually changing goals (Clark, 2001).

In other words, conversational interaction can be described as encompassing two or more communication partners engaging in a back-and-forth communicative interaction. The interaction commences when one of the communicators initiates a topic, by posing either a question or statement or comment. The partner subsequently responds to the preceding comment, statement or question. Then, he/she may either initiate a different topic or ask a follow-up question to maintain the topic at hand. In this investigation, particular emphasis was given to "asking a follow-up question" (Figure

3.2), as this was documented to be a general difficulty amongst individuals with ASD (American Psychiatric Association, 2013; Chin & Bernard-Opitz, 2000).

The topics of conversation were selected based on Nina's interest, as reported by her teacher. Her preferred topics were food and colours. Four pre-developed scripts were used for training during the intervention, and one additional script was used for generalisation. There were no video models available for the generalisation scripts. Each script comprised three parts including (a) greetings, (b) polar questions (i.e., questions that require a yes or no answer) and answers, and (c) direct "what" questions and answers. The generalisation scripts were holidays. The position of the polar and direct questions was altered between the scripts. Half the scripts had the polar question first, and the direct question after, and the pattern was reversed for the others. Table 3.2 shows an example of format and script used in training. In this example, the polar question appears before the direct question.

Table 3.2. Example of conversation format and script

Communicator	**Script format**	**Example script**
P	Greeting	Hello
CP	Greeting	Hello
CP	Polar question	Do you like to eat snacks?
P	Yes/No (Answer)	Yes/No
P	Repeat polar question (Turn)	Do you like to eat snacks?
CP	Yes/No	Yes/No
CP	Direct "What" question	What snacks do you like?
P	(Answer).	Pizza
P	Repeat "What" question (Turn)	What snacks do you like?
CP	Answer	Cake

P = participant; CP = communication partner

Measures

Independent variable

The independent variable was the type of packaged video-based modelling intervention: (a) VSM with prompts; and (b) VM with prompts. The prompts were presented in a least-to-most hierarchy.

Least-to-most prompts

Six levels of prompts were used in a least-to-most hierarchy to elicit turns during the intervention sessions in this investigation. The least-to-most response prompting procedure was used because: (a) previous VM research that involved AAC users with ASD found prompts to further facilitate learning via video instruction (Copple et al., 2015); (b) the system of least prompts offers opportunities for the learner/participant to independently respond before more intrusive prompts are provided (Collins, 2012); (c) it is a systematic method for fading prompts and promoting independent performance for many learners with ASD (Libby, Weiss, Bancroft, & Ahearn, 2008; MacDuff et al., 2001); and (d) it produces more rapid skill acquisition than most-to-least prompts (where most intrusive prompts are offered, with or without opportunity for independent response) (Libby et al., 2008; MacDuff et al., 2001).

In this investigation, the participant was offered a brief, 5 to 10 seconds to independently respond. If he/she failed to respond or offered an erroneous response, the researcher provided further instruction in a least-to-most fashion, that is, offering the least intrusive prompts first (e.g., repetition of question or verbal prompt), before proceeding to more intrusive prompts (e.g., modelling or physical prompts). Each level of prompt was provided after 5 to 10 seconds latency. The hierarchy included independent answers or turns (I), repetition of questions (R), verbal (V), navigation (N), gestural (G), modelling (M) and physical (P). (The operationalised definitions for each type of prompt are presented in Table 3.3.)

VSM with prompts

The participants watched videos of themselves demonstrating the targeted behaviour in the VSM

intervention (i.e., taking-turns during the conversational interaction between the communication partner (primary researcher) and self). Following that, the participant and the researcher engaged in the script that was watched previously. As mentioned before, the prompts were provided in a least-to-most hierarchy to elicit targeted behaviour as required.

VM with prompts

In the VM interventions, the participants watched videos of a peer demonstrating the targeted behaviour (i.e., taking-turns during the conversational interaction between the communication partner (primary researcher) and actor (peer). Following that, the participant and the researcher engaged in the script watched previously. Prompts were provided in a least-to-most hierarchy to elicit targeted behaviour.

Table 3.3. Operationalised definitions and scores for the levels of prompts

Level of prompts	Score	Operationalise definition
F (Full score, unprompted)	6	Full score is given for an independent, unprompted response. An unprompted response is one that is appropriate to the preceding question or an appropriate turn. For studies 1 and 2, a full score is given even if the turn is interchanged, (e.g., “What’s yours?” instead of “What about you?” or vice versa).
R (Repetition of questions)	5	Repetition of question score is given when the question is repeated verbatim or with minimal variation, (i.e., “What do you do on the weekends?” vs. “What do you like to do on the weekends?”)
V (Verbal)	4	Verbal prompt score is given when the participant is prompted only verbally either by reinforcing the question or request. (i.e., If the participant didn't take his/her turn, he or she might be verbally prompted by saying "it is your turn" OR" whose turn is it?”).
N (Navigation)	3	Navigation prompt score is given when the participant is verbally provided with the navigational pathway to access the required symbol. (i.e., "Go to GRID" OR "Go to CHAT").
G (Gestural)	2	Gestural prompt score is given when any gestural indication is provided for the participant to access the AAC system or symbol. (i.e., pointing to the location of the folder, etc.). If CP points to the actual final answer or response or symbol, this should be considered as a modelling prompt.
M (Modelling)	1	Modelling prompt score is given when CP either models the pathway or answer, OR when CP points directly at the final answer/response/turn/symbol for the participant to access.
P (Physical)	0	Physical prompt score is given when CP physically moves participant’s hand/finger to activate the appropriate symbol

Dependent variable

Dependent variables were measured using (a) percentage of independent conversational interaction, (b) percentage of prompted conversational interaction, and (c) type and number of prompts required. Conversational interaction follows the pattern in the conversation script (i.e., answering a question and asking a follow-up question). (The operationalised definitions for the targeted behaviours within the conversation script are presented in Table 3.4.). The performance was based on scores provided for prompt levels in the hierarchy needed to elicit a correct response. These raw scores were converted to the percentage of scripted conversational interaction (see Data Analysis for calculation method). Greetings were not included in the scoring.

Table 3.4. Operationalised definitions for components within the conversation script

Targeted behaviours/measures	Operationalised definitions
Scripted conversation	Pre-developed conversation script used in the video clips. The scripts involved the communication partner (researcher) initiating a topic by asking a question. The participant responds to that question and reciprocates by asking a turn-question.
Answer	An answer to a question was defined as a statement or word that is pertinent to the preceding question. Communication behaviours that may represent answering include one-word utterances (e.g., banana), statement (e.g., I like…) and gestural (pointing, showing, etc.).
Turn	A turn was defined as a statement or word that is contingent upon the topic of conversation, but not a response to the question posed immediately before the new utterance. This may include the scripted question, or an unscripted utterance, statement or question sensible to reciprocating the interaction.
No	No response is given.

Procedure

Production of video clips

The video clips for VM and VSM were recorded and developed well before the start of the baseline phase. This was to ensure that any acquisition effect resulting from the instructions and prompts during the VSM taping session was assessed at baseline. The video clips were uploaded on an iPad for viewing by the participant during the intervention sessions. (see Table 3.2 for an example of conversational interactions between the actors.)

Production of the VM clips

The VM clip involved the peer and the researcher. Ahead of the recording, the researcher instructed the peer on how to use the communication app to express their responses. The peer model's answers and turns were pre-stored in the communication app. The researcher and the peer model also rehearsed the sequence of interaction before the recording. The sequence of the conversational interaction was as follows: (a) the researcher asking a question; (b) the peer model responding; followed by (c) the peer model reciprocating with a turn question; and finally (d) the researcher responding. This sequence was recapped for both VM training scripts. The video clips were recorded in a quiet room in the peer participant's home.

Production of the VSM clips

The VSM clip involved the participant and the researcher. The feedforward method for VSM was used in this investigation. The researcher prompted the participant to navigate and locate the answers as well as the turns for the interaction. The instructions used during the video recording were navigational and gestural prompts. For navigational prompts, the participant was verbally directed to the appropriate folders or categories (e.g., "Go to HOME PAGE, go to CHAT, etc."). Gestural prompts were used to point at the preferred folder/category or symbol, (e.g., "Press this"). These prompts were later edited out, resulting in a scene of the researcher and the participant engaging in a continuous conversational interaction. The sequence of the interaction followed the same pattern as

the VM clips, but with different scripts. (Table 3.2 shows an example of the conversational interaction between the actors.) The process was repeated for both VSM training scripts. The video clips were recorded in the same room as the intervention. Overall, each VSM clip took between one to 1.5 hours to record, edit and produce.

Video-based modelling interventions

Every session was videotaped. The video camera was positioned on a tripod in the corner of the room.

Baseline

During the baseline condition, Nina did not watch the developed video clips. After five consecutive baseline measures, Nina progressed to the intervention phase. Nina was not prompted for interaction in the baseline phase. If she did not respond, the researcher moved on to the next component of the script. The performance was scored based on the percentage of independent conversational interactions.

Intervention

Nina was shown each video, one at a time during the intervention. Immediately after watching the video clips, she was required to engage in the same interaction with the researcher. Prompts were provided in a least-to-most fashion to elicit the answers and turns. The scoring was based on (a) prompted answers and turns, and (b) the level of prompt. A short break was offered before presenting the next video clip. In each intervention session, Nina watched four videos (two different scripts for VM and for VSM). The performance score was based on the percentage of independent and prompted conversational interactions and the type and number of prompts required per session. Intervention sessions were conducted up to three times per week, with a total of nine sessions.

Generalisation

Generalisation was assessed in both the baseline and intervention phases. Nina and the conversation

partner (researcher) engaged in four separate, untrained conversational scripts without the preceding VSM or VM vignettes. The pre-developed scripts followed the same pattern as the trained conversations (VM or VSM) but addressed different topics. Prompts were again provided on the basis of a least-to-most hierarchy to elicit interaction. Generalisation was assessed using the scripts without the video models.

Maintenance

Maintenance was assessed two weeks following the cessation of the intervention. The participant did not watch any videos during this phase. Similar to baseline, only independent responses were scored.

Social validity

The purpose of intervention research is also to ensure that the changes in the targeted behaviour, as a result of the intervention, have made a qualitative difference to the lives of the participants and their significant others (Kazdin, 1977; Kratochwill & Levin, 2014). Hence, all intervention research should comprise a social validity check to determine the applicability, practicality and social benefits of the proposed intervention and the resulting changes in the targeted behaviour, to the participants and their significant others.

In accordance with the social evaluation method (Kazdin, 1977, 2011), pre- and post-intervention video clips of the participant and the researcher interacting were shown to the participant's teacher to obtain information about identifiable changes in the participant's conversational behaviours. The teacher completed a questionnaire to rate the frequency and quality of conversational interaction on a 5-point scale, ranging from 1 = Never; to 5 = Always/Fluently, after watching 10 to 15-minute video clips. The clips were selected randomly, one baseline, two intervention and the final maintenance sessions. Intervention components, including the video instruction and the prompting strategy, were edited out of the video clips before presenting it to the teachers. This ensured that the teachers would not be aware of which session was pre-, peri- and post-intervention.

The eight questions were about the teacher's perception about the participant's interaction and communication mode during the viewed sessions in the video clips. At the end of the questionnaire, there was provision for the teachers to provide additional comments regarding the benefits and challenges they encountered post-intervention (outside the intervention sessions). (See Appendix 2 for the social validity questionnaire.)

For the pilot study, Nina's class teacher completed the social validity questionnaires. The social validity evaluation for the pilot study was conducted two-months' post intervention, due to school holidays.

Data analysis and scoring

Each baseline and intervention session was video-recorded. Interactions were scored based on the specified score for each operationalised prompt, as outlined in Table 3.3. (The scoring protocol is attached in Appendix 3.) Raw scores were then converted to percentage scores and graphed. In the pilot study, each script comprised two answers and two turns. Each independent response (either an answer or a turn) was given a full score (6 points), totalling a maximum score of 24 points per script. Hence, the percentage of prompted score per script (Y) was calculated by dividing the total raw score (x) by the maximum score (24 points) and multiplied by 100%.

$$\mathbf{Y = (x/24)\ X\ 100\%}$$

For example, if the participant demonstrated two independent responses (answer or turn) and two prompted responses (one navigation and one verbal prompt), he/she would receive 6 points per independent response, 3 points for the navigation prompt and 4 points for the verbal prompt. Therefore, the total raw score (x) will be 6+6+3+4 = 19. Thus,

$$\mathbf{Y = (19/24)\ X\ 100\% = 79.2\%}$$

The average prompted score for each intervention (Z) is calculated by adding the individual percentage of prompted scores for each script used in the same type of intervention (VM or VSM),

divided by two.

$$Z = (Y_1 + Y_2)/2$$

For baseline and maintenance sessions, only independent performances were scored and graphed. Therefore, the raw score per scripts could either be 24 points (maximum, all answers and turns were performed independently = 100%), 6 points (one independent answer or turn = 25%), 12 points (two independent answers, or one independent answer and one independent turn, or two independent turns = 50%) or zero (no independent answer or turn= 0%).

Data were analysed by visual inspection to assess changes in performance across the phases, changes in the level of performance and/or changes in the trend. The robust improvement rate difference (R-IRD) (Parker et al., 2009) was used to calculate the effect size.

Improvement Rate Difference (IRD)

Improvement Rate Difference (IRD) is based on the "risk difference" model (Altman, 1998), which is primarily used in evidence-based medical research. IRD is defined as the difference between the improvement rates (IR) in the baseline versus the treatment phases (Parker et al., 2009). IR is calculated as the division of "improved points" over total points within a particular phase (Parker et al., 2009). At baseline, improved points are those that overlap or exceed any data point in the intervention phase. Improved points in the intervention phase are those that exceed all points in the baseline phase (i.e., the points that do not overlap) (Parker et al., 2009).

$$IRD = IRIx - IRB$$

$$IR = (\#\ \text{improved points}/\ \text{total points})$$

This non-overlap method possesses many advantages: (a) easily calculated by hand; (b) complements visual analysis; (c) correlations with established effect sizes like Phi, Pearson's R and Kappa; (d) specified confidence intervals; and (e) being established in evidence-based medical research (Parker et al., 2009).

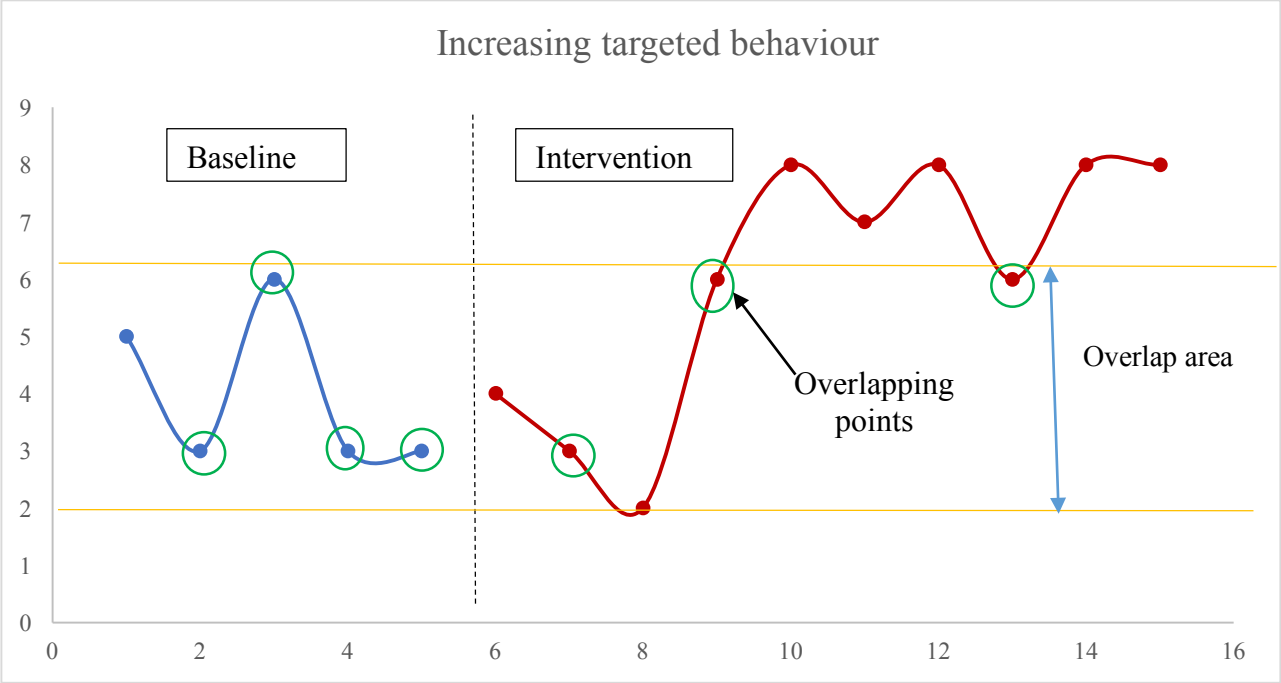

Figure 3.3. Example of IRD calculation

Figure 3.3 is an example of how to calculate IRD. The area between the yellow lines represents the overlapping area, that is, the highest point in the baseline and the lowest point in the intervention (for intervention that targets to increase behaviours). The circled points denote the overlapping points. The overlapping points are first visually eliminated to provide complete data separation. To avoid unnecessary elimination and data wastage in the IRD method, minimal data elimination is conducted. This means that instead of removing all the overlapping points, only adequate points are removed from both or either phases to demonstrate absolute non-overlap.

A minimum of four data points need to be removed for complete data separation in Figure 3.3. This is done by visually eliminating (a) two points from baseline (values 5 and 6) and two points from

intervention (values 3 and 4) on the y axis; or (b) four points from baseline; or (c) four points from intervention. Once a decision is made about which points to eliminate, a line is drawn across the phases to create quadrants, as shown in Figure 3.4. For the purpose of the current example, this line will be referred to as the quadrant line. The purpose of the quadrant line is to distinguish between the "improved" points in the baseline and intervention phases. For example, if option (a) is selected (i.e., one point from baseline (value 6) and one point from intervention (value 3), then the quadrant line will be drawn as shown in Figure 3.4.

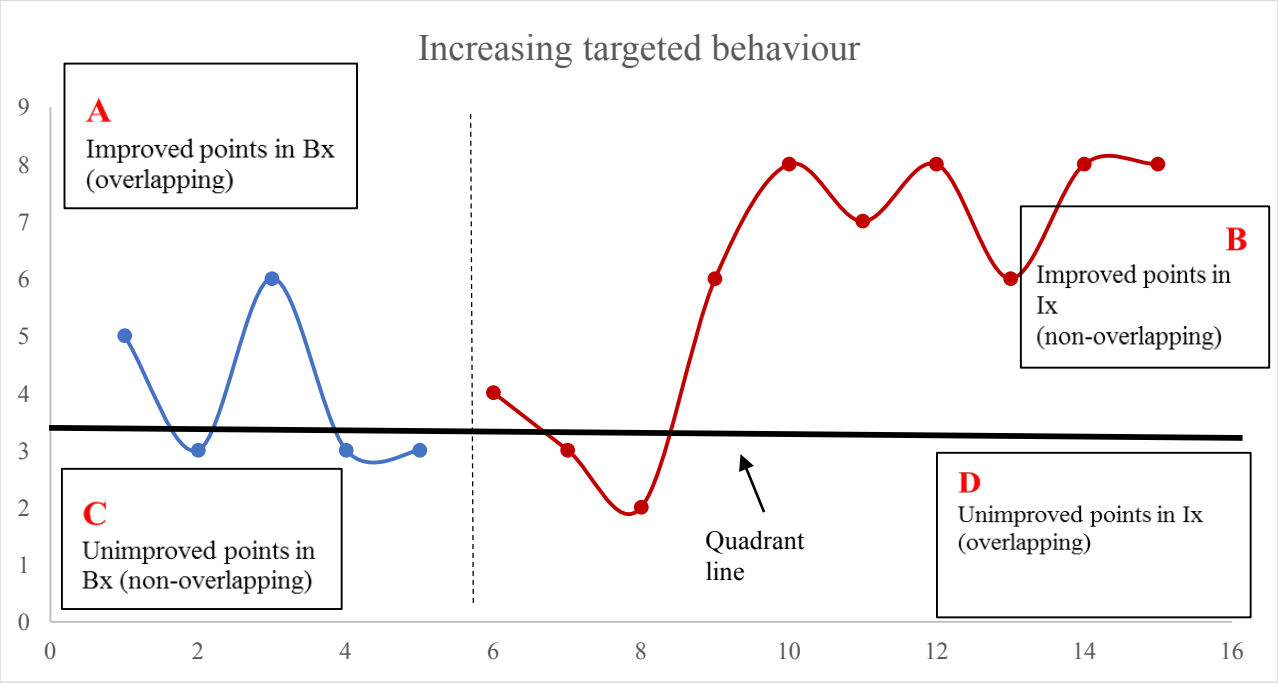

Figure 3.4. Quadrant line and IRD calculations

All points above the quadrant line are regarded as improved points across both phases. Here, the improved points are two points at baseline (A) and eight points in intervention (B). To the contrary, all points below the quadrant line are considered unimproved: three points at baseline (C) and two points in intervention (D). Regarding the example in Figure 3.4, the IRD equates to (IRIx – IRB) = [B/(B+D)-A/(A+C)] = [8/(8+2) – 2/(2+3)] = 0.4. If option (b) was selected (i.e., four points from baseline), then the IRD will be (5/10 – 0/5) = 0.5. If option (c) (i.e., four points from intervention) is

selected, then the IRD will be (5/10 – 0/5) = 0.5.

It is important to note that these descriptions are relevant only for interventions that aim to increase targeted behaviour, because for interventions that focus on reducing targeted behaviour, the procedure is reversed (i.e., baseline points below the quadrants are improved, and those above are unimproved).

Robust-Improvement Rate Difference (R-IRD)

The variability in the effect size estimates might sometimes give rise to ambiguity depending on which points are eliminated. Such ambiguity can be reduced by using the R-IRD method. Furthermore, the R-IRD is compatible to the robust Phi and Cohen's Kappa (Parker, Vannest, Davis, & Sauber, 2011), making it an improved estimate of the intervention effect. The calculation formula for R-IRD is the same as that for IRD (i.e., IRIx – IRB). However, one additional step is involved: The overlapping points from both phases, baseline and intervention (i.e., quadrants A and D), are equalised. By doing so, an equal number of points from each phase are "removed". Subsequently, the values of quadrants C and B must be adjusted to ensure that the total number of points in each phase remains the same. This means, C = $N_{Baseline}$ - A (=D); and B = $N_{Intervention}$ – D (=A) value. Given that complete separation of the data can be obtained by eliminating a minimum of four data points in Figure 3.4, two points are respectively distributed between the "overlapping" quadrants for both phases, (i.e., quadrants A and D). Thus, R-IRD = [B/(B+D) – A/(A+C)] = 8/(8+2) – 2/(2+3)] = (8/10 – 2/5) = 0.4.

A=D	B = (nIx – D)
C =(nBx – A)	D=A

Figure 3.5. Representation of the R-IRD calculation in a quadrant format

In summary, the steps for calculating IRD and R-IRD are as follows:

- Identify and determine the degree of overlap between phases. This is done by identifying the extreme points in both phases.
- Determine the minimum number of overlapping points that need to be (visually) eliminated for complete data separation. Points are not actually removed. They are only visually eliminated for calculation purposes (Vannest & Ninci, 2015).
- For R-IRD, the number of overlapping points to be eliminated is equally distributed between baseline and intervention phases.
- The proportion of improvement is calculated as follows:
    - Improvement rate for baseline (IRB) = (# overlap/ total points)
    - Improvement rate for intervention (IRIx)= [(Total points - #overlap)/ Total points]

IRD = IRIx – IRB

IRD/R-IRD scores range from -1.0 to 1.0. An IRD score of 1.0 means maximum improvement from baseline to intervention, whereby no points in the baseline and intervention phases overlapped. There is no established standard for IRD/R-IRD however the tentative benchmark is set as follows (Parker et al., 2009):

- IRD/R-IRD below 0.5 shows that the intervention was ineffective or has questionable

effectiveness;

- IRD/R-IRD between 0.51 and 0.70 demonstrates moderate effect;
- IRD/R-IRD above 0.71 shows large effect; and
- IRD/R-IRD above 0.75 demonstrates very large effect.

IRD/R-IRD of 0.5 means chance level (50/50) of effectiveness (Parker et al., 2009). However, IRD/R-IRD correlates with the established Pearson's R, and by that computation, IRD/R-IRD = 0.50 is a moderate effect (R= 0,30) and IRD/R-IRD = 0.60 is a large effect (R = 0.50) (Parker et al., 2009; Vannest & Ninci, 2015). Negative IRD/R-IRD scores indicate non-improvement in the intervention compared to the baseline phase (Vannest & Ninci, 2015).

IRD/R-IRD should also be reported in conjunction with their confidence intervals (CIs). A small CI shows more precision, hence demonstrating better reliability of the IRD/R-IRD than in the case of a larger CI (Parker et al., 2009). An adjusted CI of 87.89% (Payton, Miller, & Raun, 2000) was used to evaluate the statistical significance of the findings. Although typically CIs of 95% or 90% are used in research, studies have shown that these may produce conservative results. The upper and lower parameters for a 95% CI will be too wide, indicating less confidence. Furthermore, the comparison of CI shows that for a sample n=5, an 87.89% confidence interval corresponds with p = 0.05 (statistical significance for CI=95%) (Payton et al., 2000; Schenker & Gentleman, 2001).

One main limitation of IRD/R-IRD is that it does not capture the trend or drift in performance. Furthermore, the number of data points in the intervention phase compromises the IRD/R-IRD estimate. This means that if there are more data points in intervention, and there is more overlap between the phases, the IRD/R-IRD likely yields a negative estimate. Hence, any negative value does not necessarily indicate regression. Despite this, IRD/R-IRD still stands out as a more robust non-overlap effect size measure for single-case research designs.

Results and discussion

The overall findings demonstrated that both VM and VSM were effective to facilitate conversational skill for Nina, when implemented with additional prompts. The additional prompts were necessary to elicit answers and turns from Nina. Figure 3.6 displays the percentage of prompted conversation turn-taking following the packaged VM versus VSM interventions (i.e., including prompts).

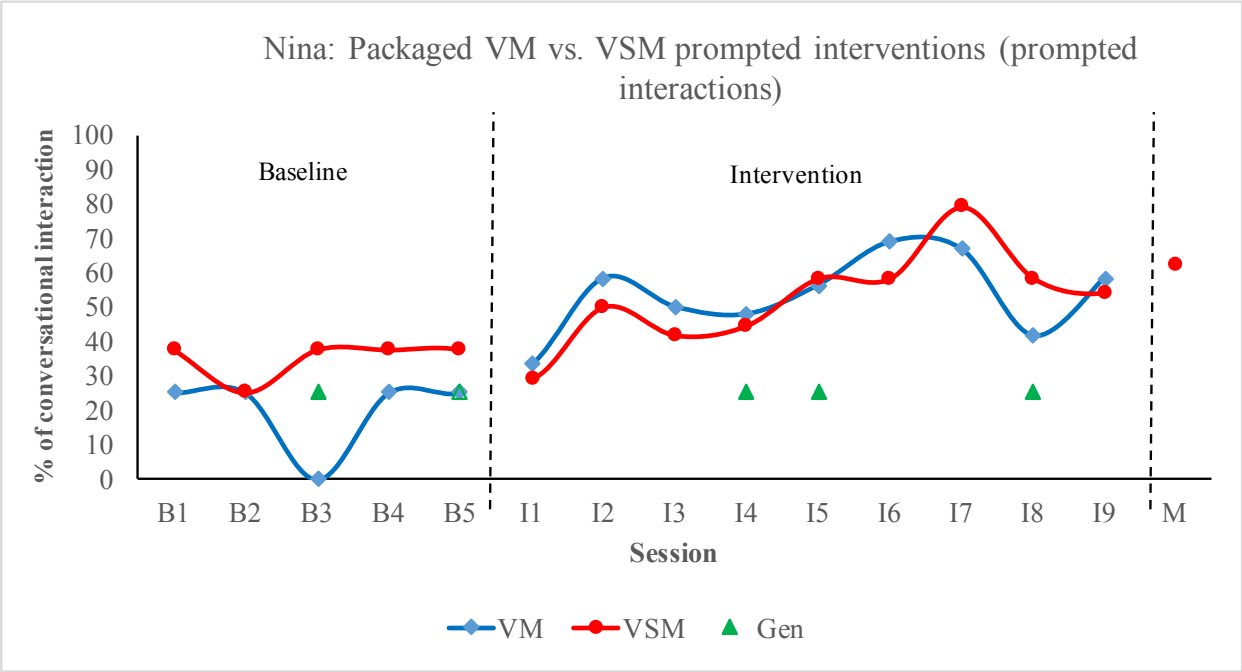

Figure 3.6. Average percentage of prompted conversation interaction for Nina

Nina demonstrated positive effects for both intervention packages, as shown in Figure 3.6. The R-IRD indicated that the treatment was highly effective for Nina. Table 3.5 displays the effect size scores, and the upper and lower parameters for the adjusted confidence intervals at 87.89% (Payton et al., 2000) for Nina. Figure 3.6 shows there was a 33.5% change in the means across the phases for VM (M_B =20%; M_I =53.5%); and a 17.6% change in means across the phases for VSM (M_B = 35%; M_I =52.6%).

Table 3.5. R-IRD scores for Nina's performance based on packaged VM and VSM interventions

Intervention	***p***	**R-IRD**	**CI (87.89%)**
Packaged VM	0.00	1.00	[0.46, 1.00]
Packaged VSM	0.00	0.84	[0.28, 1.00]

Video modelling (VM)

Overall, the packaged VM intervention showed large treatment effect sizes regarding Nina's performance: IRD = 1.00 [0.46, 1.00]. There was no overlap between Nina's performance at baseline and intervention (see Figure 3.6), and the results were statistically significant ($p = 0.00$). Nina did not demonstrate any turn-taking ability during the baseline. She responded consistently at an average of 25% for independently answering questions during the baseline phase, except for a lower performance during the third baseline measure. The application of the packaged VM intervention showed an overall upward trend, with Nina's performance reaching its peak in the final session at an average of 68.8% of prompted conversational interaction. Maintenance could not be assessed for the VM topics due to high levels of anxiety and preoccupation on Nina's part. Figure 3.7 displays Nina's performance in each script using the VM technique.

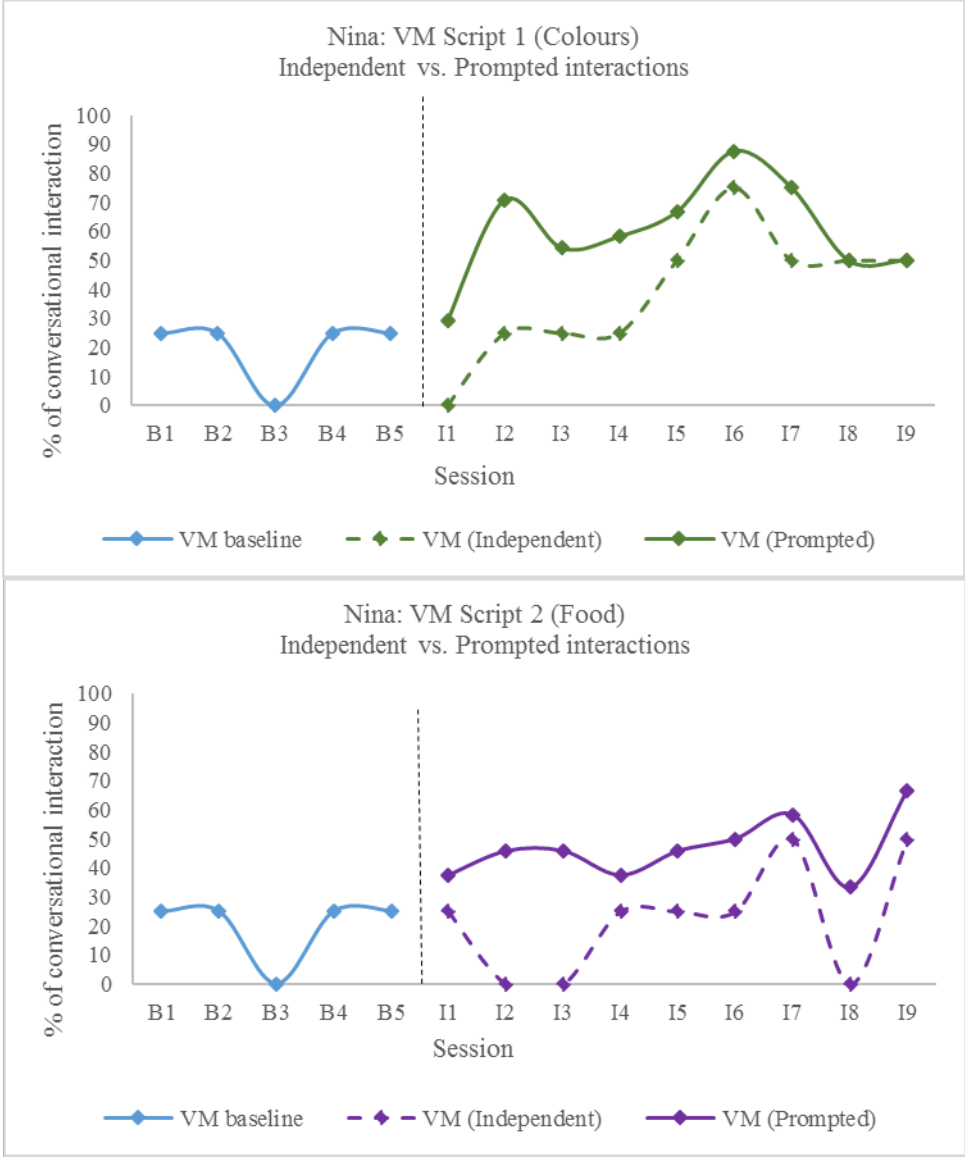

Figure 3.7. Comparison of Nina's independent versus prompted conversational interactions following VM interventions

Two scripts were trained using the packaged VM intervention. The R-IRD for individual scripts is detailed in Table 3.6.

Table 3.6. R-IRD scores for Nina's performance following the VM intervention

	Script 1		Script 2	
	Independent	Prompted	Independent	Prompted
p	0.27	0.00	0.58	0.00
R-IRD	0.38	1.00	-0.09	1.00
CI (87.89%)	[-0.17, 0.80]	[0.46, 1.00]	[-0.47,0.45]	[0.46, 1.00]

VM Script 1

Independent performance

Overall, there was an upward trend in Nina's independent performance for script 1 (colours). The R-IRD estimates for Nina's independent performance in script 1 showed lower treatment effects, indicating high levels of data overlap between baseline and intervention phases. While there was an initial decrease in independent performance following the introduction of the intervention for script 1, her performance gradually increased and reached its peak at 75% of independent conversational interactions in sessions I6. Nina's performance for target behaviour declined to 50% in session I7 and she maintained this level of performance until the end of the intervention period.

Prompted performance

Additional prompts boosted her overall performance, resulting in complete data separation between baseline and intervention phases (i.e., R-IRD =1.00 [0.46, 1.00]). As expected, there was an immediate treatment effect following the introduction of the prompts. Overall, her performance followed a gradual upward trend until session I8. Nina's performance in scripted conversation however decreased in the last session (I9), during which she continued to engage in other, off-script conversational interactions. For instance, after responding to the first question about "What colour do you like?" she continued to ask about every colour in the colour folder in her device. Following that, she started to point to different things and describe the colour properties, which then led to talking about other objects that interested her like clothes and jewellery.

VM Script 2

Independent conversational interaction

No distinct trend was observed for Nina's independent performance in script 2. The R-IRD estimates for Nina's independent performance showed no treatment effects, indicating high levels of data overlap between baseline and intervention phases. Her independent performance stabilised and slightly increased for a short period from sessions I4 to I7 before decreasing in session I8. In that session Nina required more prompts to shift her focus back on task, as she was highly distracted and

preoccupied with the previous topic and question. Her performance increased again in the final session (I9).

Prompted conversational interaction

Additional prompts also boosted her overall performance in script 2, illustrated by the complete data separation observed between the two phases (i.e., R-IRD =1.00 [0.46, 1.00]). There was an immediate treatment effect following the introduction of the packaged intervention (VM plus prompts). Overall, her performance followed a general upward trend, except in session I8. As explained above, the reason for this decrease in performance was because she was highly distracted and preoccupied with the previous topic or question.

Video self-modelling (VSM)

Overall, the packaged VSM interventions yielded large effects on Nina's performance: IRD = 0.84 [0.28, 1.00]. There was one data-point overlap between her performance at baseline and intervention (see Figure 3.6). The results were statistically significant (p = 0.00). Nina did not demonstrate any independent turn-taking abilities at baseline, but provided answers to some or all questions independently, as seen in Figure 3.8. She responded consistently at an average of 37.5% (for independent answers) in the baseline phase with a small decrease in the B2 session. The application of the packaged VSM intervention showed an overall upward trend, with Nina's performance reaching its peak in session I7 at an average of 68.8% for prompted conversational interaction. She maintained the learnt skill two weeks post-intervention. (Figure 3.8 displays Nina's performance in each script using the VSM technique.)

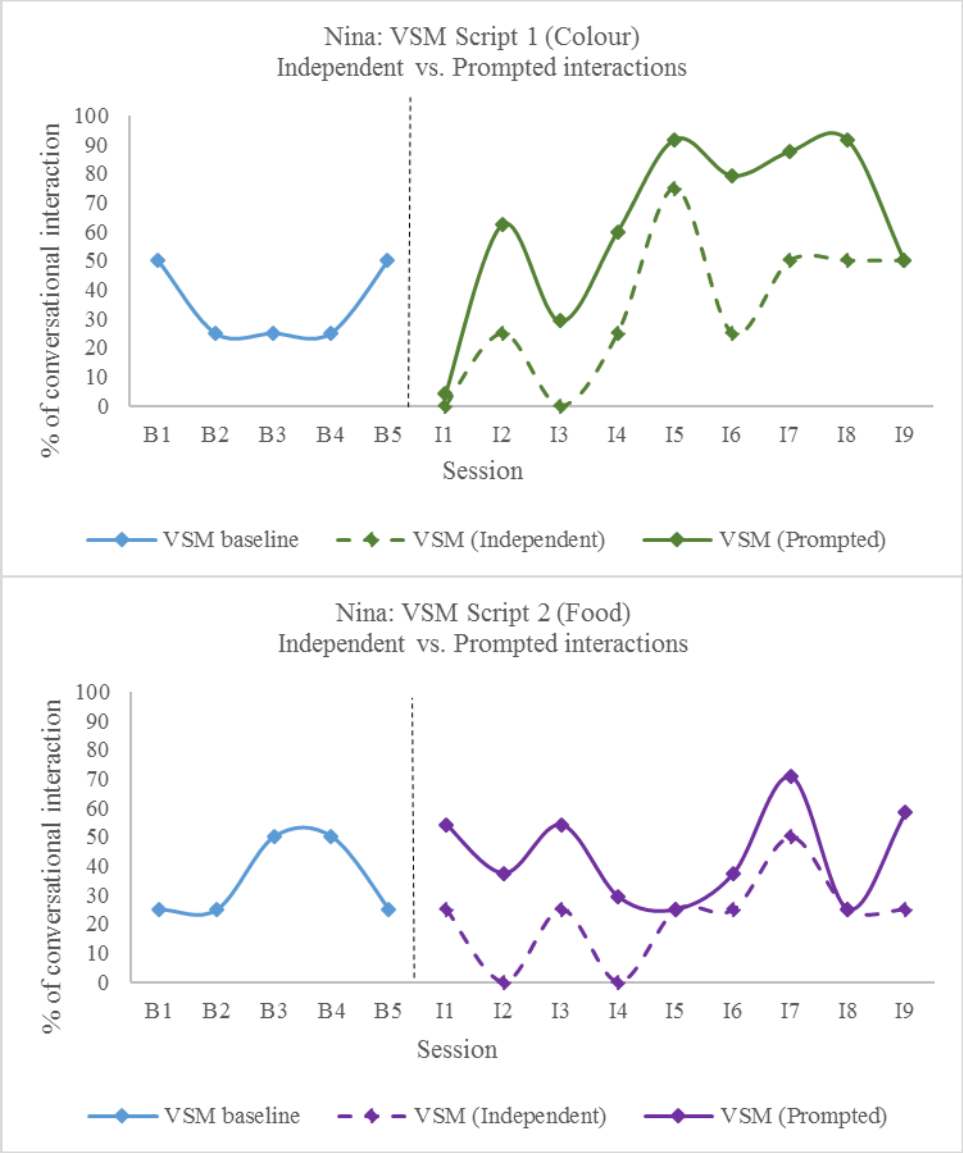

Figure 3.8. Comparison of Nina's independent versus prompted conversational interactions following the VSM intervention

Two scripts were trained using the packaged VSM intervention. The R-IRD for the individual scripts is detailed in Table 3.7.

Table 3.7. R-IRD scores for Nina's performance following the VSM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	0.58	0.09	0.58	0.27
R-IRD	-0.24	0.53	-0.09	0.38
CI (87.89%)	[0.53, 0.32]	[-0.03, 0.89]	[-0.47, 0.45]	[-0.17, 0.80]

VSM Script 1

Independent conversational interaction

Overall, there was an upward trend in Nina's independent and prompted performance for script 1 (colours). The R-IRD estimates Nina's independent performance showed no treatment effects. While there was an initial decrease in independent performance following the introduction of the intervention for script 1, her performance gradually increased and reached its peak at 75% of independent conversational interactions in session I5. Nina's performance decreased to 25% in session I6 but increased and stabilised at 50% from sessions I7 to I9. The decrease in session I6 was a result of topic preoccupation, and her difficulty shifting focus in the absence of additional prompts.

Prompted conversational interaction

Although the additional prompts promoted higher performance, the overall treatment effect was still small. There was a decrease in performance following the introduction of intervention. Upon watching the first video model, Nina became preoccupied with the topic and had challenges in transferring to the following questions. The additional prompts were not as useful in shifting her focus. Overall, her performance followed a general upward trend until session I5 and then decreased slightly in session I6, before increasing and peaking in session I8. Her performance in the scripted conversation declined in the final intervention session (I9). However, this happened because she was engaging in off-script interactions. Most of these interactions involved her asking on-topic (off-script) and off-topic questions.

VSM Script 2

Independent conversational interaction

No distinct trend was observed for Nina's independent and prompted performance for script 2. The R-IRD estimates Nina's independent performance showed no treatment effect. Her independent performance fluctuated throughout intervention. The food-related topic was of great interest to Nina, but most of her interactions were again off-script. Furthermore, the food folder in the Proloquo2Go™ contained pre-stored questions like "Are you hungry?", "What are we having?", "When are we going

to eat? which she often used during the interactions. These pre-stored responses were not scored as correct for two reasons: (a) they were not in the script thus, only the scripted interactions were scored; and (b) it was difficult to determine whether the button activation was purposeful. Overall, Nina was very keen to explore the pages and folders on her Proloquo2Go^{TM} and sometimes continued to press several keys consecutively. As such, it was not possible to gauge her intentions consistently.

Prompted conversational interaction

The additional prompts increased Nina's overall performance in script 2 as well. However, the treatment effects were small and insignificant given the level of overlap between baseline and intervention phases. The additional prompts increased the immediacy of the intervention effect, but the overall trend was not distinct.

Prompts

Figure 3.9 represents the number and type of prompts Nina required during the intervention. Nina mainly required repetition, verbal and navigational prompts. She required prompts to re-direct her focus to the task most of the time. In the first three intervention sessions, Nina required the modelling prompts, as she did not know the navigational pathways to access the right vocabulary, especially for the turns. As the sessions progressed, she continued to require navigational prompts. However, this was not exclusively for learning the navigational pathways, but to also shift her focus away from her preoccupation. There was an increase in independent performance from session I2 to I5, and then again in session I7. On two occasions, she required full physical prompts (sessions two and four) to get her attention. On the last session (I9), she once again required modelling prompts. However, this was because she was highly distracted and the less intrusive prompts were unsuccessful in shifting her focus back on task. Overall, there was an increase in independent conversational interactions as the sessions progressed.

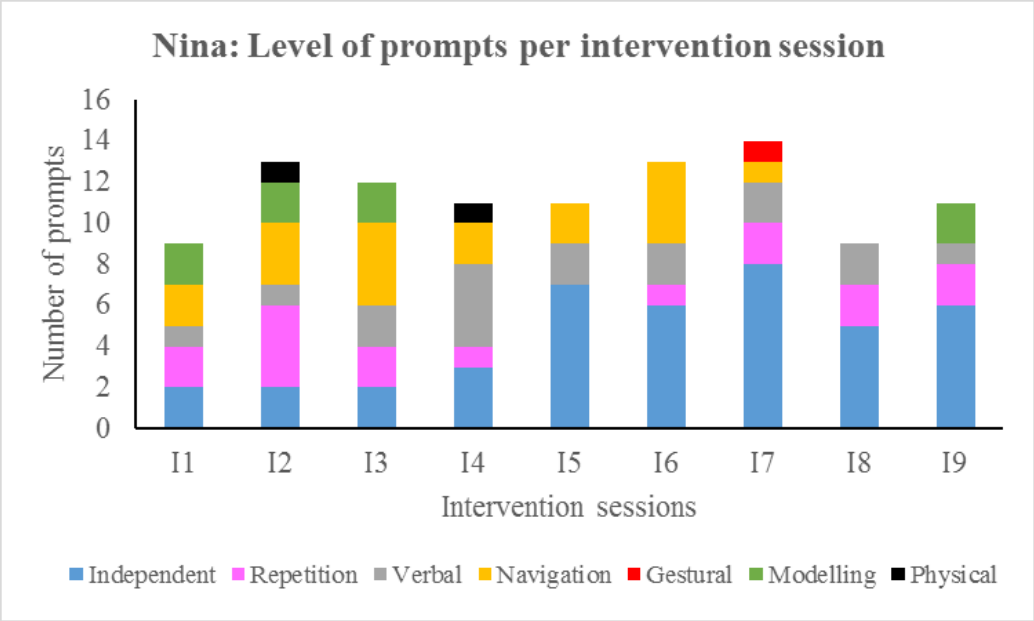

Figure 3.9. Number and type of prompts per intervention session for Nina

Additional observations

Nina was naturally inclined to social interaction. For instance, she frequently approached school staff and the researcher to interact, although her interactions were often one-sided. Although Nina responded when required, she mainly asked questions during the interactions. She was also highly distractible and found it challenging to remain on task.

In the first three intervention sessions, she required navigational and modelling prompts to demonstrate where the intended vocabulary was located in her Proloquo2Go™. As the sessions progressed, she continued to require prompts only to remain engaged on the same topic.

Social validity

Nina's teacher watched four video clips of Nina's interaction with the researcher in the scripted conversation during baseline, intervention and maintenance, and rated her conversation skills based on the frequency of (a) initiation, (b) turn-taking, and (c) termination of interaction. Her teacher also rated the quality of her overall interaction from the video clips. Overall, Nina's teacher stated that there was a general increase in the frequency of initiation and turn-taking during the intervention

phase. The interaction was rated on a five-point Likert scale, ranging from 1 = Never to 5= Always/Fluently. (Figure 3.10 displays the ratings given by Nina's teacher for the four sessions.)

Nina's class teacher stated that Nina generally used her SGD more than other modes of communication in the video clips. Her teacher felt that Nina initiated at a relatively stable frequency for both SGD (average: 4.25; range: 4-5) and other modes of communication (average: 2.75; range: 2-3). Her teacher also reported that the frequency of turns increased over time for SGD (average: 4; range: 3-5), but remained relatively stable for other modes of communication (average: 2.75; range 2-3). The teacher felt that Nina terminated the interaction more as the sessions progressed using both SGD (average: 3.5; range: 2-4) and other modes of communication (average: 2.5; range: 2-3). However, the teacher could have interpreted Nina responding to the researcher's "goodbye" as a termination of interaction and overall felt that Nina interacted more using the SGD (average: 4.25; range 4-5), compared to using other modes of communication (average: 2.75; range: 2-3) in the video clips.

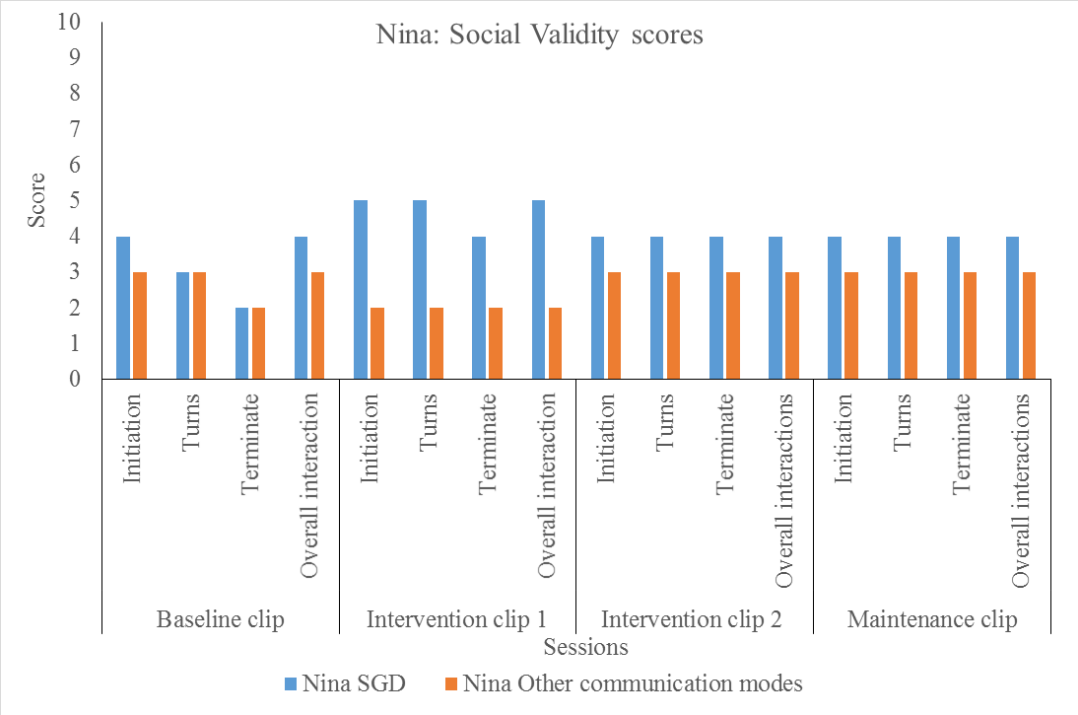

Figure 3.10. Social validity scores for Nina

The teacher reported that while Nina interacted with the communication partner (researcher), she often engaged in off-script and, on some occasions, off-topic interactions during the sessions. The teacher noted that the additional support (through prompts) helped to keep Nina on the task during the session. Nina's teacher remarked that overall (after the intervention) "the modelling and encouragement have helped (Nina) to want to use her device even more [because it] helps with her speech. She listens to what is on her device and what is said by the device and then tried to copy verbally".

Challenges

Several challenges were encountered in the pilot study, including (a) preoccupation with preferred topics, and difficulties shifting focus; (b) communication system layout and its impact on accessing the required vocabulary; and (c) generalisability of the turns.

Preoccupation with preferred topics and difficulties shifting focus

In this investigation, preferred topics were used in training as they were anticipated to increase the desirability of the set activity. Bandura (1971) proposed that the activation of learning is influenced by desirability or motivation for the task. Furthermore, previous findings showed that the use of preferred items increased the demonstration of targeted behaviour of AAC users with ASD (Banda et al., 2010; Copple et al., 2015). However, the findings of the current pilot study showed that the use of preferred items increased topic preoccupation, which led to challenges in terms of shifting focus to other topics or questions. Nevertheless, the previous studies by Banda et al. (2010) and Copple et al. (2015) targeted spontaneous requesting, which may explain why using preferred objects may have increased the frequency of targeted behaviour.

Accessing the required vocabulary

Although Nina was transitioning to the electronic communication system (iPad with the Proloquo2Go™) and mainly used the Proloquo2Go™, her PODD was available as backup. Nina sometimes used the PODD, for example, to access the required vocabulary when she had difficulty locating the appropriate vocabulary in the electronic system. This was mainly because she lacked adequate navigational competence with her Proloquo2Go™.

Secondly, Nina's Proloquo2Go™ user profile was set in the basic vocabulary display, with some pre-stored phases. While these phrases enabled her to communicate relatively quickly, the vocabulary display in her communication system (i.e., basic vocabulary) limited the number of words. Furthermore, not all the pre-stored phrases were relevant to the scripts used in the intervention.

Generalisability of turns

As mentioned earlier, the turns used in the scripted conversation were script-specific, meaning that the specific target turn can only be used for that particular script. This was challenging, especially when the participants had to access more than one button to generate the phrase used in the turn. For example, Nina had to press multiple buttons to ask "Do you like to eat snacks?" Furthermore, participant-effort was increased when each required word was located in a different folder or page. The added participant-effort also caused distraction.

Summary

The overall findings of the pilot study showed that video-based modelling interventions used in conjunction with prompts were effective in developing conversational skills for Nina. The VM and VSM packaged interventions yielded small treatment effects on Nina's independent conversational interactions. The social validity results showed that Nina's teacher felt that the intervention was effective in increasing the interest to use and explore the communication system outside the intervention. Nina's teacher also reported that Nina's communication functionality expanded beyond her pre-intervention skills. The limitations and challenges posed by the study influenced the overall findings. The pilot study outcomes showed that the main intervention study should focus on increasing the generalisability of the conversational turns and use more general conversational topics. The details of changes made from the pilot study to the main intervention studies will be discussed in Chapter 4.

CHAPTER 4: METHOD – MAIN STUDIES

The purpose of this chapter is to present the general method and procedures used in conducting the main intervention studies, 1 and 2. The outcomes from the pilot study informed the planning and implementation of the main intervention studies. The changes made are explained in detail in the following sections. Study 2 was a systematic replication of Study 1. Each study comprised two participants. For the two main intervention studies, ethics approval was obtained from (a) Social and Behavioural Research Ethics Committee, Flinders University, South Australia; and (b) Department for Education and Child Development, South Australia. The information in this chapter will be presented in the following order: (a) the research designs; (b) participant inclusion criteria and recruitment; (c) materials and instrumentation; (d) measures; (e) procedure; (f) reliability and social validity; and (g) data analysis. The method related information relevant to the two separate studies will be presented in chapters 5 (Study 1) and 6 (Study 2) respectively.

Method

Design

The two main intervention studies were conducted using a combination of two types of single-case research design: (a) multiple baseline design (Kazdin & Kopel, 1975) across participants, with predetermined intervention start points and baseline probes for successive participants; and (b) alternating treatments design (Barlow & Hayes, 1979).

Multiple baseline design

Multiple baseline design was used to evaluate the effectiveness of the two interventions across participants. The defining characteristic of this design is the staggered introduction of the independent variable (i.e., intervention) across the dependent variable (i.e., participants, settings, time, behaviour (Kazdin, 2011; Kratochwill & Levin, 2014). Although more than two replications are preferred for the demonstration of an experimental effect, two entities (i.e., participants, settings or behaviours) are technically sufficient to demonstrate any treatment effect (Kazdin, 2011; Kratochwill & Levin, 2014;

Murphy & Bryan, 1980). Multiple baseline design can thus be used across participants, behaviours or settings.

Figure 4.1 represents an example of multiple baseline design across three participants, involving the measurement of intervention effects for the same behaviour or setting. As can be seen, all three participants commence baseline at the same time. Once participant one starts with the intervention, participants two and three remain in the baseline condition until a change in behaviour is observed in participant one, or at a predetermined starting point. By introducing the intervention successively, one can confidently conclude that any change in behaviour is a consequence of intervention rather than other confounding variables, such as maturation, history, etc., hence exercising experimental control (Kazdin, 2011; Koehler & Levin, 1998; Kratochwill & Levin, 2014; Murphy & Bryan, 1980).

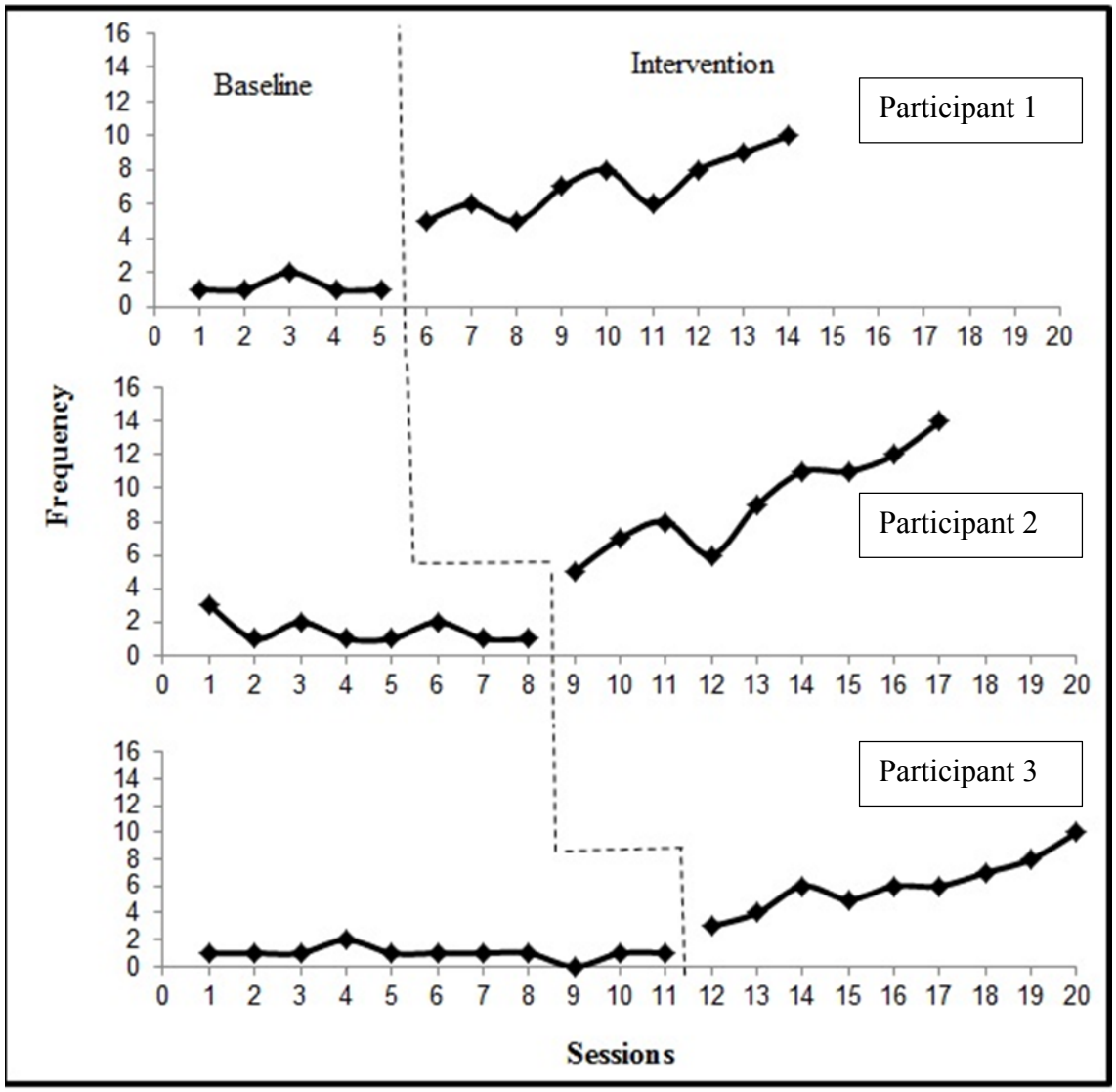

Figure 4.1. Hypothetical data for multiple baseline design across participants

As mentioned before, multiple baseline design calls for the introduction of the intervention to participants 2 and 3 to be deferred until a change in performance or behaviour is observed in participant 1. This means that the intervention for participants 2 and three may be postponed for an extended period if no change in behaviour is observed for participant 1, as they will continue to remain in the baseline phase. Besides ethical issues that may arise from the deferment of treatment, research also shows that extended baselines might compromise methodological rigour (Gast & Ledford, 2014; Horner & Baer, 1978; Kazdin, 2011; Kratochwill & Levin, 2014). A prolonged baseline may for instance promote an increase in irrelevant and contesting behaviours in participants (Panyan, Boozer, & Morris, 1970). Two methods can be implemented to overcome these challenges:

(1) the use of probes; and (2) the use of predetermined starting points.

Probes

Probes refer to intermittent assessments of targeted behaviours conducted during baseline or before the application of the intervention (Kazdin, 2011; Koehler & Levin, 1998; Kratochwill & Levin, 2014; Murphy & Bryan, 1980). Before adopting a probe design, it is essential for the researcher to have an a priori assumption that the baseline performance will be stable; in other words, there is an assumption that there would not be any change in performance or behaviour before the introduction of the intervention.

Fixed intervention start points

Intervention start points for each participant can be randomised or sequentially predetermined. Start points can be predetermined by using a randomisation method or by assigning the participants/behaviour/setting to a sequential onset. This can ensure the successive implementation of the intervention while reducing the negative implications of prolonged baselines. There is also growing evidence to suggest that pre-determining the start points further strengthens the design's internal validity (i.e., reducing the length of baseline) and consequently may increase the scientific credibility of the design (Kratochwill & Levin, 2014).

Alternating treatments design

The application of alternating treatments design was explained in Chapter 3 (see Design).

Participants

The eligibility criteria remained the same as the pilot study: (a) aged between 10 to 18 years; (b) diagnosed with ASD, according to DSM-IV (the DSM-V was released after the call for participants was advertised. Furthermore, because this investigation focuses on adolescents, potential participants would have been diagnosed using the DSM-IV); (c) uses aided AAC system/s, preferably SGD; (d)

symbolic communicators – being either context-dependent or independent as determined by their speech pathologist or teachers; (e) able to recognise and discriminate between self and others in a set of photos (as provided by the teachers); (f) able to understand and follow simple instructions; (g) showing an interest in watching videos; and (h) having no objections to being filmed.

The participant recruitment process for the two main intervention studies was the same as for the pilot study. In short, the participants were recruited through education sectors in South Australia. The school teachers and principals identified potential participants, and sent out the introduction packs containing a letter of introduction, information brochure (in English or translated language) and consent forms to families of participants who matched the eligibility criteria. The overall recruitment process took between six months and one year for all participants from both studies.

The participants in the two main intervention studies attended special schools. They had no physical disabilities and were ambulatory. Although some of the participants used vocalisations and echolalia, they were unable to use speech functionally for communication. All participants were deemed as context-dependent communicators by their class teachers. In other words, the recruited participants were able to use established symbols through their AAC systems to communicate reliably. Their communicative capacities were limited in their functions (e.g., requesting, describing feelings), partners (e.g., teachers, parents, and school support officers) and contexts (e.g., school, home). Specific characteristic and demographic information for the recruited participants will be provided in chapters 5 and 6 respectively.

Setting

The intervention studies were conducted at the participants' respective special schools. Specific information on setting descriptions for each study will be detailed in the relevant chapters 5 and 6.

Material

Most of the materials used in the two main intervention studies remained the same as the pilot study, with the exception of (a) photographs, and (b) conversation topics and scripts.

Photographs

Since intervention for all participants was conducted at the participants' respective schools, the self-recognition assessment was carried out using photographs of all students in each participant's class. Each class had between eight and 10 students. The participants were requested to choose their photograph from the collection of photos and place it next to their names on the SMART Board. For the older participants who were not involved in the group circle class activity; photos of all the students in the class were presented in a random order, and the participants were asked to show or point to their own photos. This assessment was conducted twice, on two separate occasions.

Peer models

Two neurotypical peer models matched for age and gender were included in the VM clips. The male participant was 11 years old, and the female participant was 13 years old. Both peer models were Caucasian.

Conversation scripts

The challenges encountered in the pilot study resulted in the modification of conversation scripts in the main intervention studies. The scripts were modified in four aspects: (a) use of general topics (versus preferred topics); (b) length of scripts; (c) generalisability of the turns and number of overall turns; and (d) number of overall conversational scripts.

Use of generic topics for conversation

Preferred topics were used in the pilot study as it was seen as a potential reinforcer or motivator for task engagement. However, one of the main challenges encountered was the participants' preoccupation with the preferred topics and difficulties shifting to the relevant topic(s). Given that VM did not yield any differential effects for conversational initiations in preferential and non-preferential topics (Haymes, 1995), generic topics that were deemed to engage school-aged individuals between the ages of 10-18 years were used. These topics were: (a) Food; (b) Holiday; (c)

Movie; (d) Colours; (e) Recess; and (d) Weekend. Although the same topics were used in the pilot study, the topics in the pilot study were distributed by preference to the participant. Such distribution was not done in the main intervention study. All the participants engaged in all eight topics, regardless of their preferences for any specific topic.

Length of scripts

After the pilot study, the scripts for the main intervention studies were changed to reflect a shorter script with more general turns. Table 4.1 exhibits the difference between the scripts used in the pilot versus the main intervention studies. As can be seen, the scripts for the main intervention studies were shorter, including only one turn and one answer per script, versus two turns and two answers per script in the pilot study. Sherer et al. (2001), the only other study to have compared the use of VM and VSM in teaching conversation skills to children with ASD, also included only one turn in their intervention study.

The greeting component was also removed from the scripts in the two main intervention studies. As in the pilot study, greetings ("Hello, how are you?") were usually exchanged earlier, when the researcher (communication partner) met and escorted the participants from their classroom to the therapy room. Thus, the inclusion of the greeting component in the scripts made the conversational interaction less natural and awkward. Therefore, a decision was made to remove these greetings from the script in the two main intervention studies.

Table 4.1. Comparison between scripts in the pilot and main intervention studies

Pilot		Main intervention studies	
Conversant	**Script 1**	**Conversant**	**Script 1**
Participant:	Hello		
Comm. Partner:	Hello. Do you like colours?	Comm. Partner:	What did you eat for breakfast?
Participant:	Yes (answer) Do you like colours? (turn)	Participant:	Cereal (answer) What about you? (turn)
Comm. Partner:	Yes. What colour do you like?		
Participant:	Pink (answer) What colour do you like? (turn)	Comm. Partner:	Toast.
Comm. Partner:	Orange.		
Conversant	**Script 2**	**Conversant**	**Script 2**
Participant:	Hello	Comm. Partner:	What is your favourite holiday?
Comm. Partner:	Hello. What is your favourite food?		
Participant:	Cheese slices (Answer) What is your favourite food? (Turn)	Participant:	Easter (Answer) What is yours? (Turn)
Comm. Partner:	Cakes. Do you like cakes?		
Participant:	Yes (Answer) Do you like cheese slices? (Turn)	Comm. Partner:	Christmas
Comm. Partner:	Yes.		

Generalisability of turn-taking

Additional elements in the turns from the pilot study scripts resulted in higher participation. In the pilot study, depending on how the communication system was set up, participants were required to learn more pathways and keys in the communication system to construct different turns. Furthermore, the turns could not be easily generalised to other topics. For example, "What did you eat for breakfast?" could not be used to find out about "What colour do you like?" However, a turn like "What about you?" could be used in both instances, and only requires activation of three words. (See example in Table 4.2.)

Therefore, unlike the script specific turns used in the pilot study (i.e., "What is your favourite colour?", "Do you like to eat snacks?"), more generic turns such as "What about you?" and "What's yours?" were used in main intervention studies. The use of these more generic turns was deemed to improve the generalisability of the targeted skills: conversational turn-taking (see Table 4.2). For example, one can say "what about you?" to ask about someone's weekend activity as well as someone's view on a particular issue.

Table 4.2. Example of generalisability of turns

Conversant	**What about you?**	**What's yours**
Conversant 1	What did you do on the weekend?	What's your favourite movie?
Conversant 2	I went fishing. What about you?	The Avengers. What's yours?
Conversant 1	What did you think of….?	What's your phone number?
Conversant 2	What about you?	What's yours?

Number of scripts

As in the pilot study, four scripts, two for VM and VSM respectively were used during the two main studies. However, because the length of the scripts was shortened, two additional scripts were included in the generalisation measure. (The scripts used in main intervention studies are detailed in Table 4.3.)

Table 4.3. Conversation scripts used in the main intervention studies

Turn	**What about you?**				**What's yours?**			
Session	VM	VSM	Generalisation		VM	VSM	Generalisation	
Topic	Holiday	Food	Weekend	Recess	Food	Holiday	Colour	Movie
Script	What did you do for Easter?	What did you eat for breakfast?	What do you like to do on the weekend?	What do you like to do at recess?	What's your favourite food?	What's your favourite holiday?	What's your favourite colour?	What's your favourite movie?

(In a nutshell, the changes made from the pilot study to the main intervention study are depicted in Figure 4.2.)

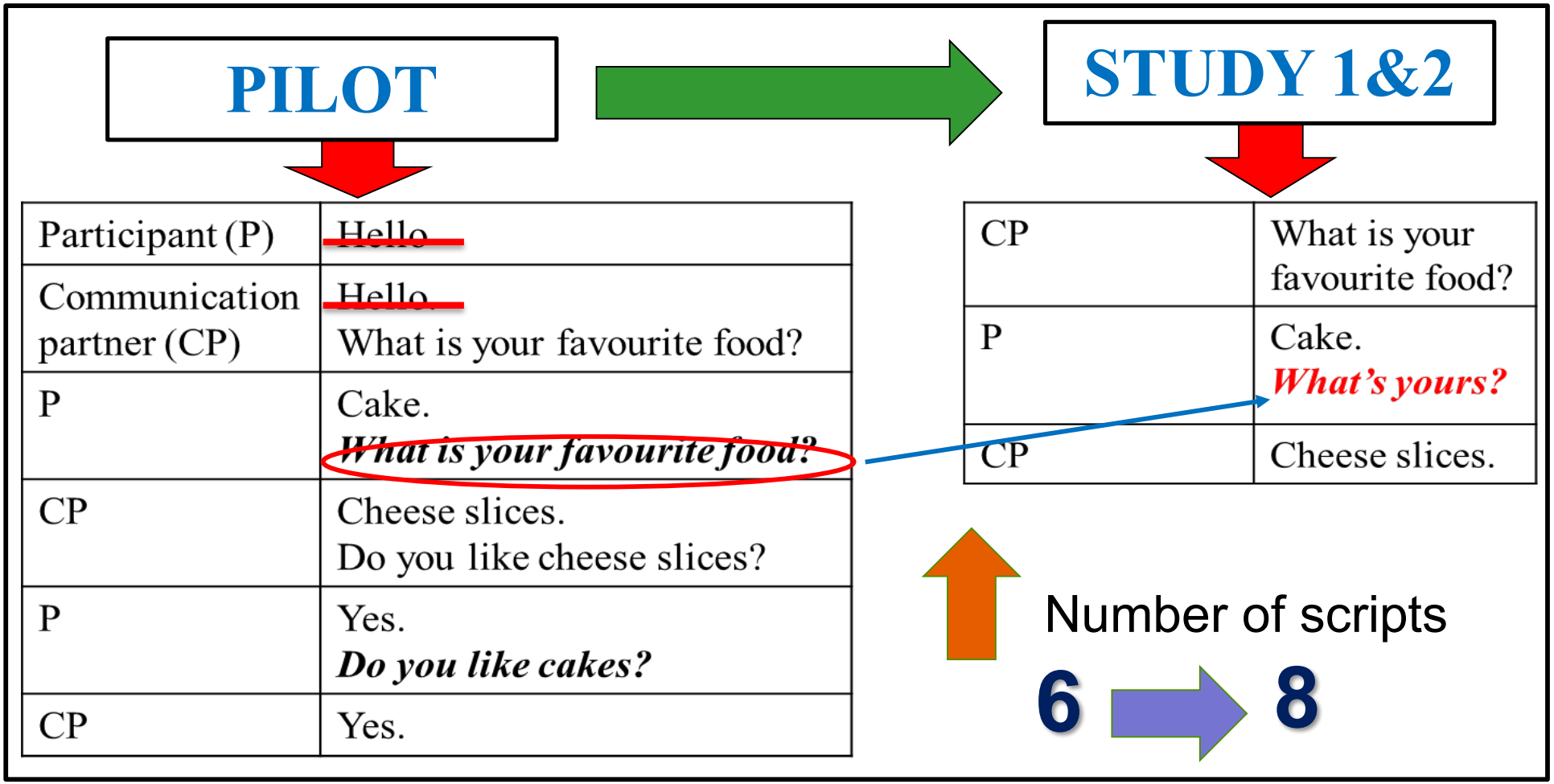

Figure 4.2. Representation of the changes made from the pilot to the main intervention studies

Measures

Independent and dependent variables were the same as in the pilot study.

Independent variables

Independent variables were two types of packaged video-based modelling interventions: (a) VSM with prompts; and (b) VM with prompts. The prompts were presented in a least-to-most hierarchy, as described in Chapter 3. The rationale for using the least-to-most prompting system was also described in Chapter 3.

Dependent variable

Dependent variables were measured using (a) percentage of independent conversational interaction, (b) percentage of prompted conversational interaction, and (c) type and number of prompts required. Conversational interaction follows the pattern in the conversation script (i.e., answering a question and asking a follow-up question). The operationalised definitions for targeted behaviours within the conversation script were described in Chapter 3 (see Dependent variable).

Procedure

Production of video clips

Again, both sets of video clips for VM and VSM were recorded and developed before the start of the baseline phase in the main intervention studies. The production of VM and VSM clips followed the same protocol as the pilot. Table 4.4 offers an example of the conversational interaction between the model (peer or self) and the researcher, who was also the communication partner.

VM production

The VM clips were recorded in a meeting room at the university. The overall duration for producing the VM clips, including recording and editing, took approximately half an hour per script, per peer.

VSM production

The feedforward type of VSM was used in this investigation. The feedforward clips were recorded in the school library for both participants. The overall duration for producing the VSM clips took between one to 1.5 hours per script, per participant.

Table 4.4. Example of conversational interaction between the actors

Conversant	Script
Researcher/Conversation partner	What's your favourite food?
Model	Pizza (Answer)
Model	What's yours? (Turn)
Researcher	Pasta

Baseline

In the main intervention studies, both participants in each study commenced baseline simultaneously. Participant 1 had five baseline sessions before progressing to the intervention phase. Participant 2 remained in the baseline phase for additional baseline probes. During the baseline phase, the participants were assessed on their interaction in eight scripted conversations with the researcher using the measures as described earlier. The participants did not view any of the video clips. The conversational interaction followed the same pattern as described earlier. Any question the participant did not answer was repeated, but no further prompts were given to elicit turns. The performance was scored based on the percentage of correct independent conversational interaction.

Intervention

During the intervention sessions, the participants were shown each video, one at a time. Before starting, participants were informed that they were going to watch a video. After each viewing, the participant and the researcher engaged in the same scripted conversation interaction presented in the video clips. Prompts were provided to elicit answers and turns, and the scoring was based on the level of prompt required to elicit a correct response. Following the training trial, a short break was given before presenting the next video clip. In each session, the participant watched four videos (two different scripts for VM and two different scripts for VSM). The performance was based on scores

provided for prompt levels in the hierarchy needed to elicit a correct response. These raw scores were converted to the percentage of scripted conversational interaction, as described below (see Data Analysis). The types and number of prompts required per session were also recorded. Intervention sessions were conducted three to four times per week, up to nine sessions.

Generalisation

Generalisation was measured during every baseline and intervention session for the two main studies. During generalisation sessions, the participants and conversation partner (researcher) engaged in four separate, untrained conversational interactions. The pre-developed scripts followed the same pattern as the trained conversations but they were different topics. Furthermore, there were no video models for generalisation sessions. Prompts were provided based on a least-to-most hierarchy to elicit interaction.

Maintenance

Maintenance was assessed at least two weeks post intervention. The participants did not watch video clips during the maintenance phase. Similar to baseline, only independent responses were scored.

Data analysis

The data scoring procedure remained the same as the pilot study. (see the section on data analysis in Chapter 3.) However, in the main intervention studies, each script used in the intervention had only one answer and one turn. Therefore, the maximum score per script was 12 points. The percentage of prompted score per script (Y) for the main intervention studies was calculated by dividing the raw score (x) by the maximum score (12) multiplied by 100%.

$$\mathbf{Y = (x/12)\ X\ 100\%}$$

For example, if the participant demonstrated one independent response (answer or turn) and one prompted response (navigation prompt), he/she would receive 6 points per independent response and 3 points for the navigation prompt. Therefore, the total raw score (x) will be 6+3 = 9.

$$Y = (9/12) \text{ X } 100\% = 75\%$$

The average prompted score for each intervention (Z) is calculated by adding the individual percentage of prompted scores for each script used in the same type of intervention (VM or VSM) divided by two.

$$Z = (Y_1 + Y_2)/2$$

For baseline and maintenance sessions, only independent performances were scored and graphed. Therefore, the raw score per script could either be 12 points (maximum), 6 points (one independent answer or turn) or zero (no independent answer or turn).

The robust improvement rate difference (R-IRD) was used to calculate the effect size (Parker et al., 2009). (The calculation of R-IRD was described in detail in Chapter 3.)

Inter-observer reliability

The primary researcher and one other member of the research team (supervisor) independently observed and recorded the performance for 20% of sessions for all participants and phases (baseline, intervention, generalisation and maintenance). This was done to ensure the appropriateness of the response definition and to evaluate the reliability of dependent variable measurement. For inter-observer reliability, both observers watched and scored the performances based on a predetermined scoring specification (see Table 3.3 and Appendix 3). Any disagreement on performance score was discussed and resolved.

Treatment fidelity

Treatment fidelity is a major component in intervention research as it describes the degree to which the intervention was implemented as intended (Kazdin, 2011; Schlosser, 2002). Reporting treatment fidelity is important to ensure valid comparison for replication (Bellini & Akullian, 2007; Moncher & Prinz, 1991) as well as to aid our understanding of the corresponding levels of fidelity with the levels of outcomes (Schlosser, 2002). When studies do not report treatment fidelity it is not known whether the treatment was carried out as planned; hence, it becomes unclear as to whether the independent variable (intervention) affected the changes in the dependent variable (target outcomes) (Kazdin, 2011; Schlosser, 2002).

Using a checklist, an independent observer evaluated the procedures undertaken during the baseline and intervention phases for 20% of sessions for all participants. (See Appendix 4 for the checklist of baseline and intervention procedures.)

Social validity

The same social validity questionnaires were used in the main intervention studies. These questionnaires were completed by class teacher for each participant. For Study 1, the social validity evaluation was conducted within a month from completion of the maintenance phase. For Study 2, the social validity evaluation was conducted four months following the completion of the maintenance phase due to the summer school holidays.

CHAPTER 5: STUDY 1

This chapter presents the results of Study 1. Firstly, specific information about the Method and procedural details that were not covered in Chapter 4 (General Method) which include participant demographics and specific procedural information will be described. Next the inter-observer reliability and treatment fidelity outcomes will be reported. Finally, the results of Study 1, including social validity outcomes, will be presented in order of participants.

Participant characteristics

Two participants, Sam[3] and Lily[3] met the eligibility criteria. Both participants were a part of the same special school, but were from different classrooms. The descriptive characteristics of each participant are presented in Table 5.1.

Sam

Sam was an 11-year-old male with a diagnosis of ASD, global developmental delay and partial chromosomal deletion. Sam was diagnosed when he was 7;9 years of age. Using the PPVT-4 (Dunn &Dunn, 2007), Sam's language age equivalent was 6;3 years.

Sam used the Proloquo2Go™ application on his personal mini iPad. This application was set up with the intermediate core vocabulary template, in a 5X9 grid. He preferred typing his messages using the QWERTY keyboard function on the Proloquo2Go™ application. Sam seemed interested in social interaction with people, especially around topics of interest, such as the letters of the alphabet, musical instruments and categories of favourite things.

[3] Pseudonyms.

Lily

Lily was an 11-year-old female with a diagnosis of ASD. She was initially diagnosed with Global Developmental Delay at an early age and the diagnosis was later revised to ASD when she was 6;9 years. Lily's raw and standard scores in the PPVT-4 (Dunn & Dunn, 2007) assessment did not yield any age equivalent score, indicating that her language age equivalent score was below that of a two year old.

Lily used a personalised and customised vocabulary template in the Proloquo2Go™. The picture grids in her user profile were categorically organised and each folder represented a phrase (e.g., I want, I feel, etc.). From observation, Lily enjoyed watching cartoon shows and playing with her soft toys or other sensory toys by herself. Her interaction with others was limited to requesting items of interest, (e.g., "I want my iPad to watch Peppa") using the Proloquo2Go application on the iPad mini. Lily often appeared exhausted and tired, and reported to have had insufficient sleep during the night. She was also fidgety and held something in her hands, or a chewy-tube for sensory regulation.

Setting

The intervention took place in the meeting room at the special school, away from the classrooms. This room was located next to the school reception area. The reception area was generally a quiet space. The door (glass door) remained unlocked during the sessions to ensure that the participants were always in the line of sight of school staff, as per the school's safety policy. The setting resembled a meeting room, with a standard rectangular table and chairs. The researcher and the participant sat in chairs facing each other. The researcher allowed the participant to choose their preferred seat, before proceeding to sit opposite them.

Table 5.1. Participant characteristics: Study 1

Participants	Age	Sex	Language age equivalence[#]	Self-recognition	AAC	Other communication characteristics
Sam[3]	11;2	M	6;3	100%	• Proloquo2Go™: 5 X 9 intermediate core vocabulary on his personal mini iPad.	• Did not have any speech sounds • Used gestures, such as pointing or finger tracing letters of the alphabet
Lily[3]	11;4	F	< 2;0[+]	100%	• Proloquo2Go™ personalised on her personal iPad mini.	• Able to say one-word utterances, but her speech was unintelligible.

[#] Language age derived from the PPVT-4 (Dunn &Dunn, 2007) (Form B)
[3] Pseudonym

[+] Lily's raw/standard scores in the PPVT-4 (Dunn &Dunn, 2007) assessment did not yield any age equivalent score. The PPVT-4 (Dunn &Dunn, 2007) age equivalent score ranges from ages two and above. Hence, if someone's age equivalence is less than two years of age, no score is given.

Procedure

A detailed description of the procedural steps was outlined in Chapter 4. After five consecutive baseline measures, Sam progressed to the intervention phase whilst Lily remained in the baseline phase for four additional probe sessions. Although changes were observed in Sam's targeted behaviour following the application of the intervention, Lily did not commence her intervention until session I5 for Sam, due to illness and absence from school. Lily was typically distracted and disinterested during the intervention sessions. In an attempt to focus Lily's attention and to encourage her, the researcher's answers were modelled using Lily's Proloquo2Go. Each session was videotaped using a Sony video camera positioned on a tripod in the corner of the room. A break of up to three minutes was offered to each participant after each interaction training trial. Sam generally requested to continue the interaction, while Lily was indifferent.

Maintenance

Maintenance was assessed two weeks following the termination of intervention for Sam. Maintenance sessions could not be conducted for Lily due to equipment failure. The user profile on the application utilised during the project was deleted, and the backup could not be restored. As Lily used a customised and personalised template, a generic setting on the Proloquo2Go^{TM} could not be used.

Data analysis

Inter-observer reliability (IOR)

The average IOR for the prompted, conversational interaction for Study 1 was 87.5%. The individual scores are listed in Table 5.2.

Table 5.2. IOR information for Study 1

Participant	**IOR (%)**			
	Total	Answers	Turns	Prompts
Sam	87.5	93.8	100.0	90.6
Lily	87.5	95.8	91.7	87.5
Average	87.5	94.8	95.9	89.1

The total number of pre-developed scripts per session included two each for VM and VSM and four for generalisation measures, which was a total of eight pre-developed scripts for conversation interaction per session. For Sam, IOR measures were conducted for four sessions (i.e., 20% of sessions across different phases) including one baseline measure, two intervention sessions and one maintenance session. This resulted in a total of 32 interactions. The overall IOR score for Sam was (28/32) X 100% = 87.5%. The total number of pre-developed scripts for Lily was the same as Sam's (i.e., eight scripts per session). For Lily, IOR measures were conducted for three sessions including one baseline measure and two intervention sessions. Lily did not have a maintenance session; hence the results of this session could not be included in her IOR measure. This resulted in 24 scripts overall. The overall IOR score for Lily was (21/24) X 100% = 87.5%. Table 5.2 provides the breakdown of the individual IOR scores for each dependent variable.

Treatment fidelity

The average treatment fidelity score for Study 1 was 94.4%. The individual scores are listed in Table 5.3.

Table 5.3: Treatment fidelity scores for Study 1

Participant	Baseline	VM	VSM
Sam	87.5%	87.5%	91.5%
Lily	100%	100%	100%

Treatment fidelity assessment was conducted for one baseline measure, with two intervention sessions for both VM and VSM respectively, totalling 24 scripts. Components that were only relevant for the first and final scripts, such as ensuring the device was set up and informing the participants that the session was completed and they should return to class, were not included in the scoring as these were not relevant for between scripts.

Results

The results were variable across the two participants. Sam demonstrated improved performance in the prompted conversational interaction following the implementation of the packaged intervention. However, Lily's performance did not show any visual or statistically significant differences. Figure 5.1 displays the percentage of correct, prompted conversational interaction for Sam and Lily.

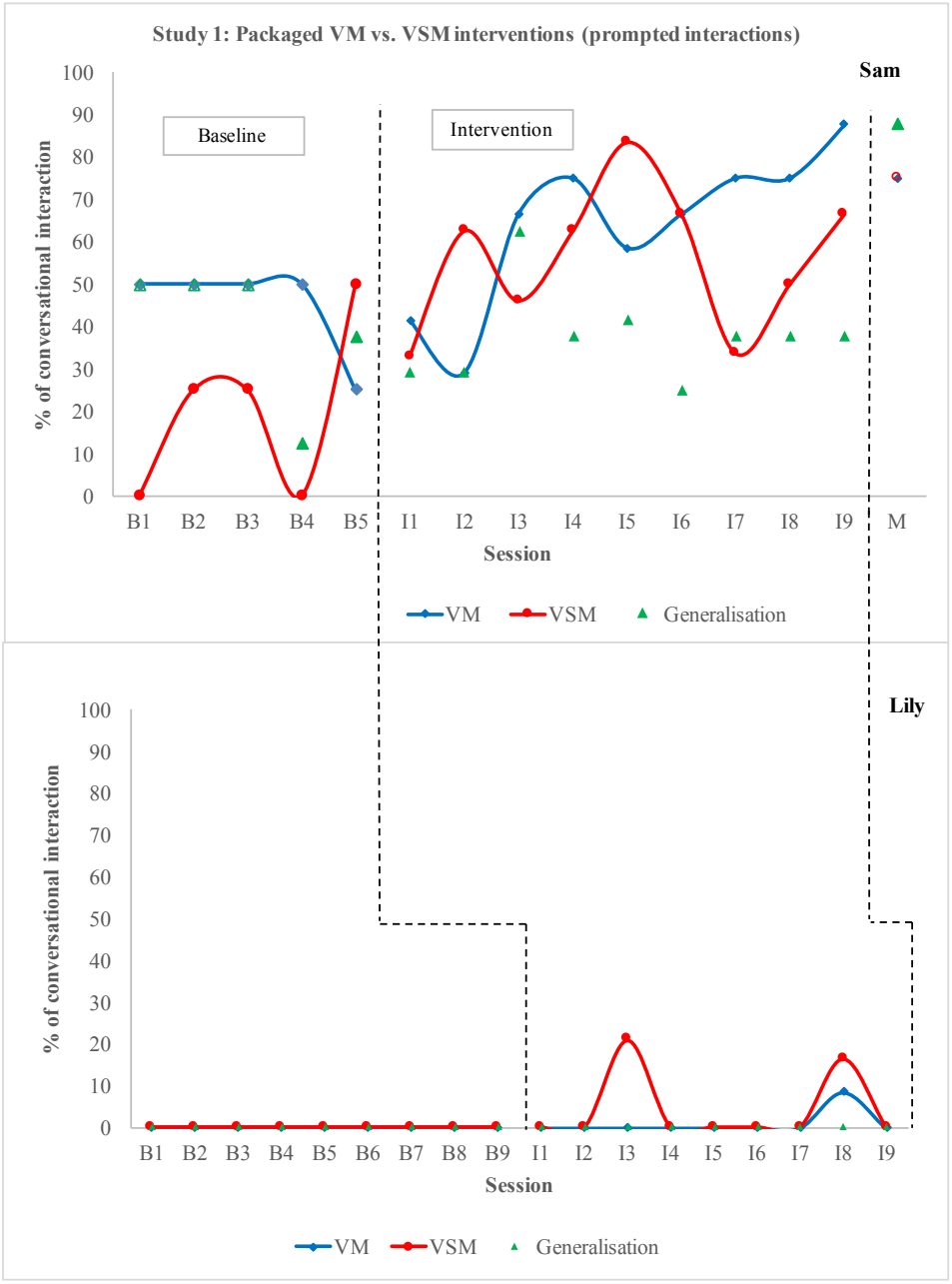

Figure 5.1. Average percentage of prompted conversation interaction for Sam and Lily

Sam

Sam demonstrated positive effects with respect to both intervention packages, with a greater effect for the packaged VSM intervention. Table 5.4 displays the effect sizes, and the upper and lower parameters for the adjusted confidence intervals at 87.89% (Payton et al., 2000) for Sam. Visual inspection of the graph in Figure 5.1 shows an 18.8% change in the means across the phases for packaged VM (M_B =45.0%; M_I =63.8%); and a 31% change in the means across the phases for packaged VSM (M_B = 25.0%; M_I =56.0%).

Table 5.4. R-IRD scores for Sam's performance based on the packaged VM and VSM interventions

Intervention	*p*	R-IRD	CI (87.89%)
Packaged VM	0.02	0.69	[0.12,0.96]
Packaged VSM	0.00	0.84	[0.28,1.00]

Video modelling (VM)

Overall, the packaged VM intervention showed a moderate effect (R-IRD = 0.69), and the results were statistically significant (p = 0.02). Sam responded independently at an average of 50% in the baseline phase with a sudden decrease in the last baseline session. The application of the packaged VM intervention showed an upward trend, with Sam reaching peak performance in the final session at an average of 88% for prompted conversational interaction. There was a slight decrease in his performance on the VM trained scripts during maintenance.

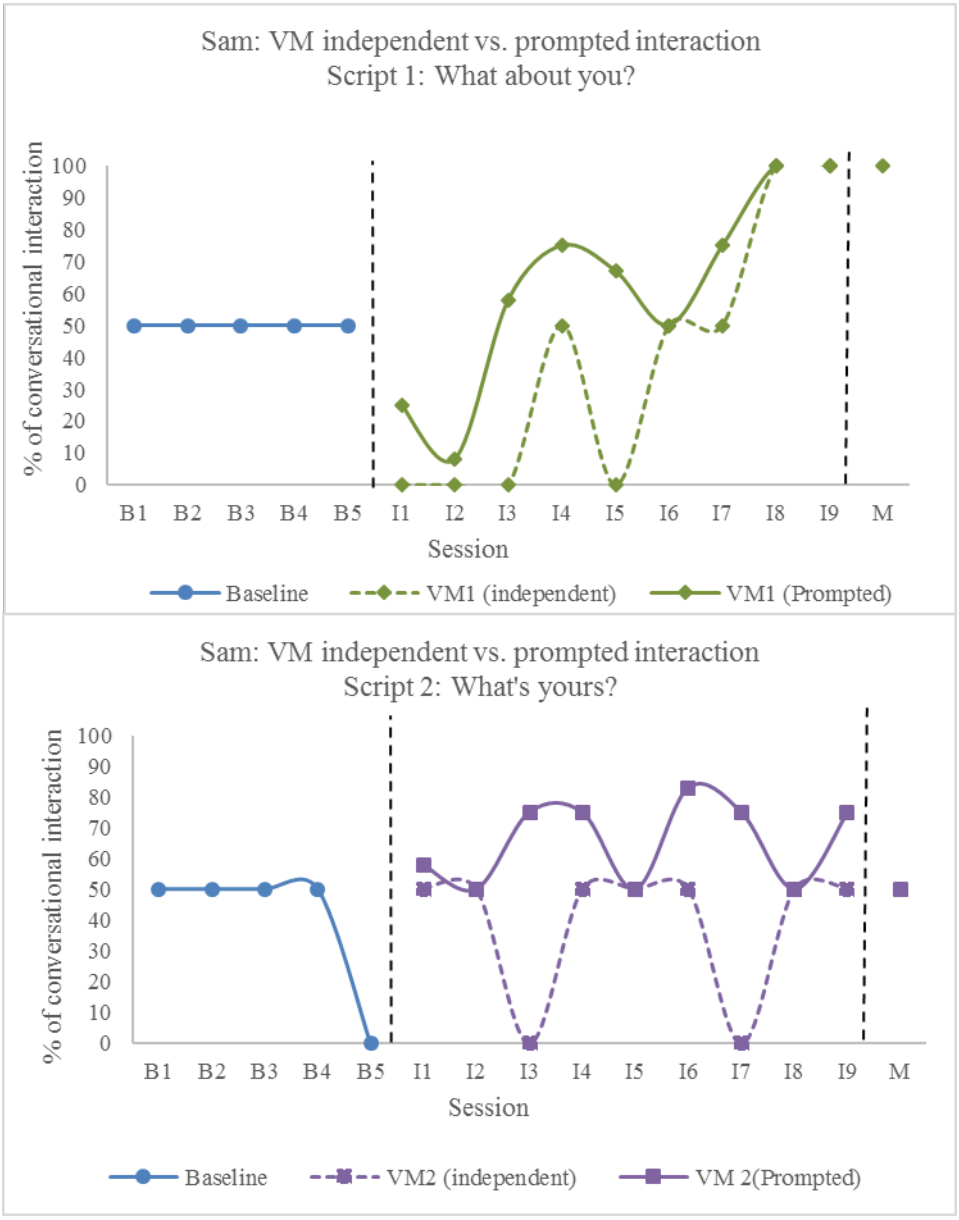

Figure 5.2. Comparison of Sam's independent versus prompted conversational interactions following the VM intervention

Two scripts were trained using the packaged VM intervention. Visual analysis of the individual graphs (see Figure 5.2) show there was an upward trend in Sam's independent and prompted performance for script 1, but no definite trend for script 2. Table 5.5 displays the effect size for both independent and prompted conversational interactions for scripts 1 and 2.

Table 5.5. R-IRD scores for Sam's performance in each script following the VM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	0.09	0.09	1.00	0.09
R-IRD	-0.40	0.53	0.07	0.53
CI (87.89%)	[-0.56, 0.17]	[-0.03,0.89]	[-0.39,0.58]	[-0.03,0.89]

VM Script 1

Independent performance

Overall, there was an upward trend in Sam's independent performance in script 1. The R-IRD score showed no treatment effects, indicating high levels of overlap between baseline and intervention phases. Sam reached the criterion (100% independent answers and turns during the interaction) in script 1 by session I8 and maintained his performance in session I9 and in the maintenance phase.

Prompted performance

As expected, the additional prompts increased his overall performance. Yet, there was no complete data separation between baseline and intervention phases. When the intervention was first introduced, his performance was lower than the baseline phase. Due to the novelty of the video instruction, he required further cues to re-direct his focus on the task. However, his performance increased by session three and showed a general upward trend. As mentioned above, by session I8, Sam did not require any prompts to respond and take turns in VM script 1 (100% independent conversational interaction).

VM Script 2

Independent performance

Sam's independent performance in VM script 2 indicated no treatment effects. There was complete data overlap between baseline and intervention phases. Overall, there was a fluctuating pattern between answering questions (50% independent conversational interaction) and not responding at all (0% conversational interaction) (See Figure 5.2). Sam did not maintain his performance in the scripted conversations. However, he did engage in new topics and scripts, as displayed in Figure 5.4

Prompted performance

Overall, the additional prompts increased his performance. Albeit small, there was an immediate treatment effect following the introduction of the prompts. Although Sam did not achieve criterion (100% independent conversational interaction) in script 2, the overall treatment effect for VM script 2 was greater than the effect for VM script 1 because the degree of overlap between baseline and intervention phases was lower in script 2 than in script 1.

Video self-modelling (VSM)

Overall, the packaged VSM intervention showed a large effect (IRD = 0.84), and the results were statistically significant (p = 0.00). Sam responded independently at an average of 25% for the first three baseline measures, followed by a substantial decrease to 0% in session B4 and then a substantial increase to 50% in session B5. (see Figure 5.1). There was an upward trend in his performance following the packaged VSM intervention, even though the trend was not as evident as it was in the VM intervention. Sam reached peak performance in session I5 at an average of 84% for prompted conversational interaction, before gradually decreasing to 35% of prompted conversational interaction in session I7 and increasing again to 67% of prompted conversational interaction in the final session (I9). During maintenance, Sam demonstrated a mean score of 75% independent scripted interaction in the VSM trained topics.

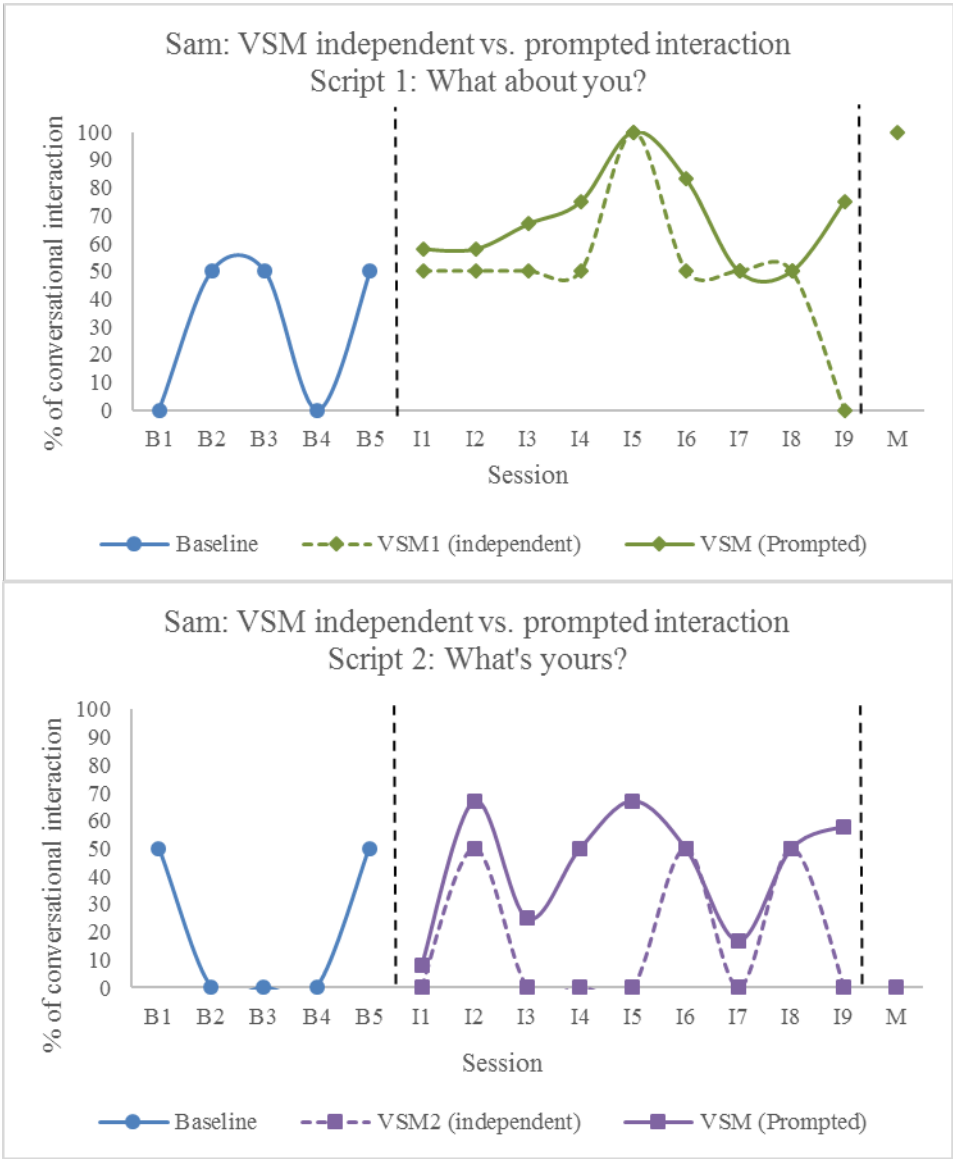

Figure 5.3. Comparison of Sam's independent versus prompted conversational interactions following the VSM intervention

The packaged VSM intervention also involved two scripted conversational interactions. Variability in performance was noted in both scripts. Visual analysis of the individual graphs showed no change in Sam's independent conversational interactions in both scripts. Yet, the immediacy of the intervention effects was enhanced by the additional instructional prompts. The effect sizes for both the independent and prompted conversational interactions are displayed in Table 5.6.

Table 5.6. R-IRD scores for Sam's performance in each script following the VSM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	0.27	0.02	0.58	0.02
R-IRD	0.38	0.69	-0.24	0.69
CI (87.89%)	[-0.17,0.80]	[0.12,0.96]	[-0.53,0.32]	[0.12,0.96]

VSM Script 1

Independent performance

Overall, Sam's independent performance for script 1 did not show any trend (See Figure 5.3). The R-IRD score for Sam's independent performance in script 1 showed very small treatment effects, indicating high levels of overlap between baseline and intervention phases. There was a sudden increase in session I5, where he achieved criterion (100% independent conversational interaction). However, he did not maintain this performance during the next four intervention sessions. His performance in the maintenance phase for VSM script 1 was 100%.

Prompted performance

As expected, the additional prompts increased his performance overall. Yet, there was no complete data separation between baseline and intervention phases. Albeit small, there was an immediate treatment effect following the introduction of the prompts. There was an upward trend during the prompted performance. As mentioned above, in session I5, Sam did not require any additional prompts to respond and take turns in VSM script 1, but his performance in the next three sessions decreased before increasing again in session I9. He maintained his performance in the scripted conversation two weeks post intervention.

VSM Script 2

Independent performance

Sam's independent performance in VSM script 2 also showed no treatment effects. There was complete data overlap between baseline and intervention phases. Overall, there was a fluctuating pattern between answering questions (50% conversational interaction) and not responding at all (0%

conversational interaction) (See Figure 5.3). Although Sam did not maintain his performance in the scripted conversations, he did engage in new topics and scripts, as displayed in Figure 5.4 below.

Prompted performance

Although the prompts increased his overall performance, Sam did not reach criterion for VSM script 2. On the first intervention session, his performance was lower than it was in the last baseline measure; this was mainly due to his preoccupation with the video clips for which he required additional cues to re-direct him to the task. The degree of overlap between baseline and intervention phases for the prompted performance was the same in both VSM scripts.

Generalisation

Sam's performance with the pre-developed generalisation scripts did not show any changes during the intervention period. His performance in the generalisation scripts during baseline and intervention sessions was inconsistent. During maintenance, he performed better with the pre-developed generalisation scripts, in comparison to the trained VM and VSM scripted interactions (See Figure 5.1). There was a 2.5% decrease in the means across the baseline and intervention phases (M_B = 40%; M_I =37.5%) for the prompted conversational interaction. Although Sam did not demonstrate much change across the pre-set generalisation topics during intervention, he demonstrated expansion of his interaction ability, particularly by initiating interactions for new and pre-set topics, as mentioned above and in Figure 5.4.

Figure 5.4 demonstrates that Sam was already initiating new topics of interactions in the baseline phase. Most of his initiations were around "What's your favourite…?" During the final baseline session, he initiated a pre-set generalisation topic: "What's your favourite movie?" In order to follow a naturalistic pattern of conversational interaction, the researcher responded to this question and asked a follow-up question as per the script. However, this was not scored as the interaction pattern did not adhere to the script. In other words, Sam initiated the question rather than providing an answer and asking a follow-up question.

Additional observations

Throughout the intervention, he continued to initiate interactions based on the pre-developed generalisation scripts, such as "What is your favourite movie?" and "What do you like to do on the weekend?" Sam's sentences were not always grammatically accurate; however, because the aim of the study was to evaluate the participation in reciprocal conversational interaction, grammatically incorrect sentences were given a full score, as long as the sentence was deemed appropriate for the context. For example, Sam asked "What is favourite for weekend?" rather than "What do you like to do on the weekend?" This was given a full score, because the intent of the message was logical.

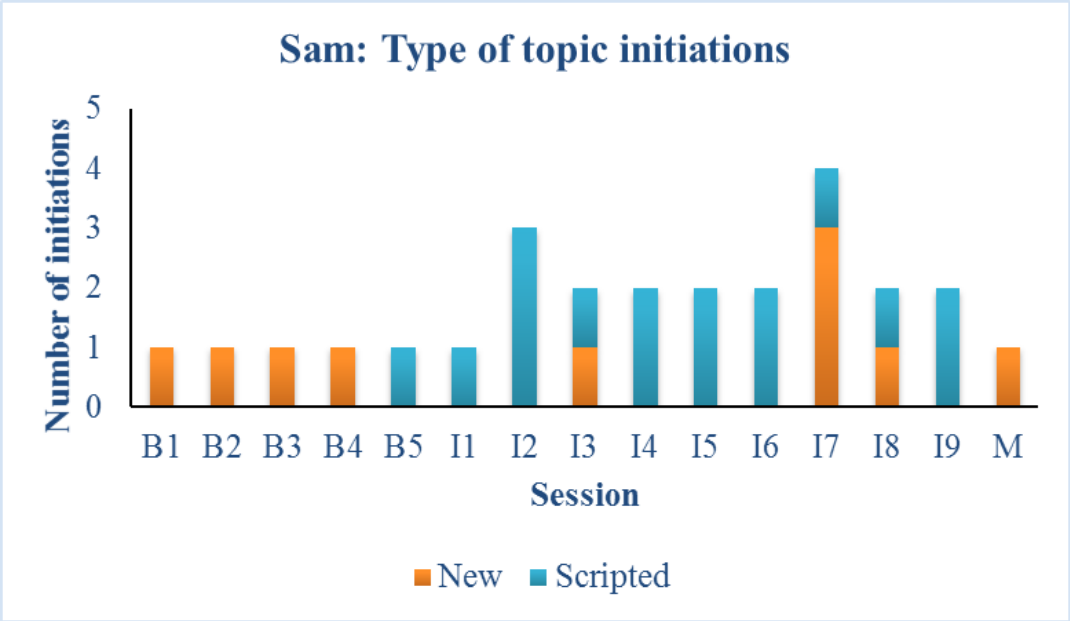

Figure 5.4. Number of independent initiations demonstrated by Sam

Furthermore, Sam also initiated novel topics (i.e., not from the pre-developed scripts). Novel topics mainly revolved around favourite things such as bugs, letters and characters. Sometimes, he started the interaction by asking, "want to hear a story?" or "quiz". Although he initiated new topics, he did not seek to prolong the interaction by maintaining the same topic. He swiftly changed topics by initiating new questions, showing that Sam enjoyed interacting socially. Sam began asking questions and initiating topics on most occasions as soon as the researcher escorted him out of his

classroom. Sam also did not like to take breaks between the interaction and video-viewing session. If he was offered a choice, he would choose to continue the interaction rather than taking a break. Even during the breaks, he would engage in other interactions, by starting a quiz, asking questions, etc.

Prompts

Figure 5.5 represents the number and type of prompts provided to Sam during the intervention period. (See Chapter 3 regarding the prompting hierarchy). The graph depicts a decline in the level of prompts from sessions I1 to I9. In the first two intervention sessions (I1 and I2), Sam required more modelling prompts, and by session I9, no modelling prompts were required. Gestural prompts were required in the sessions I2 and I3 and once again in session I7. Navigational prompts were required in all sessions with the exception of I2 and I6.

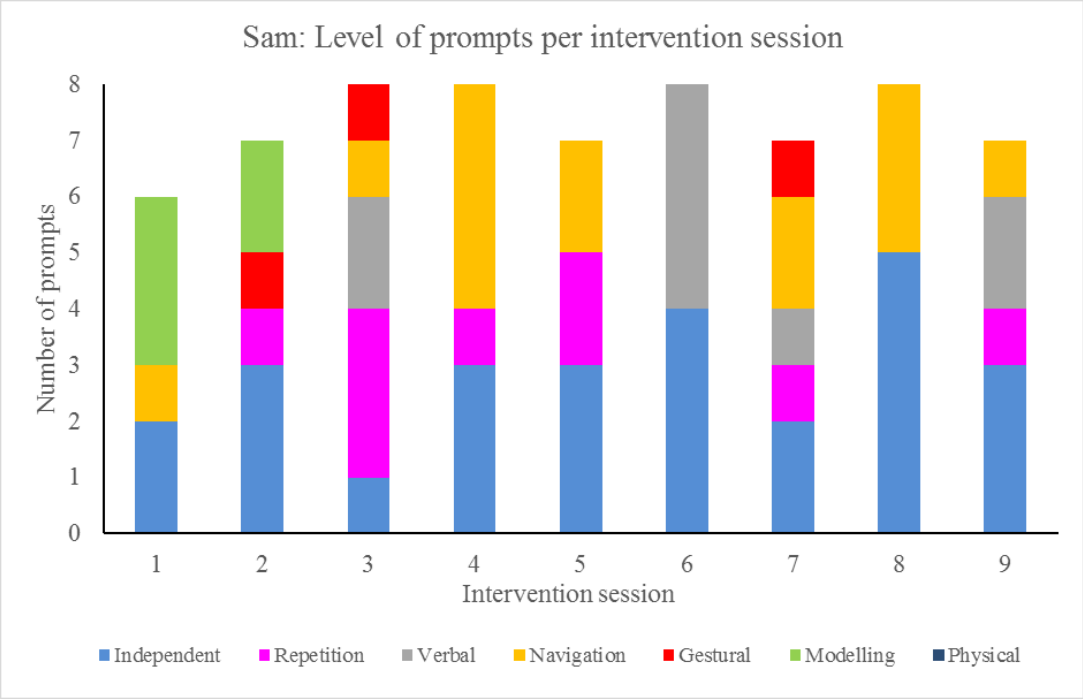

Figure 5.5. Number and type of prompts per intervention session for Sam

Social validity

Sam's teacher watched four video clips of his interaction with the researcher during the baseline, intervention and maintenance sessions, and rated his conversation skills based on the frequency of (a)

initiation, (b) turn-taking, and (c) termination of interaction. His teacher also rated the quality of his overall interaction. Overall, his teacher stated that there was a general increase in the frequency of initiation and turn-taking during the intervention phase for Sam. The interaction was rated on a five-point Likert scale, ranging from 1 = Never to 5= Always/Fluently. (Figure 5.6 represents the scores given by Sam's teacher for the four sessions.)

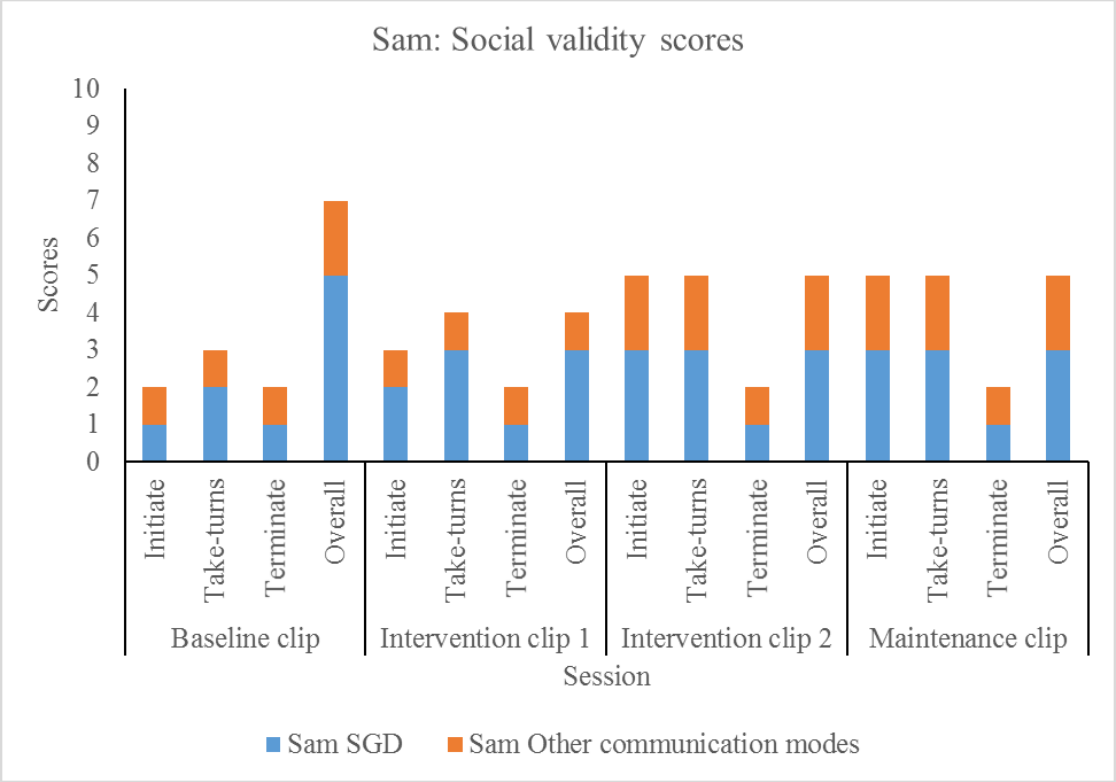

Figure 5.6. Social validity scores for Sam

Sam's class teacher stated that the frequency of Sam's initiation increased progressively using both SGD (average: 2.25; range:1-3) and other modes of communication, such as gestures (average: 1.5; range: 1-2) in the viewed sessions. His teacher also noted that the frequency of turns increased over time. She calculated that Sam took more turns using his SGD (average: 2.75; range 2-3), than other modes of communication (average: 1.5; range: 1-2) in the video clips. She felt that Sam did not terminate the interaction during any of the sessions, which is consistent with the scripted interactions, where no opportunities for termination of interaction were provided. Overall, Sam interacted more

using the SGD (average: 3.5; range 3-5), compared to using other mode of communication (average: 1.75; range: 1-2) in the video clips. Sam's teacher stated that Sam was "Using the device more to express needs and wants – "(he)…told us he is feeling mad at us… thought the SSO was evil".

Lily

Lily demonstrated no changes in the scripted conversational interaction based on the VM or VSM techniques, as can be seen in Figure 5.1. Table 5.7 shows the effect sizes and the upper and lower parameters for the adjusted confidence intervals at 87.89% (Payton et al., 2000) for Lily.

Table 5.7. R-IRD scores for Lily's performance based on the packaged VM and VSM interventions

Intervention	***p***	**R-IRD**	**CI (87.89%)**
Packaged VM	1.00	0.11	[-0.34, 0.53]
Packaged VSM	0.22	0.35	[-0.24, 0.62]

As can be seen in Table 5.7, Lily's performance did not yield any statistically significant differences for packaged VM or VSM interventions. The additional prompts did not have any impact on her conversational interactions, as she required full-physical prompts (i.e., hand-on-hand activation of her speech generating device) to correctly answer and take turns. She did not demonstrate any generalisation. Maintenance measurement could not be conducted due to equipment failure, as reported earlier.

Prompts

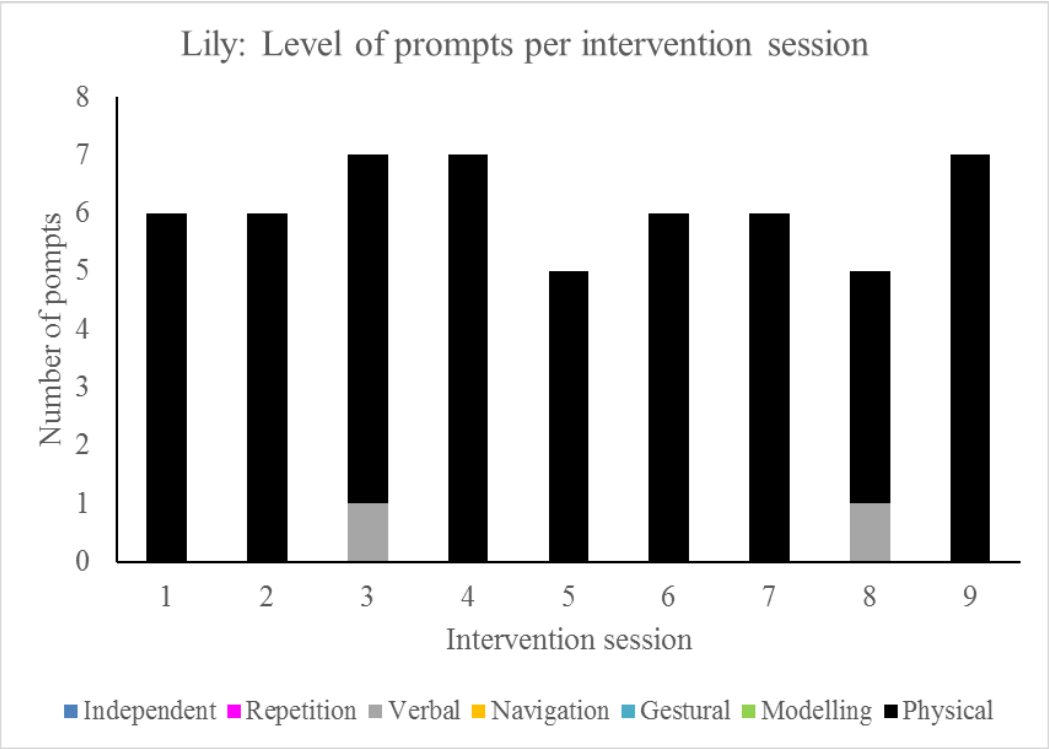

Figure 5.7. Number and type of prompts per intervention session for Lily

Figure 5.7 represents the number and types of prompts required by Lily per session. (See Chapter 3 regarding the prompting hierarchy.) As shown in the graph, Lily required full physical prompts for scripted conversational interaction from sessions 1 to 9. In sessions 3 and 8, a verbal prompt was sufficient for her to provide the correct answer for one of the scripts; however, this did not persist. It is likely that it was a random choice that happened to be the correct answer.

Additional observations

Throughout the sessions (baseline and intervention), Lily initiated some interactions. She often used the iPad to request her favourite cartoon (i.e., "I want my iPad to watch Peppa") or food item. She even made comments such as "I am sad, cold" or one-word utterance like "mean". She also tried to terminate the interaction by pressing "Goodbye" several times.

Social validity

Lily's class teacher watched four video clips of Lily's interaction with the researcher during baseline and intervention sessions, and rated her conversation skills based on the frequency of (a) initiation, (b) turn-taking, and (c) termination of interaction. Her teacher also rated the quality of Lily's overall interaction rated on a five-point Likert scale, ranging from 1 = Never to 5= Always/Fluently. Overall, her teacher stated that there was a general increase in the frequency of initiation during the intervention phase. As the sessions progressed, Lily also indicated her desire to end the interaction, as noted by her teacher.

Lily's class teacher reported that Lily used different modes of communication to initiate interaction during the viewed sessions. Her score for Lily's SGD averaged at 3.75 (range 1-5), and other modes of communication averaged at 3.5 (range 3-5). As the sessions progressed, Lily's SGD use for initiation increased. Her teacher also reported that the frequency of turns increased over time. She noted that Lily used other modes, such as gestures (average: 2.5; range: 2-4) slightly more than the SGD (average: 2; range: 1-4) during the viewed sessions. Lily mainly terminated the interaction using other modes of communication (average: 3.25; range: 1-5) in the video clips. The teacher felt that overall, Lily interacted more using the SGD (average: 3; range 1-5), compared to using other modes of communication (average: 2.25; range: 1-4) in the video clips.

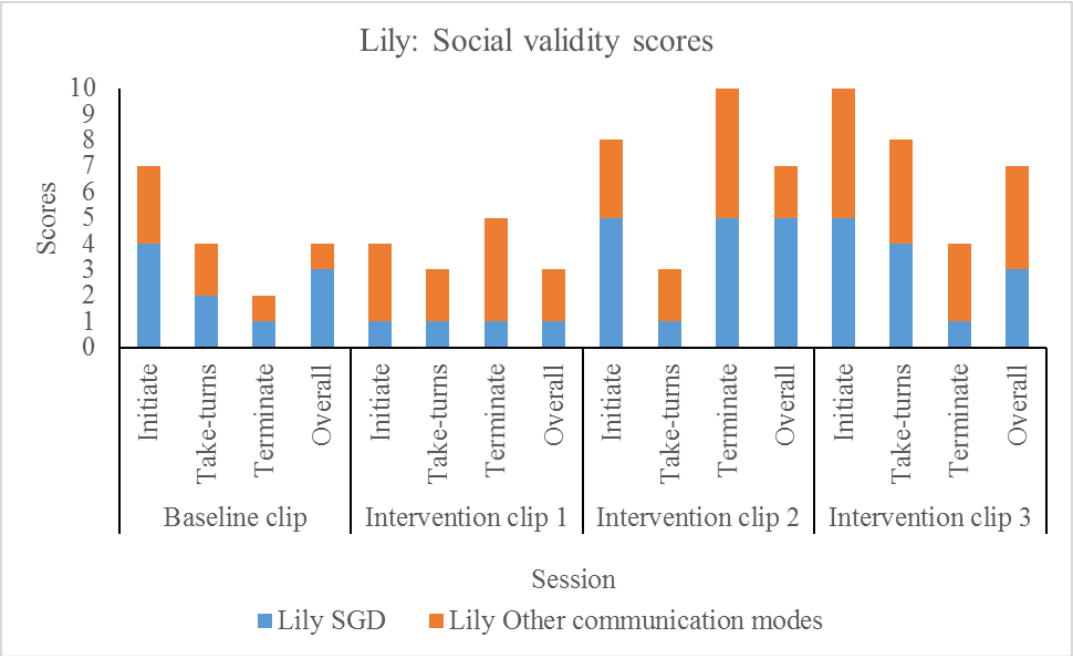

Figure 5.8. Social validity scores for Lily

Her teacher reported that Lily showed more interest in the SGD following the interventions. She remarked that "Prior to engaging in the project, [Lily] was restricted to what she wanted to communicate on the iPad and required assistance to communicate on the iPad for differing purposes. After the project [Lily] has shown answer to questions and is independently initiating conversations".

Summary

In summary, the findings of main study 1 showed that the packaged VM and VSM were effective to facilitate conversation skills for one participant. For Sam, the packaged VSM yielded greater intervention effects than VM. Sam required more intrusive prompts, such as modelling or navigational prompts in the earlier intervention sessions to learn appropriate navigational pathways to access the required vocabulary to take turns in conversational interaction. Although Sam required prompts throughout the intervention period, he mainly needed them to redirect his attention to the task. The VM and VSM interventions yielded small treatment effects on Sam's independent conversational interactions.

Lily did not demonstrate any effects with regards to both packaged VM and VSM interventions. She required full-physical prompts throughout the intervention period to interact.

The teachers of both participants judged them to be more interactive after participating in the intervention. The teachers reported that both participants demonstrated increased interest in using and exploring folders within the communication device. The social validity scores for Lily must be interpreted with caution given her teacher has rated her interactions highly, despite Lily not performing well during the intervention. It is important to note that her teacher's higher ratings were for Lily's use of other communicative modes, such as vocalisations and gestures. Furthermore, the teacher rated Lily's interaction overall, and not just in the scripted conversation. Therefore, any communicative behaviours displayed by Lily, such as requesting her cartoons, or saying "goodbye" and "go" were included in the teacher's rating.

CHAPTER 6: STUDY 2

This chapter presents the results of Study 2. Firstly, specific Method related details, which were not covered in Chapter 4 (General Method), including participant demographics and specific procedural information (e.g., settings description, intervention start points, and break duration) will be presented. Next, the inter-observer reliability and treatment fidelity outcomes will be reported. Finally, the results of Study 2, including social validity outcomes, will be presented in order of participants

Method

Participant characteristics

Two participants, Dan[3] and Pete[3] met the eligibility criteria. Both attended the same special school. (Their descriptive characteristics are presented in Table 6.1.)

Dan

Dan was an 18-year-old male with a diagnosis of ASD. Dan exhibited echolalia, and could speak three-word sentences. According to PPVT-4 (Dunn & Dunn, 2007) assessment scores, Dan's language age was equivalent to 2;3 years. Dan also exhibited behaviours of concern like snapping pencils and rulers, and tipping water on people. Furthermore, he engaged in compulsive skin picking mannerisms. From observation, Dan was happy to work one-on-one with the researcher, but did not intentionally engage with other students in the class; he was often by himself. His topics of interest were Teletubbies and food. At the time of this study, Dan was assigned a speech pathologist. However, the clinician did not have any one-on-one contact with Dan. The therapist mainly worked with Dan's mother with the set up and maintenance of the AAC device.

Dan used two versions of the Proloquo2Go™ application. At school, he used the class iPad with the Proloquo2Go™ application. This was set up using the intermediate core-vocabulary template in

[3] Pseudonym

a 7X7 grid. The school did not permit any addition of extra vocabulary or modification of the application. His iPad mini was personalised and organised categorically. Each folder represented a phrase (e.g., “I want”, “I need”, “I feel”). His mother permitted inclusion of additional vocabulary on his personal Proloquo2Go™; therefore, the researcher was able to include the required vocabulary on his customised template prior to recording the VSM clips. (See Table 6.1 for information about Dan’s AAC system.) During the baseline phase, Dan used his personalised Proloquo2Go™. However, he had a tendency to delete the application or the users within the application despite various attempts to lock and restrict deletion. The backups could not be restored. As such, for the period of the intervention, Dan used the standardised Proloquo2Go™ 7X7 core template on the researcher’s iPad.

Pete

Pete was an 11-year-old male with a diagnosis of ASD. Pete exhibited echolalia. He used mostly one-word utterances. According to the PPVT-4 (Dunn &Dunn, 2007) assessment scores, Pete’s language age was equivalent to 2;5 years. Pete also exhibited some behaviours of concern, including screaming and hitting. He seemed to enjoy using the iPad either to explore the Proloquo2Go™ or to engage in other activities like playing games, watching video clips, etc. He did not seem to engage or socially interact with other classmates and preferred playing with or using the iPad alone. At the time of this study, Pete did not have a personal Proloquo2Go™ and used the application on the class iPad. (See Table 6.1 for information about Pete’s AAC system.) He demonstrated a desire to explore and listen to the voice output from the app and then repeated the words verbally.

The school did not permit any addition of specific words required for the project on the class app. Therefore, Pete used the standardised Proloquo2Go™ 7X7 core template on the researcher’s iPad. Pete was not receiving any speech therapy at the time of this study.

Table 6.1. Participant characteristics – Study 2

Participants	Age	Sex	Language age equivalence[#]	Self-recognition	AAC	Other communication characteristics
Dan[3]	18;0	M	2;3	100%	• Proloquo2Go™ on his iPad mini was personalised and categorically organised.	• Echolalic. • Able to navigate through the more complex school folder and formulate three-word sentences to express what he wanted. Most of his sentences started with "I want" and ended with "please".
Pete[3]	11;0	M	2;5	100%	• Proloquo2Go™ on school iPad was set up in an intermediate core-vocabulary template in a 7X7 grid.	• Echolalic. • Spell out names of things that interested him on a QWERTY keyboard.

[#] Language age equivalence was derived from the PPVT-4 (Dunn &Dunn, 2007) (Form B)
[3] Pseudonym
[3]

Setting

Dan's sessions were conducted in the computer area of a storage/work room located close to his classroom. There was a table in the middle of the room with chairs. The researcher and the participant sat in chairs next to each other. The researcher allowed the participant to choose his preferred seat, before proceeding to sit next to him.

Pete's sessions were conducted in an activity room located directly opposite his classroom. There was a small working table in the middle of the room with chairs. The researcher and the participant sat opposite each other. The researcher allowed the participant to choose his preferred seat, before proceeding to sit opposite him.

All the school staff were encouraged to use the Proloquo2GoTM application to model language to the students. As such, every classroom had multiple iPads with the Proloquo2GoTM application, set up in a generic 5X9 grid with the intermediate core vocabulary template. Furthermore, the use of the communication application was embedded in all classroom activities.

Procedure

Dan progressed to the intervention phase after five consecutive baseline measures whilst Pete remained in the baseline phase for two additional probe sessions. Generalisation measures were conducted at every session. Maintenance assessment was conducted two weeks following the termination of the intervention. All the sessions were videotaped. The video camera was positioned on a tripod in the corner of the room. A detailed description of the procedural steps was outlined in Chapter 3. Following on from the previous study, some changes were made to this study, including:

- The researcher modelled her own answers using the Proloquo2Go™ on the same device.
- The duration of a break between engaging in a script and watching the next video-clip was fixed at one minute, and both participants were offered breaks regardless of whether or not they were requested.

Data analysis

Inter-observer reliability (IOR)

Average overall IOR for prompted conversational interaction score for Study 2 was 84.4%. (The individual scores are listed in Table 6.2.)

Table 6.2. IOR information for Study 2

Participant	**IOR (%)**			
	Total	Answers	Turns	Prompts
Dan	75.0	81.8	87.5	71.9
Pete	93.8	100.0	93.8	93.8
Average	84.4	90.9	90.7	82.3

The total number of pre-developed scripts included two for VM, two for VSM and four for generalisation measures, totalling eight pre-developed scripted conversational interactions per session. For both participants, IOR was conducted for four sessions (i.e., 20% of sessions across different phases), namely one baseline measure, two intervention sessions and one maintenance session. This resulted in a total of 32 interactions. For Dan, the overall IOR score was (24/32) X 100% = 75%, and for Pete, the overall IOR was (30/32) X 100% = 93.75%. (Table 6.3 provides a breakdown of the individual IOR scores for each participant.)

Treatment fidelity

Average treatment fidelity score for Study 2 was 97.2%. (The individual scores are listed in Table 6.3.)

Table 6.3. Treatment fidelity scores for Study 2

Participant	Baseline	VM	VSM
Dan	100%	100%	100%
Pete	87.5%	100%	95.75%

Treatment fidelity assessment was conducted for one baseline measure, two intervention sessions for both VM and VSM respectively, totalling 24 scripts. Components that were only relevant for the first and final scripts, such as ensuring the device was set up and informing the participants that the session is completed and they can return to class, were not included in the score as these were not relevant for between scripts.

Results

The findings showed that both participants demonstrated a positive intervention effect following the packaged video-based modelling (VM and VSM) interventions. The participants showed greater effect size for VSM plus prompts than for VM plus prompts, with varying levels of effectiveness. Results will be presented for each participant separately. (Figure 6.1 displays the percentage of prompted conversational interaction for Dan and Pete.)

Dan

Dan demonstrated a positive effect for both intervention packages, with a larger effect for the packaged VSM intervention. (Table 6.4 displays the effect size scores and the upper and lower parameters for the adjusted confidence intervals at 87.89% (Payton et al., 2000)(Payton et al., 2000).)

Table 6.4. R-IRD scores for Dan's performance based on packaged VM and VSM interventions

Intervention	***p***	**R-IRD**	**CI (87.89%)**
Packaged VM	0.02	0.69	[0.12, 0.96]
Packaged VSM	0.00	0.84	[0.28, 1.00]

Both interventions demonstrated immediacy of effects, comparing the last data point at baseline and the first data point in intervention phases. Figure 6.1 shows a 24% increase in the mean across baseline and intervention phases for the packaged VM intervention (M_B =10%; M_I =34%); and a 25% increase in the mean across the baseline and intervention phases for the packaged VSM intervention (M_B = 5%; M_I =30%). Although, Dan achieved a higher percentage of prompted conversational interaction with VM, there was relatively more data overlap between baseline and intervention phases for VM, compared to VSM. Therefore, the intervention effects were greater for the packaged VSM compared to the packaged VM intervention.

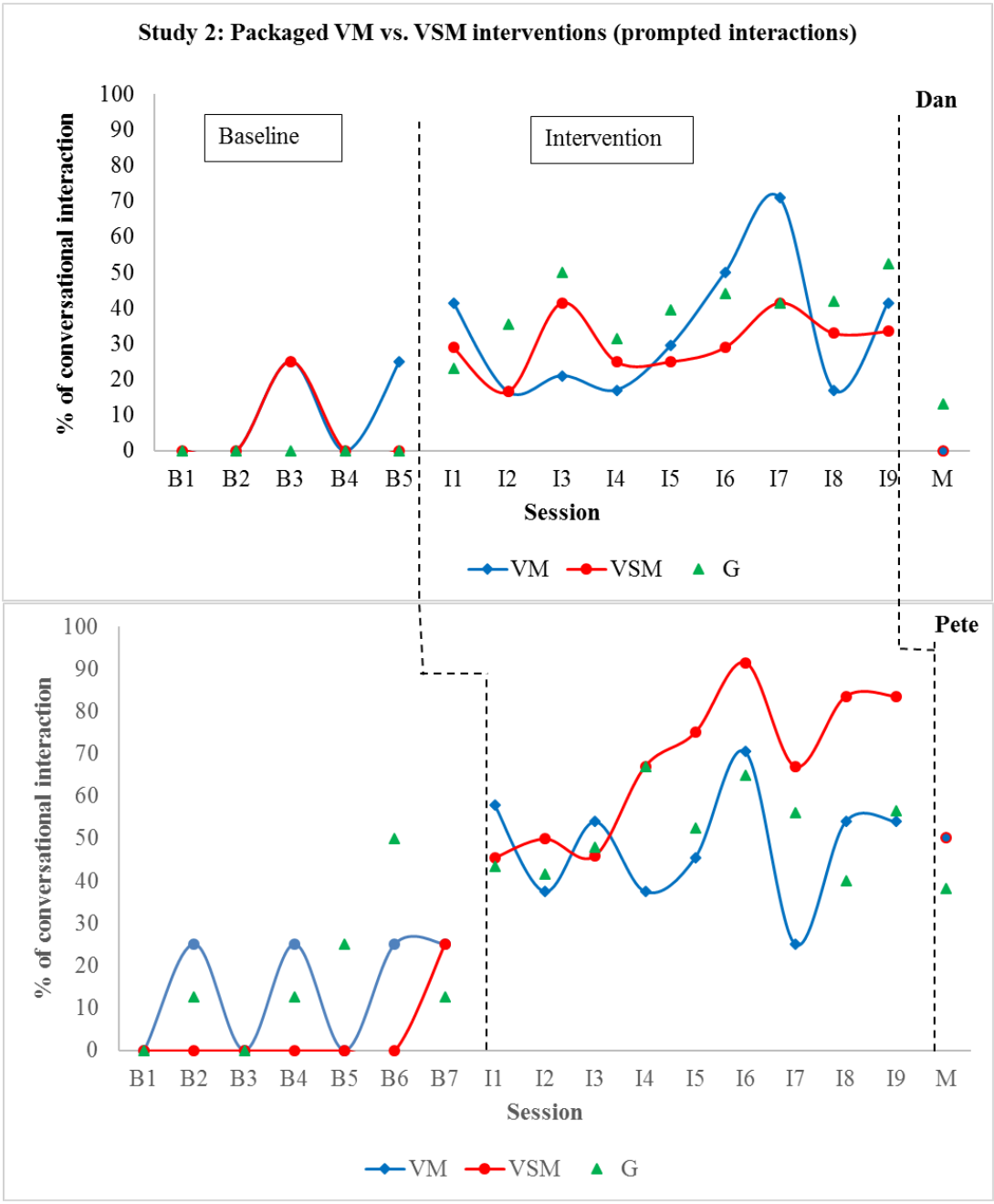

Figure 6.1. Average percentage of prompted conversation interaction for Dan and Pete

Video modelling (VM)

Overall, the packaged VM intervention showed a moderate effect, R-IRD = 0.69 [0.12, 0.96], with statistically significant results (p = 0.02) (see Table 6.4). Dan's baseline performance was variable. In sessions B3 and B5 in Figure 6.1, he had an average independent score of 25% respectively, with no independent conversational interactions during the other three baseline sessions. Nonetheless, Dan did not demonstrate any independent turn-taking ability during baseline. Figure 6.2 demonstrated a substantial increase in performance as soon as the intervention commenced. In the first intervention session (I1), Dan's performance of prompted conversational interaction increased by 17%. However, the pattern was inconsistent. After three fluctuating scores between sessions I2 and I4, there was a consistent increase in his prompted performance peaking at 71% in session I7, before decreasing to 17% in session I8 and then increasing slightly to 42% in the final intervention session (I9). Dan did not demonstrate maintenance of skills for the VM topics.

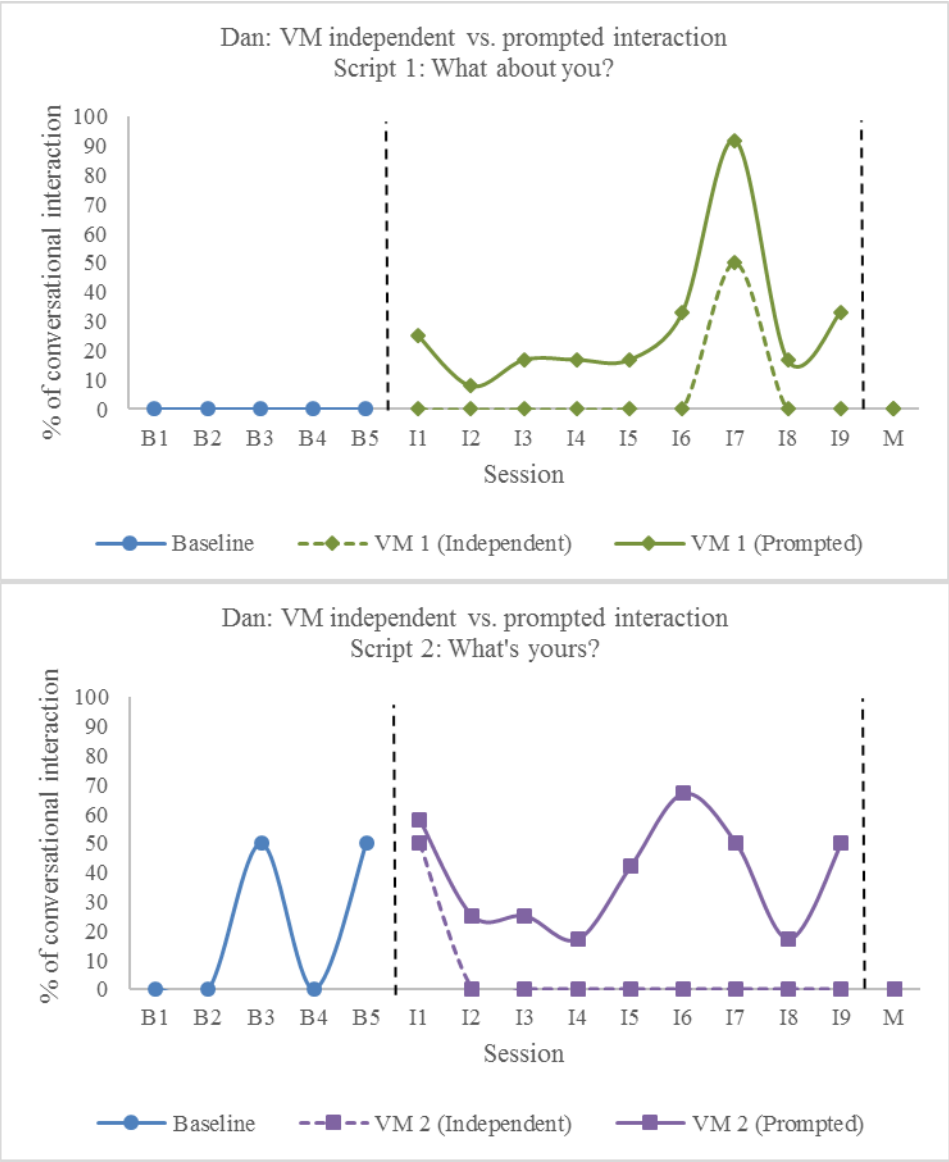

Figure 6.2. Comparison between independent versus prompted conversational interactions for Dan, following the VM intervention

Two scripts were trained using the packaged VM intervention. Visual analysis of the individual graphs showed an overall upward trend in Dan's prompted performance for Script 1, but no trend for Script 2. (Table 6.5 displays the effect size for both the independent and prompted conversational interactions for Scripts 1and 2.)

Table 6.5. R-IRD scores for Dan's performance in each script following the VM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	0.58	0.00	0.00	0.02
R-IRD	-0.24	1.00	-0.71	0.69
CI (87.89%)	[-0.53,0.37]	[0.46,1.00]	[-0.56,-0.16]	[0.12,0.96]

VM Script 1

Independent performance

As can be seen from Figure 6.2, Dan did not independently answer or take turns during baseline for Script 1. No change was noted in the independent answers or turns following the intervention. The R-IRD score for Dan's independent performance in Script 1 showed no treatment effects, indicating a high level of overlap between baseline and intervention phases (see Table 6.5). There was a sudden peak in session I7 in Figure 6.2, where he answered the question independently, but did not take his turn. His performance returned to the baseline level in sessions I8 and I9. He also did not demonstrate any independent conversational interaction in the maintenance phase.

Prompted performance

As expected, the additional prompts increased his performance in VM Script 1, however, he failed to reach criterion throughout the intervention period (100% independent conversational interaction). Nonetheless, the R-IRD for the prompted conversational interactions estimate revealed full data-separation between baseline and intervention phases (R-IRD = 1.00) (see Table 6.5). Yet he did not demonstrate the learnt skill during the maintenance phase, two weeks post intervention (0%).

VM Script 2

Independent performance

Dan's independent performance in VM Script 2 indicated no treatment effects, as reflected by the R-IRD score. Dan independently answered the researcher's questions twice in sessions B3 and B5 during baseline, but he did not independently take conversational turns. With the exception of I1, his performance from sessions I2 to I9 was at baseline level (0% independent conversational interaction). Dan did not demonstrate any independent conversational interaction during the maintenance phase

(0%).

Prompted performance

Despite exhibiting expected improvements in prompted performance, Dan failed to reach criterion throughout the intervention period. His R-IRD scores for prompted conversational interactions revealed some degree of data overlap between baseline and intervention phases (R-IRD = 0.69). Dan did not demonstrate maintenance of learnt skills, two weeks post intervention (0%) as seen in Figure 6.2.

Video self-modelling (VSM)

Overall, the packaged VSM intervention demonstrated a large effect on Dan's performance, R-IRD = 0.84 [0.28, 1.00], and this result was statistically significant (p = 0.00). Dan did not demonstrate any independent conversational interactions during the baseline phase, except for I3, with an average score of 25% for independently answering the scripted question. Overall, there was a fluctuating trend in his performance following the introduction of the packaged VSM intervention. After an initial 25% increase in I1, there was a slight decrease in I2. His performance peaked at an average 42% of prompted conversational interactions in I3 and I8. Dan did not demonstrate maintenance of the gains made previously in the VSM trained topics (0% conversational interactions) as can be seen in Figure 6.3 below.

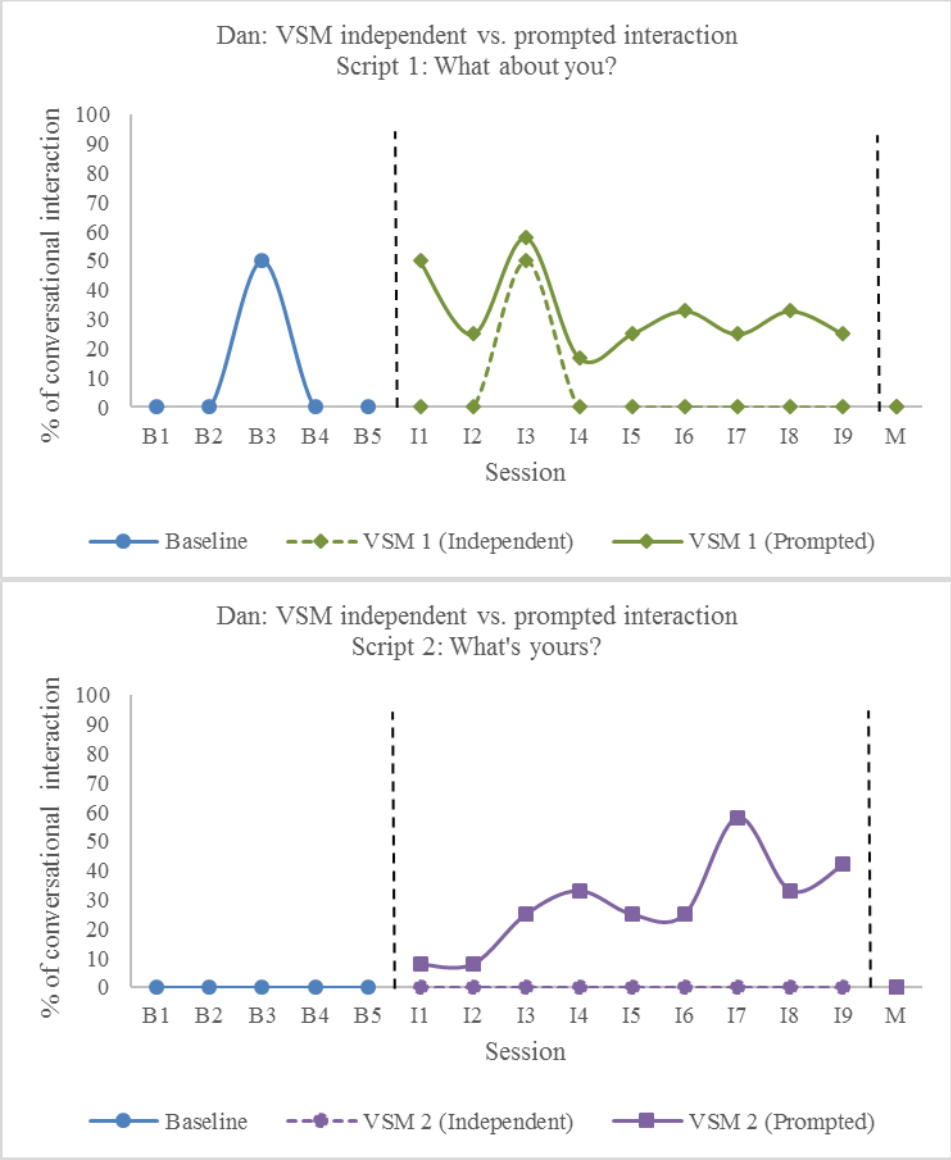

Figure 6.3. Comparison between independent versus prompted conversational interactions for Dan, following the VSM intervention

The packaged VSM intervention also involved two scripted conversational interactions. Variability in performance was noted in both scripts. (The effect size for both independent and prompted conversational interactions for each script is displayed in Table 6.6.)

Table 6.6. R-IRD scores for Dan's performance in each script following the VSM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	0.09	0.00	1.00	0.00
R-IRD	-0.40	0.84	0.00	1.00
CI (87.89%)	[-0.56, 0.17]	[0.28, 1.00]	[0.00,0.00]	[0.46,1.00]

VSM Script 1

Independent performance

Overall, Dan did not demonstrate any independent performance in VSM script 1, except for a sudden, short-lived increase in session I3. He did not demonstrate any independent conversational interaction in the maintenance phase (0%). The R-IRD score for Dan's independent conversational interaction in script 1 showed low treatment effects, indicating high levels of overlap between baseline and intervention phases.

Prompted performance

As expected, the additional prompts had an impact on his overall performance, leading to more interactions. Yet, there was no complete data separation between baseline and intervention phases. There was an immediate treatment effect following the introduction of the prompts. Overall, there was an upward trend in his prompted conversational interactions. As mentioned earlier, there was no intervention effect in the maintenance phase (0% conversational interaction).

VSM Script 2

Independent performance

Dan's independent performance in VM script 2 also showed no treatment effects. He neither answered questions nor took turns independently (0% independent conversational interaction). There was complete data overlap between baseline and intervention phases. Dan demonstrated no intervention effect in the maintenance phase.

Prompted performance

As expected the additional prompts increased Dan's performance in VSM script 2, and generated

complete data separation (i.e., R-IRD = 1.00). There was a small, yet immediate treatment effect when the prompts were introduced. However, Dan failed to reach criterion throughout the intervention period. As mentioned earlier, there was no intervention effect in the maintenance phase (0%).

Generalisation

The data showed changes during the generalisation assessments throughout the intervention, as can be seen from the complete data separation in Figure 6.1. However, throughout the intervention phase, Dan only responded to questions independently, but failed to take-turns to maintain the interaction. Dan did not demonstrate any intervention effect in the maintenance phase (0%). Overall, there was a 40% increase in the mean across the phases for the prompted conversational interaction (M_B = 0%; M_I =39.9%).

Additional observations

As mentioned above (see participant characteristics), Dan often began his sentences at the start of the study with "I want" and ended with "please". However, as the sessions progressed, he also started to use "I like…". He was prompt dependent and would frequently look at the researcher's face to guess which phrase he should use, either "I want" or "I like". Furthermore, Dan also initiated asking for "help" as the sessions progressed. For example, on some occasions when he did not know where to locate the "answer" to the posed question, he pushed the device towards the researcher and provided eye contact. A few times, the researcher interpreted this as a request for help, and modelled the way to request for help, by pressing the "help" key. From then, Dan independently pressed the "help" button.

Prompts

Figure 6.4 represents the number and type of prompts required by Dan during the intervention period. (See Chapter 3 regarding the prompting hierarchy.) The graph depicts a decline in the level of intrusive prompts from sessions I1 to I9. The most intrusive prompt was the model prompt, which

was needed throughout the intervention period. However, the number of times Dan required this prompt decreased as the intervention progressed. As the sessions progressed he was also able to provide appropriate answers to gestural prompts.

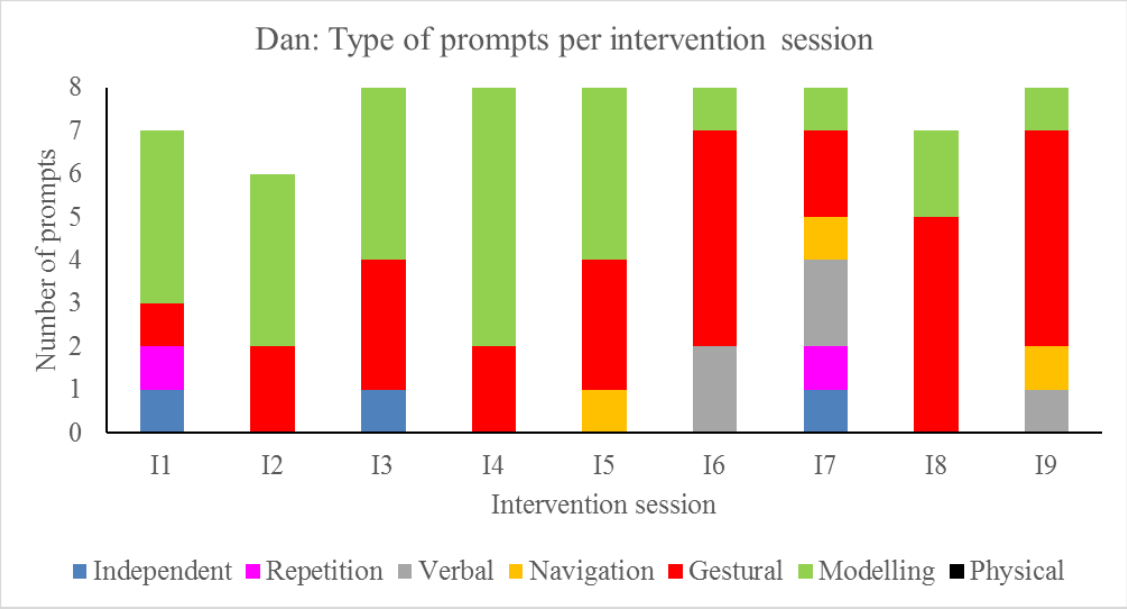

Figure 6.4. Number and type of prompts used per intervention session for Dan

Social validity

Dan's teacher watched four video clips of his conversational interactions with the researcher in the baseline, intervention and maintenance sessions, and rated his conversational skills based on frequency of (a) initiation, (b) turn-taking, and (c) termination of interaction. His teacher also rated the quality of his overall interaction. Overall, there was an increase in the frequency of turn-taking as sessions progressed. The interaction was rated on a five-point Likert scale, ranging from 1 = Never to 5 = Always/Fluently. (Figure 6.5 represents the scores given by Dan's teacher for the four sessions.)

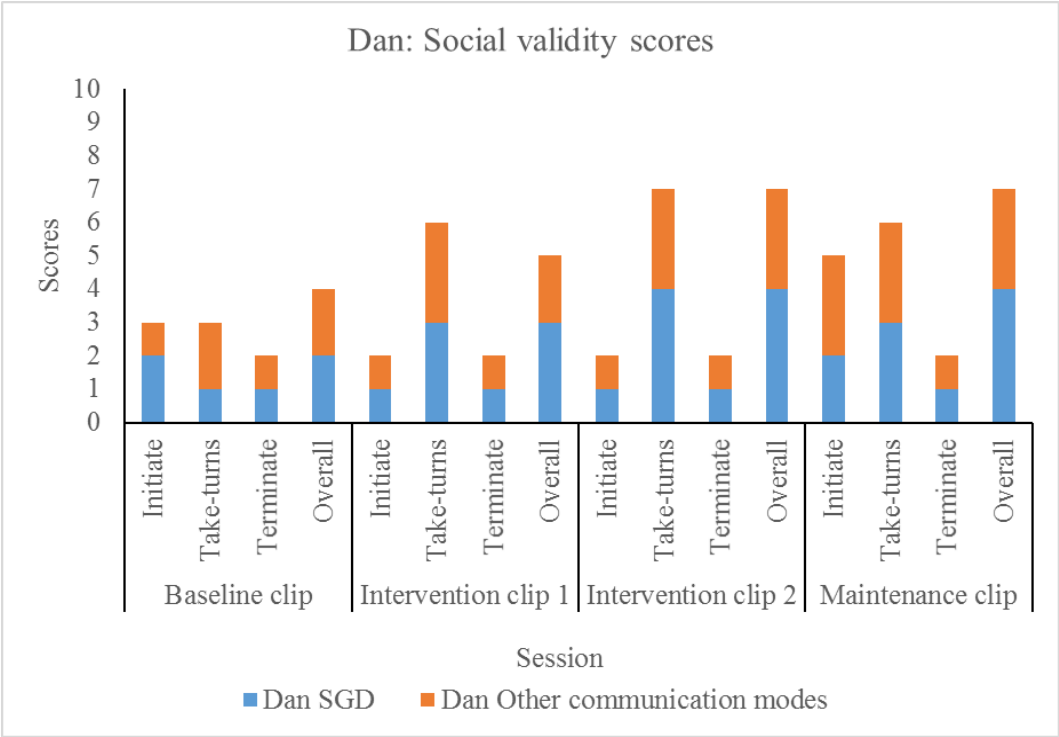

Figure 6.5. Social validity scores for Dan

Dan's class teacher stated that Dan rarely initiated interaction, using either SGD (average: 1.5; range: 1-2) or other modes of communication (average: 1.5; range: 1-3) during the viewed sessions. His teacher also judged that the frequency of turns increased over time. She rated Dan using both modes of communication equally, SGD and other, averaging at 2.75 (range: 1-4). She stated that Dan did not terminate the interaction during any of the sessions, which is consistent with the scripted interactions, where no opportunities for termination of interaction were provided. The teacher judged that overall, Dan interacted more using the SGD (average: 3.25; range 2-4), compared to using other modes of communication (average: 2.5; range: 2-3) in the video clips. In general, Dan's class teacher reported that Dan's interest and keenness to use the SGD for communication increased after the intervention. She stated: "[Dan] Used P2G more frequently and confidently. Needed a lot of prompting (before). Exploration increased."

Pete

Both intervention packages yielded positive effects on Pete's conversational interaction. Table 6.7 details the effect size scores and the upper and lower parameters for the adjusted confidence intervals at 87.89% (Payton et al., 2000).

Table 6.7. R-IRD scores for Pete's performance based on the packaged VM and VSM interventions

Intervention	***p***	**R-IRD**	**CI (87.89%)**
Packaged VM	0.00	0.87	[0.39, 1.00]
Packaged VSM	0.00	1.00	[0.55, 1.00]

Figure 6.1 shows a 34% increase in the means across the baseline and intervention phases for the packaged VM intervention (M_B =14%; M_I =48%); and a 64% increase across baseline and intervention phases for the packaged VSM intervention (M_B = 4%; M_I =68%). Pete did not demonstrate any independent turn-taking abilities in the baseline phase.

Video modelling (VM)

Overall, the packaged VM intervention showed a very large effect, R-IRD = 0.87 [0.39, 1.00], and the findings were statistically significant (p = 0.001). Pete's independent conversational interactions in the baseline phase were variable and fluctuated between zero and 50%. There was an overall upward trend during intervention; however, the pattern of performance fluctuated. His performance in prompted conversational interaction peaked in session I6, averaging at 71% and then decreased in I7 to 25%. It then increased during sessions I8 and I9, averaging at 54% of prompted conversational interactions. There was a small, 4% decrease in his performance on the packaged VM trained topics during the maintenance phase (See Figure 6.1).

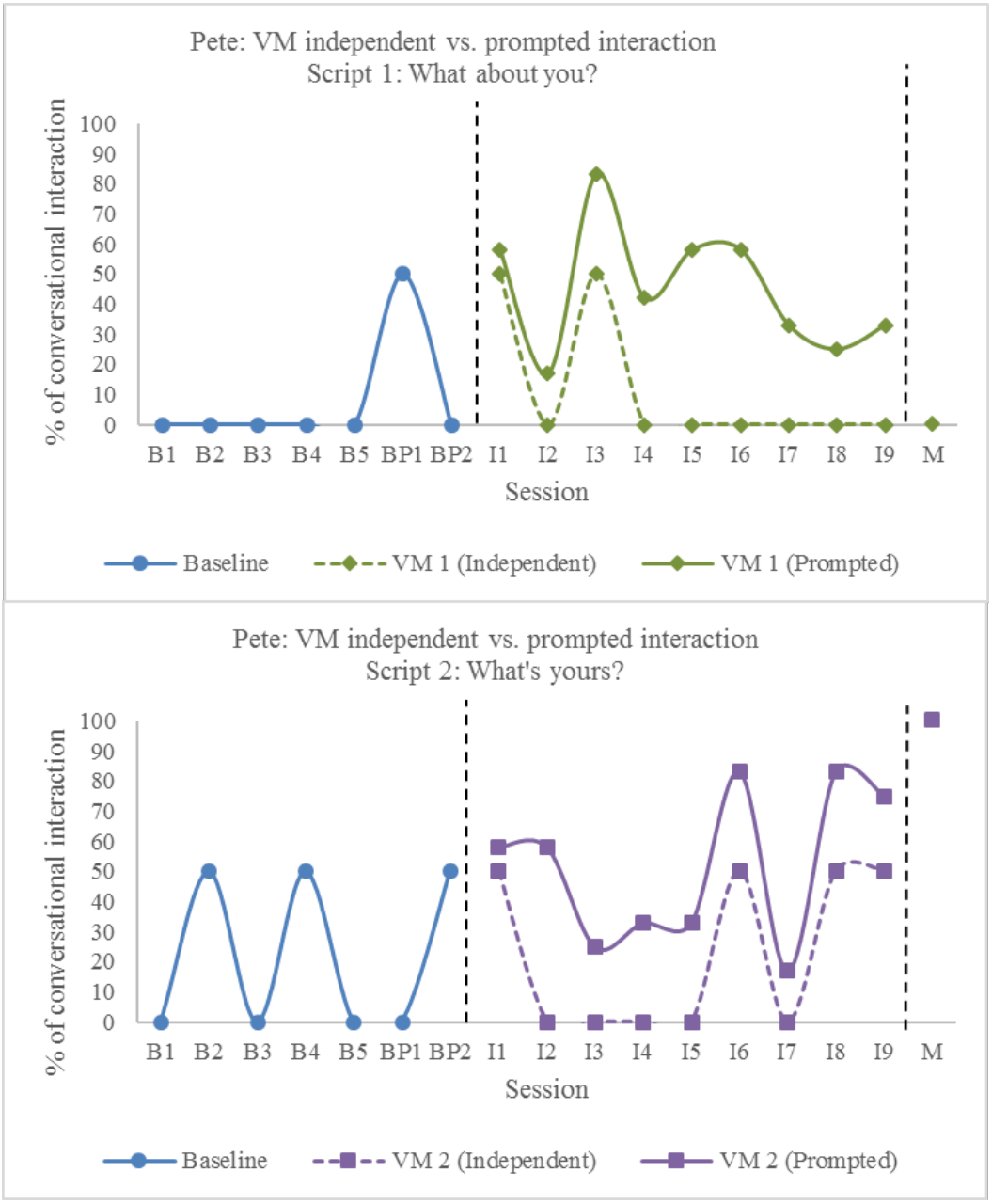

Figure 6.6. Comparison between independent versus prompted conversational interactions for Pete, following the VM intervention

Two scripts were trained using the packaged VM intervention. The respective graphs in Figure 6.6 showed an overall upward trend in Pete's prompted conversational interaction for script 1, but no distinct trend for script 2. (Table 6.8 displays the effect size for both the independent and prompted conversational interactions for Scripts 1 and 2.)

Table 6.8. R-IRD scores for Pete's performance in each script following the VM intervention

	Script 1		**Script 2**	
	Independent	Prompted	Independent	Prompted
p	1.00	0.00	1.00	0.01
R-IRD	-0.02	0.87	-0.02	0.62
CI (87.89%)	[-0.47,0.46]	[0.39,1.00]	[-0.47,0.46]	[0.11,0.91]

VM Script 1

Independent performance

The R-IRD score (detailed in Table 6.8) for Pete's independent performance in script 1 showed no treatment effect, indicating a high level of overlap between baseline and intervention phases. As can be seen in Figure 6.6, there was no distinct trend in Pete's independent conversational interaction for script 1. There was a sudden peak in session I3, but he did not maintain this level of performance in the following sessions. He also did not demonstrate any improved performance in the maintenance phase compared to the baseline.

Prompted performance

As expected, the additional prompts increased his overall performance. Yet, there was no complete data separation between baseline and intervention phases. There was an immediate treatment effect when prompts were introduced during the intervention. As mentioned above, Pete did not demonstrate any improved performance in the maintenance phase (0%).

VM Script 2

Independent performance

Pete's independent performance in VM script 2 also indicated no treatment effects. There was complete data overlap between baseline and intervention phases. Overall, there was a fluctuating pattern between answering questions (50% independent conversational interactions) and not responding at all (0% independent conversational interactions) (See Figure 6.6). Nonetheless, Pete demonstrated maintenance of learnt skills two weeks post-intervention (100% independent conversational interaction), as displayed in Figure 6.6.

Prompted performance

Even though the additional prompts led to an improved performance in VM script 2, Pete did not reach criterion (100% independent conversational interaction) during the intervention sessions. The overall pattern was fluctuating. Albeit small, there was an immediate treatment effect following the introduction of the prompts. Pete demonstrated maintenance of interaction skill two weeks post intervention (100% independent conversational interaction).

Video self-modelling (VSM)

Overall the packaged VSM interventions demonstrated very large effects on Pete's performance, IRD = 1.00 [0.55, 1.00] as there was no overlap between his performances in prompted conversational interaction at baseline versus intervention (See Figure 6.1). The results were statistically significant (p = 0.00). Pete did not demonstrate any independent conversational interaction during the baseline phase, except for one peak in the final baseline measure (BP 2), with an average score of 25%. Overall, there was an upward trend in his performance following the introduction of intervention, and no overlap in his performance between baseline and intervention phases. After an initial 21% increase in session I1, he continued to improve, with his performance peaking at 92% for prompted conversational interactions in I6, before decreasing slightly to 67% for prompted conversational interactions in I7 and increased again to 84% for prompted conversational interactions in sessions I8 and I9 respectively. There was a substantial decrease to 34% for prompted conversational interaction during maintenance.

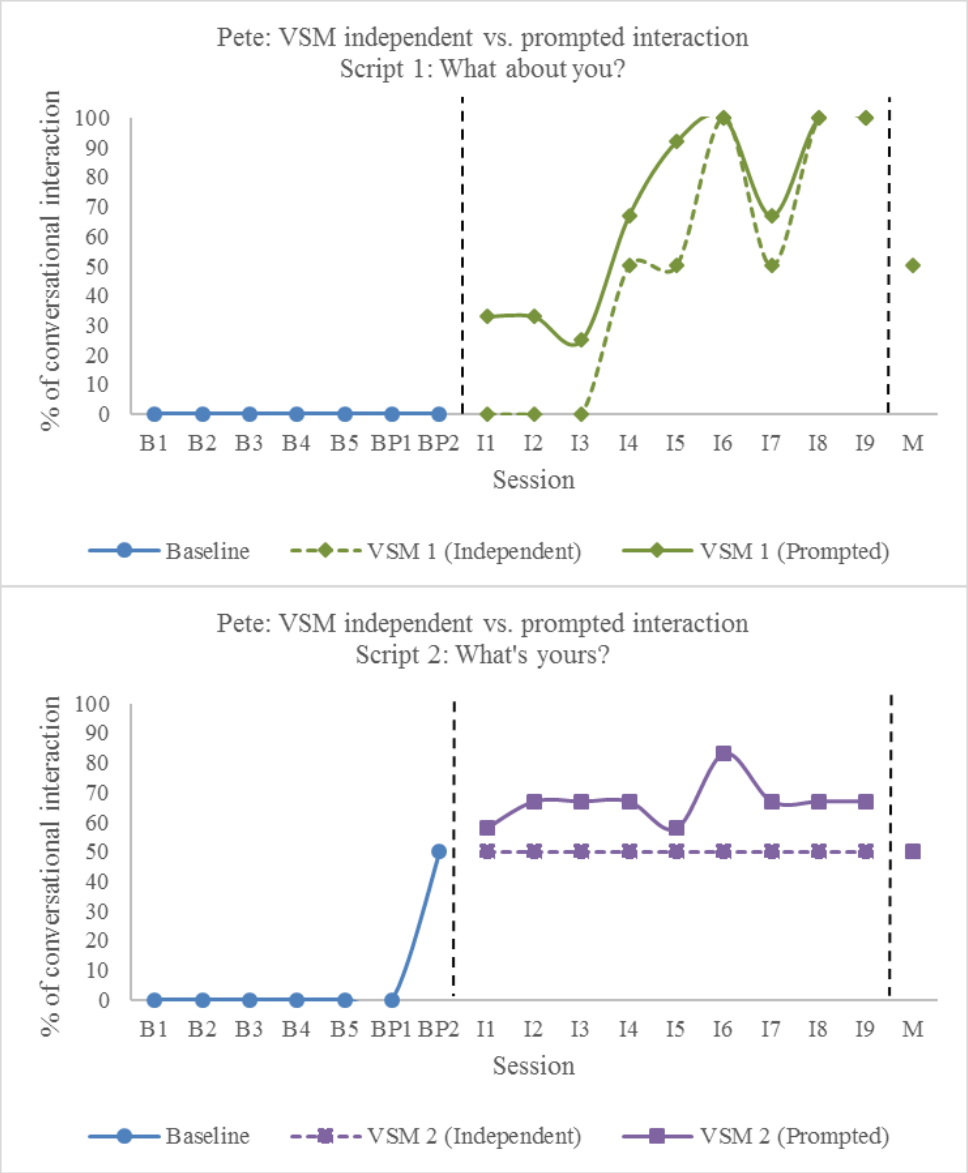

Figure 6.7. Comparison between independent versus prompted conversational interactions for Pete, following VSM intervention

The packaged VSM intervention also involved two scripted conversational interactions. Variability in performance was noted for both scripts. The immediacy of intervention effects was enhanced by the additional least-to-most instruction. The effect size for both the independent and prompted conversational interactions for each script is detailed in Table 6.9.

Table 6.9. R-IRD scores for Pete's performance in each script following the VSM intervention

	Script 1		Script 2	
	Independent	Prompted	Independent	Prompted
p	0.09	0.00	0.00	0.00
R-IRD	0.62	1.00	0.87	1.00
CI (87.89%)	[0.11,0.91]	[0.55,1.00]	[0.39,1.00]	[0.55,1.00]

VSM Script 1

Independent performance

Overall, Pete's independent performance for script 1 showed an upward trend. The R-IRD score for Pete's independent performance showed moderate treatment effects, indicating some levels of overlap between baseline and intervention phases. There was also a three-point overlap these phases. There was a gradual increase from session I3 and by I6, he achieved criterion (100% independent conversational interaction). Although his performance in the maintenance phase decreased slightly, his performance was still higher than it was at baseline (50%).

Prompted performance

As expected, his overall performance improved with the introduction of the additional prompts. The R-IRD scores revealed complete data separation between baseline and intervention phases for VSM script 1. There was an immediate treatment effect following the introduction of the prompts. As mentioned above, in session I6, Pete did not require any additional prompts to answer questions and take turns in VSM Script 1. Although there was a slight decrease in I7, his performance returned to 100% independent conversational interaction in sessions I8 and I9. As mentioned above, there was a slight decrease in his performance in maintenance (50%).

VSM Script 2

Independent performance

Pete's independent performance in VSM script 2 also showed large treatment effects (R-IRD = 0.87), with a one-point overlap between baseline and intervention phases. Overall, there was a steady pattern in the intervention phase, where he mainly answered the researcher's question (50% independent conversational interaction) (see Figure 6.7). Pete maintained the same level of performance in the

maintenance phase (50%).

Prompted performance

The additional prompts further enhanced his performance and resulted in a complete data separation between baseline and intervention phases. Yet, Pete did not demonstrate criterion (100% independent conversational interaction) in VSM Script 2. As mentioned above, his maintenance performance was levelled at 50% independent conversational interaction.

Generalisation

As can be seen from Figure 6.1, Pete demonstrated generalisation throughout the intervention period. Nonetheless, the performance pattern on the generalisation topics fluctuated. There was a 36% increase in the means across the baseline and intervention phases (M_B = 16%; M_I =52%) for the prompted conversational interaction.

Additional observations

Pete's behaviours of concern, such as screaming and hitting, reduced as the intervention progressed. The researcher used verbal instruction (e.g., "Stop") augmented by a visual cue from the Proloquo2GoTM ("STOP" symbol) to prompt him when he demonstrated screaming and hitting behaviours. His obsession with exploring the folders in the Proloquo2Go™ app continued. However, he became more interactive, playful and demonstrated more commenting behaviours. He would say "not" to negate the researcher's answer and then laugh to show that he had played a trick and was using humour. For example, after taking his turn by asking a follow-up question, "What is your favourite movie?" he waited for the researcher to respond, "(movie name)", and then he would say "not".

Pete was also observed using his speech more as the sessions progressed. Pete's main mode of communication at baseline was the SGD. In session I1, he responded using speech (one-word utterance) on one occasion. Whilst no verbal answer or turns were observed in sessions I2 and I3, he responded using speech twice in I4, and again in I5. Pete started using speech to ask the follow-up

questions (two-word utterances) from session I6 onwards. This was often "What's yours?" The frequency of speech production increased as the sessions progressed; however, his speech was not adequate to meet his daily communicative needs.

Prompts

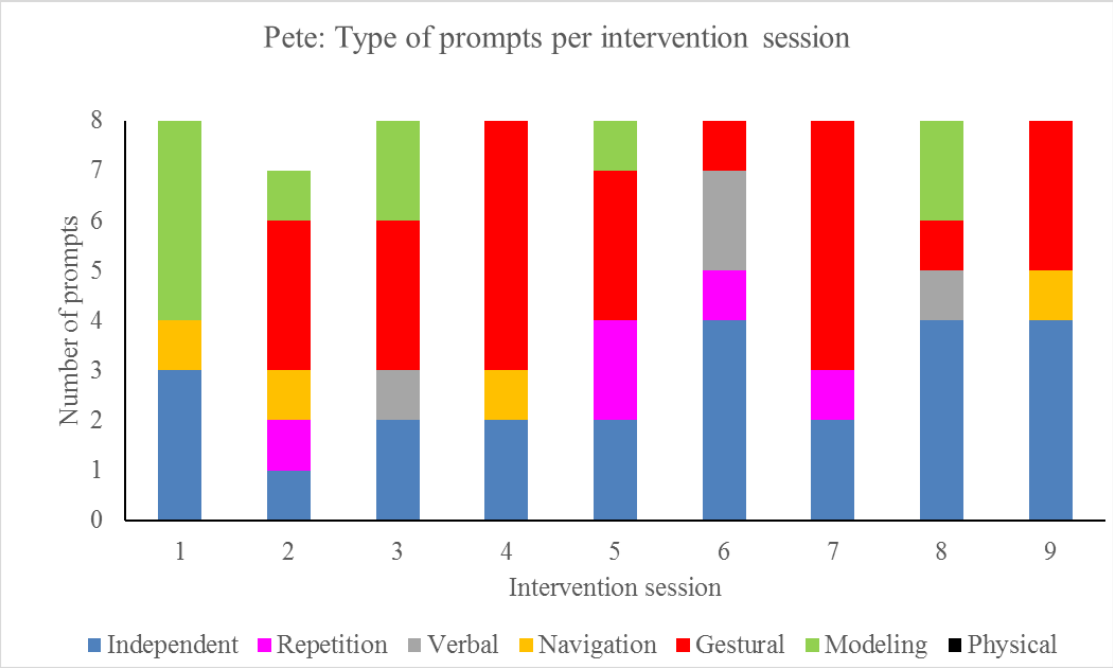

Figure 6.8. Number and type of prompts used per intervention session for Pete

Figure 6.8 represents the number and type of prompts provided to Pete per intervention session using the least-to-most prompting hierarchy (See Chapter 3). As can be seen, Pete's independent answers increased after the intervention. Furthermore, as the intervention progressed, the number of intrusive prompts required by Pete also decreased. In session I1, he relied heavily on modelling prompts, and this reduced as the intervention progressed. Despite requiring gestural prompts throughout the intervention period, the frequency reduced as the sessions progressed. He also started relying on other less intrusive prompts, such as repetition, verbal and navigational instructions, as evidenced from the Figure 6.8.

Social validity

Pete's teacher watched four video clips of Pete's interaction with the researcher during baseline, intervention and maintenance sessions, and rated his conversation skills based on the frequency of (a) initiation, (b) turn-taking, and (c) termination of interaction. His teacher also rated the quality of his overall interaction. Overall, his teacher stated there was a general increase in the frequency of initiation and turn-taking during the intervention phase for Pete. The interaction was rated on a five-point Likert scale, ranging from 1 = Never to 5 = Always/Fluently. (Figure 6.8 represents the scores given by Pete's teacher for the four sessions.)

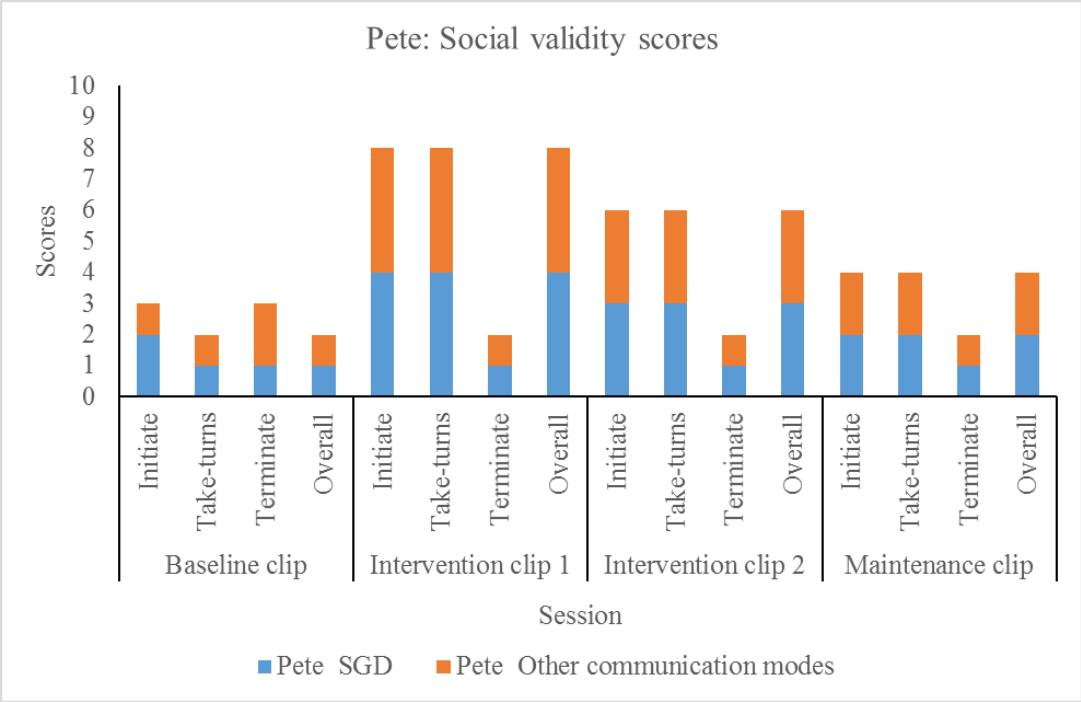

Figure 6.9. Social validity scores for Pete

Pete's class teacher judged that Pete initiated more using the SGD (average: 2.75; range: 2-4), compared to other modes of communication (average: 2.5; range: 1-4) in the video clips. His teacher felt that the frequency of turns increased from sessions I1 to I2, but then gradually decreased from I2 to I4. He rated Pete to have used both the SGD and other modes of communication to an equal extent (average: 2.5; range 1-4) during the viewed sessions. However, the number of turns Pete engaged in during all the other sessions (intervention and maintenance) was still higher than in the baseline

session. He reported that Pete did not terminate interactions during any of the sessions, which is consistent with the scripted conversational opportunities for termination of interactions. Pete's teacher stated that the quality of Pete's overall interaction increased over time, with a small decrease in the last viewed session (average: 2.5; range: 1-4). Pete's teacher also judged that Pete started demonstrating more interest to use the SGD for communication in the class following the intervention. Furthermore, Pete's vocal ability also improved since participating in the intervention. This is consistent with the researcher's observations. Pete's teacher remarked: "(Pete) expanded his use of P2G from requesting to commenting. He became more vocal throughout the year."

Summary

In summary, both participants demonstrated positive treatment effects following the packaged VM and VSM interventions. The packaged VSM yielded a relatively greater effect than the packaged VM for both participants. Independent performance following the VM and VSM interventions yielded small or no treatment effects for Dan. For Pete, VM yielded small treatment effects, but VSM yielded moderate to large treatment effects, as reflected by his independent conversational interactions (without prompts). The social validity data showed that the frequency and overall quality of the conversational interactions improved in both participants during the intervention. They were reported to demonstrate increased use of the communication system, outside the intervention setting. Nonetheless the overall comments made by the teachers regarding the participants' interaction outside the intervention must be interpreted with caution, because the social validity was conducted several months after the completion of the intervention.

CHAPTER 7: DISCUSSION

The purpose of this chapter is to discuss key research findings within the context of the extant literature on the use of video-based modelling interventions for individuals with ASD. Firstly, a summary of the outcomes of the current studies will be provided. The findings of the results will then be discussed according to the research questions. The quality and limitations of this research will be outlined, before concluding with the implications for practice and recommendations for future research.

Summary and implications of key findings

The research questions were addressed using a combination of two single-case research designs in three separate studies. The findings from this investigation showed that VM and VSM were, at varying levels, successful in facilitating reciprocal conversational interactions when implemented in conjunction with a least-to-most prompting system for participants.

The results from the pilot investigation and main intervention studies showed positive treatment effects (video instruction plus prompting) for developing turn-taking skills in all but one participant. Two participants from the two main intervention studies demonstrated a greater treatment effect during the packaged VSM intervention than during the packaged VM intervention, while one participant demonstrated similar treatment effects for both interventions. Independent conversational interactions for four of five participants following the VM and VSM interventions indicated small treatment effects. VSM intervention yielded moderate to large treatment effects for Pete (see Study 2), as revealed by his independent conversational interactions (without prompting). Overall, it was difficult to specifically extrapolate which component of the intervention – the video instruction or the least-to-most prompting system yielded more impact on the treatment outcome.

In terms of prompted conversational interactions, Nina, from the pilot study, demonstrated large intervention effects for both packaged interventions. In Study 1, Sam demonstrated a moderate effect

with the packaged VM intervention (R-IRD = 0.69 [0.12,0.96]) and a large effect with the VSM intervention (R-IRD =0.84 [0.28, 1.00]), whereas Lily demonstrated small/no effects for both interventions. In Study 2, Dan demonstrated moderate effects for the packaged VM intervention (R-IRD = 0.69 [0.12,0.96]) and large effects for the packaged VSM intervention (R-IRD =0.84 [0.28, 1.00]), while Pete showed large effects for both VM (R-IRD =0.87 [0.39,1.00]) and VSM (R-IRD = 1.00 [0.55,1.00]) interventions. The three participants who demonstrated positive treatment effects showed varying levels of generalisation across scripts. Sam and Pete also demonstrated maintenance of learnt skills above baseline performance whereas Dan did not maintain the learnt skill two weeks post intervention.

Research question one: Effectiveness of VM and VSM with prompts

The overall findings demonstrated that the packaged VM and VSM were successful to facilitate conversation skills for three of the four participants, to varying degrees. The R-IRD estimates indicated moderate to large treatment effect sizes for prompted conversation when the video instruction was implemented in conjunction with the additional instruction. The participants' independent conversational performance indicated that VM and VSM, produced small or no treatment effects for all but one participant. For Pete, VSM intervention yielded moderate to large treatment effects, based on his independent conversational interaction. Baseline data showed that none of the participants demonstrated independent conversational turn-taking ability before intervention. Individual variability was observed within and between participants. Variability within participants was observed at two levels (a) across sessions, and (b) between scripts used in VM and VSM.

Between-participant variability

In Study 1, Sam demonstrated positive treatment effects during both packaged interventions (i.e., VM: R-IRD = 0.69; VSM: R-IRD = 0.84), whereas neither package yielded sufficient changes in Lily's targeted behaviour. In Study 2, both participants exhibited positive effects for the packaged

intervention: the data for Dan showed a moderate effect for the packaged VM intervention (R-IRD = 0.69) and a large effect for the packaged VSM intervention (R-IRD = 0.84); and the data for Pete showed a large effect for both the intervention packages: R-IRD of 0.87 for the packaged VM intervention and R-IRD of 1.00 for the packaged VSM intervention. Clearly, individual differences influenced treatment outcomes.

Although language abilities, as measured using the PPVT-4 (Dunn &Dunn, 2007), emerged as a possible influence that affected treatment outcomes in Study 1 (e.g., Sam had higher language scores and performed better following both intervention packages than Lily); the findings of Study 2, and the comparison of findings of the pilot and two main studies indicated that the success of learning via video medium might not have been directly influenced by the learner's language ability. For example, Pete and Dan had a similar language age (See Table 6.1), and yet Pete's performance in all the scripted conversational interactions surpassed Dan's performance. Furthermore, Dan and Sam both demonstrated the same levels of performance, even though Sam's language abilities (6;3 years) were greater than Dan's (2;3 years). To the contrary, Pete and Nina (pilot study), who scored lower than Sam on the language assessment, exhibited greater intervention effects than Sam. A similar conclusion was drawn by Sherer et al. (2010), who postulated that the success (or failure) of video-based learning is better predicted by the learner's visual processing strengths than their language skills. No assessments measuring visual abilities and preference for visual learning were conducted in this investigation. Thus, any conclusion about the participants' visual learning capacity and its impact on intervention outcomes cannot be made.

Within-participant variability

Within-participant variability was noted at two levels: (a) across session; and (b) between scripts.

Across session variability

Nina, Sam, Dan and Pete showed across session variability during both interventions. Some days, more intrusive prompts such as gestural to modelling prompts were warranted for answer elicitation

and to re-direct focus to the task. For example, Nina's performance following the VM intervention decreased in session I8 before increasing again in session I9. The lower mean score reflects the use of gestural prompting to keep Nina engaged in the task, she was more distracted on that particular day. Similarly, Sam's performance following the VSM intervention decreased substantially in I7, before gradually increasing in I8. Sam also required explicit instruction, such as gestural and navigational prompts to bring his focus back to the task as he engaged in more off-script topics (See Figure 5.4). Dan's lower performance following the VM intervention in I8 also corresponded with larger levels of gestural prompts in that session. Pete's performance in both VM and VSM interventions in I7 was lower than other sessions, which corresponds with his need for more gestural prompts in that session. Across session variability is not uncommon in video-based modelling studies with individuals with ASD (Banda et al., 2010; Copple et al., 2015; Sherer et al., 2001). Many factors can contribute to within-participant variability including personal changes in well-being, mood and motivation to name a few.

Between scripts variability

Performances across scripts for the conversational interactions were variable for four of five participants. For example, Sam and Pete achieved criterion for some scripts but not all. Sam achieved criterion by session I8 for VM Script 1 (i.e., "What did you do for Easter?") and session I6 for VSM Script 1 (i.e., "What did you eat for breakfast?"). He maintained his performance for the VM script, but his performance in the VSM decreased in I7, and then gradually increased in I9. He maintained criterion in maintenance. Meanwhile, Pete achieved criterion only for VSM Script 1 (i.e., "What did you eat for breakfast?").

On the other hand, Dan and Nina failed to reach criterion during the intervention. While Dan never achieved full criterion level, he performed better in food-centric topics such as "What did you eat for breakfast?" (VSM) or "What's your favourite food?" (VM). Dan's data for these scripts revealed complete separation (i.e., R-IRD = 1.00). Similarly, Nina performed better in scripts about

colours.

A possible explanation for variability between scripts for each participant could be their personal preference for certain topics. Thus far, the effects of the preferred stimuli in video-based modelling interventions have been addressed in only a few studies, with mixed results. Haymes (1995), for example, found no differential effects for obsessive versus non-obsessive conversation topics in promoting verbal initiations in children with ASD. Conversely, Copple et al. (2010) found that the use of preferred items augmented treatment outcomes. Due to the challenges encountered in the pilot study (i.e., the use of preferred topics led to increased topic preoccupation), general, relatable topics across the participants were used in the current investigation. Thus, the lack of preference assessments in the current research precludes the ability to make any definitive statement about the relationship between item preference and the obtained treatment outcomes. Nevertheless, three participants, Sam, Dan and Pete, demonstrated higher disposition for some topics over others.

Research question two: Differential effects between peer and self-model

The overall findings showed mixed results, consistent with those findings in previous reviews and other studies (Bellini & Akullian, 2007; Mason et al., 2013b; Sherer et al., 2001; Shukla-Mehta et al., 2010). In the current investigation, Nina and Pete showed large treatment effects for both VM and VSM interventions, while Sam and Dan exhibited greater effects for VSM than VM interventions. Similarly, the findings from the Sherer et al. (2001) study indicated that both models (i.e., peer and self) were effective in promoting skill acquisition. Two of the five participants in their study performed distinctly better based on the type of model (i.e., one for the peer model and one for the self-model), while the type of video models did not affect the performances of the other three participants. The reviews also showed no differential effects between VM and VSM interventions. Their findings indicated that the type of model (adult, peer or self) used in the video clips did not affect participants' learning (Bellini & Akullian, 2007; Mason et al., 2013b; Sherer et al., 2001; Shukla-Mehta et al., 2010).

Sherer et al. (2001) suggested that the lack of differential effects for VM and VSM for participants with ASD could be attributed to their reduced ability to discriminate between self and others. While Sherer et al. did not report any measures of self-recognition or self-discrimination for their participants, self-recognition assessments were conducted in the current investigation using photographs of participants and their classmates. Based on this assessment, all participants in this study demonstrated 100% self-recognition, that is, they were able to discriminate their photos from those of seven to nine other classmates. However, it is important to note here that the practice of distinguishing and selecting their photos is done routinely during group/circle time for three of the five participants (Nina, Lily and Pete). Hence, the performance of these participants in the self-recognition assessments may have been influenced by practice effect.

Mason et al. (2013) conducted further investigation to identify potential moderators (e.g., age, type of disability, implementation protocol, type of model) of video-based modelling interventions. Their findings revealed that while there was no statistically significant difference between the type of video-based instruction (i.e., VM vs. VSM), moderator effects were identified for the kind of model employed (Mason et al., 2013b). The investigators found that adult models generated greater treatment effects than peer or self-models, yet self-models were more effective to facilitate skill acquisition. The finding that self as models were more effective than peer as models is consistent with the findings for Sam and Dan, but not for Nina and Pete. As mentioned earlier, both peer and self-modelling were equally effective for Nina and Pete. A possible explanation for the variability could be differences in participant characteristics.

Additional teaching strategy

The least-to-most prompting strategy was used in the current investigation in conjunction with VM or VSM to facilitate conversation skill development. As mentioned earlier, first the participants watched the video clips of the targeted behaviours being demonstrated, and were then prompted using a least-to-most prompting hierarchy to elicit answers and turns. A number of reviews have previously

examined the effects of supplemental teaching strategies on video-based interventions, and the conclusions are contradictory. While some reviews recommend implementing video instructions with further intervention strategies (e.g., prompting, reinforcements) (Delano, 2007; Shukla-Mehta et al., 2010), other reviews suggested the opposite (Bellini & Akullian, 2007; Mason et al., 2012a ; Mason et al., 2016; Mason et al., 2013b).

The results of the current investigation indicated that added instruction (i.e., least-to-most prompting) was imperative in enhancing treatment effects. The number and type of prompts reduced over time for four of five participants, and they started demonstrating higher percentages of independent conversational interactions. This finding suggests a need for longer intervention phases for the acquisition of the target skill. At the start of the intervention, every participant required the modelling prompt (i.e., the researcher pointing to the symbol on the speech-generating device). However, during the last intervention session less intrusive prompts were sufficient in eliciting answers and turns. Furthermore, the type of prompts needed to elicit correct answers and turns for each participant varied. For example, by the last session, verbal prompts were adequate to elicit appropriate answers and turns from Sam, while Dan required both verbal and gestural prompts to interact successfully. These findings will be further discussed with regards to (a) the essentiality of instruction in the current investigation, and (b) factors contributing to the variant teaching requirements.

Essentiality of additional instruction

As mentioned above, there is no consensus about the effects of supplementing video-based instruction with additional teaching strategies, such as the use of prompts or reinforcements. The lack of consensus may be attributed to several factors, including the implementation protocol and participant characteristics, to name a few. The reviews that encourage implementation of the video-based intervention without prompts postulate that the presentation of added instruction defeats the primary intention of video-based modelling interventions, such as reducing social apprehension and stimulus

over-selectivity (Bellini & Akullian, 2007; Rao, Beidel, & Murray, 2008; Rayner et al., 2009). These authors reason that the necessity for participants to focus on other factors (i.e., interventionists and in-vivo teaching strategies) not only increases stimulus over-selectivity but may also distract the individuals with ASD from the video instruction. Nonetheless, this justification only applies when additional instruction is provided while the participants watch video clips. However, it was unclear as to when the instruction was provided in previous studies. In the current investigation, the participants first watched the video clips without prompts. Then, they engaged in the same conversational interaction as seen with the researcher. Only when the participants failed to demonstrate the targeted behaviour, prompts were presented to elicit further interaction. Thus participants' attention to the video clips was not compromised.

Mason et al. (2012a) found that participants with intellectual disabilities, not limited to ASD, required additional prompts or error-correction procedures to improve their overall learning via video modelling. However, the review did not explicitly distinguish between individuals with ASD who had intellectual disabilities and those without. All participants in this study had an intellectual disability, potentially explaining the differences in performance with and without prompts.

As previously stated, very few video-based modelling studies have included participants with ASD and complex communication needs. Banda et al. (2010) and Copple et al. (2015) targeted spontaneous requesting skills using VM techniques to non-verbal children with ASD, who used speech-generating devices. Banda et al. (2010) presented the VM intervention without additional prompts, whereas the replication study by Copple and her peers (2015) supplemented the VM instruction with least-to-most prompting. The findings from both studies showed that the inclusion of additional instruction combined with VM improved treatment outcomes for AAC users. Thus far, the evidence indicates that the need for additional instruction in video-based modelling interventions is dependent upon several factors including the novelty and complexity of the targeted behaviour for the participant, the learner's intellectual ability and communicative competence, as well as other

learner characteristics (i.e., motivation, prompt dependency, etc.).

The combined complexities presented in this investigation, including participant characteristics (i.e., adolescents, ASD, intellectual disability, complex communication needs, speech generating device) and the skill being taught (i.e., conversational turn-taking, involving a back-and-forth exchange between at least two people), demonstrates the essentiality of systematic instruction in promoting skill acquisition for this cohort.

Factors contributing to the variable teaching requirements

As indicated previously, the degree of prompting required for each participant was different. Some required less intrusive prompts, such as verbal commands, whereas others warranted more explicit, physical cues such as hand-over-hand activation of the appropriate keys on the communication device. Four plausible factors may have played a role: (a) preoccupation; (b) motivation; (c) prompt dependence; and (d) communicative competence.

Preoccupation

Preoccupation or obsessional, restricted interest is a common clinical feature of ASD (American Psychiatric Association, 2013). In regards to conversation skills, topic preoccupation has been considered a significant pragmatic deficit that impedes the natural flow of conversational interactions (Lam & Yeung, 2012; Paul, 2008). Similar to the findings of previous research (e.g., Maione & Mirenda, 2006) the participants in the current investigation also displayed varying degrees of preoccupation and therefore required prompts to keep them on task. Two participants (Sam and Pete) exhibited high levels of preoccupation, which substantially affected their independent conversational interactions.

Nina and Sam were keen to interact and often initiated communication. However, they were also often fixated on certain topics that were unrelated to the scripts in the study and experienced challenges in shifting their focus to the task at hand. For example, Nina was preoccupied with

jewellery and colours, while Sam was preoccupied with the alphabet and favourite things. Preoccupation also affected his attention to the video clips and/or the following conversational interaction. Sometimes, this preoccupation was evident in their inappropriate and unrelated responses. These behaviours warranted verbal prompts to re-direct their attention constantly to the task. Similarly, Pete required verbal and navigational prompts to re-direct him to the activity at hand. Pete was fixated on typing out the names of the Wiggles characters, and exploring through the food folder on his device and then activating keys for a set of food items in a distinct sequence. He refused to shift his focus to other tasks until his compulsion was satisfied.

Motivation

Motivation or the desire to engage may be another potential factor affecting treatment outcomes. Bandura (1971) stated that even when the learner possesses all the relevant skills for the execution of observed behaviours, learning might not be triggered unless there is intrinsic motivation or desire to engage. For example, Lily did not exhibit any desire to participate in the social interactions, despite various attempts to motivate her. Her apparent lack of desire could have been caused by several factors including the severity of her ASD, sensory needs and intellectual disability. However, definitive statements about causal factors cannot be made without further examination.

The social impairment classification system proposed by Wing (1997; 2012) may be used when exploring the differential motivation levels observed in the participants. Wing (1997) identified four subgroups of individuals with ASD: (a) aloof; (b) passive; (c) active but odd; and (d) loners to explain the diversity of social impairment in individuals with ASD.

For example, Nina and Sam's personalities appear to best correspond with the active but odd group. Wing (1997) described individuals in this subgroup as active participants in social interactions, but the interaction is often one-sided and lacks understanding of the listener's needs. As described, both Nina and Sam made active approaches during social interactions. Although Nina was still learning the pathways in the Proloquo2Go^{TM}, she was very familiar with the PODD communication

system, and used both systems interchangeably to express her messages. Similarly, although Sam lacked spoken language skills, he was relatively competent in communicating using his communication system to initiate interactions, but not maintain them. Both participants initiated interactions; however, their social interactions were one-sided and lacked attention to the listener's needs or cues. For example, despite possessing the capability to initiate interactions or respond to the communication partners' questions, Sam did not seem to understand the "to-and-fro" nature of conversational interactions. Similarly, Nina needed prompts to “wait-and-listen”. Both Nina and Sam often shifted topics rapidly and without notice. As such, they constantly needed cues to ask the follow-up questions in the scripts. This substantially affected their ability to engage in a two-way conversational interaction independently.

On the other hand, Lily's personality seemed to match the description of the aloof subgroup. Wing (1997) described individuals in this subgroup as typically seeking human interaction to express needs and wants. Similarly, Lily did not demonstrate any interest in the people around her, and only approached others to request what she desired. Once she obtained what she wanted, she ignored the people around her again. Often, her initial reaction upon seeing or receiving her speech generating device was to navigate through the folders and ask for her choice of cartoon. Furthermore, regardless of the researcher's questions, her response was mainly "I want my iPad to watch…" Modelling responses or additional prompts to increase her motivation to engage was futile. Lily required physical prompts (i.e., hand-over-hand activation of the appropriate key/button) to elicit any response. Wing (1997) also described individuals from this subgroup to have unusual sleep patterns, odd motor stereotypies, and the ability to attend intensely to some activities (Wing, 1997). Lily often appeared exhausted and tired with reports of lack of sleep from staff. Furthermore, she was obsessed with certain animated films and could remain engaged with cartoons for extended periods.

Pete and Dan appeared to fit the description of the passive subgroup. Individuals from this group were described as people who did not spontaneously interact but accepted social approaches from

others (Wing, 1997). However, as the sessions progressed, Pete emerged as a more active communicator. He attended more to the instructions given during the intervention and participated more actively in the tasks, when not preoccupied with other topics. Over time, Pete demonstrated more independent answers and turns (See Figure 6.4). Dan, on the other hand, remained passive throughout the intervention sessions, which may be attributed to his prompt dependence.

Prompt dependence

Since the pre-requisites to learn by exposure to others (i.e., joint attention, imitation, etc.) is deficient in individuals with ASD, additional prompts and support are warranted for effective skill demonstration (Bellini, 2007; Hume et al., 2009; MacDuff et al., 2001). However, some individuals may become conditioned to respond only in the presence of prompts. This condition is known as prompt dependency, which prompt dependency implies that the learner is responding to the (immediate) cue rather than the intended instruction to elicit the targeted behaviour (MacDuff et al., 2001). This not only impedes independent functioning but also leads to passivity and learned helplessness (Goodson, Sigafoos, O'Reilly, Cannella, & Lancioni, 2007; Stahmer & Schreibman, 1992)

Dan demonstrated higher levels of prompt dependence in the current study than others. Although he had the skill and seemed to know the answer, he responded only when prompted. Dan generally hovered his finger over the communication symbol and looked at the researcher for a cue. Research has shown that prompt dependency is especially common in individuals who were involved in high amounts of one-on-one therapy, where instructions are based on stimulus control and frequent prompting (Hume, Loftin & Lantz, 2001). Given that Dan was much older (18) than the others (11), it is possible that Dan had experienced a much longer exposure to stimulus control instructions before the start of the study, and had become more conditioned to prompting compared to the others. Perhaps it is easier to modify and reduce over-reliance on prompts at a younger age (Copple et al., 2015).

The current investigation also showed that while prompts formed an essential component of the

intervention, the degree and type of prompting required diminished over time for most participants. This finding indicated that prompt dependence can be overcome or reduced by employing prompt-fading strategies and providing adequate processing time. Many, but not all individuals with ASD, display a significant delay in processing and attending to relevant stimuli (Luna, Doll, Hegedus, Minshew, & Sweeney, 2007). However, generally, the presentation of prompts often precedes the rate of information processing, potentially leading to overall passivity and conditioning. Thus, it is essential to ensure that individuals with ASD are afforded adequate processing time before cueing and yet not too long, otherwise they may get distracted. In the current studies, a five-to-ten second processing time (latency) was allowed before providing prompts, which was similar to the time delay in the study by Copple et al. (2015).

Communicative competence

The success of observational learning is also impacted by the learner's ability to execute the observed behaviour skilfully. This requires specific subskills, depending on the reproduction demands of the targeted behaviour (Bandura, 1971). For instance, even when the participants were able to process and produce a symbolic representation of the observed behaviour, without adequate skills (e.g., communicative competence, motoric reproduction), they may not have not been able to retrieve and reproduce the modelled conversational interaction using the speech generating device.

Lack of spoken language in AAC users necessitates additional fundamental skills to achieve communicative competence (i.e., communicating efficiently). This means that in addition to language and pragmatic abilities, AAC users also need to have sufficient knowledge and skills to operate their communication system for effective and efficient communication (Light, 1989; Light & McNaughton, 2014). The participants in the current investigation demonstrated limitations in their overall communicative competence. For all participants, except Nina and Sam, communication was restricted to requesting behaviours. This led to the increased use of modelling, gestural and navigational prompts in the initial sessions to facilitate the development of communicative proficiency beyond the expression of needs and wants, especially for Dan and Pete. Although Sam

was a relatively competent communicator, he required prompts to learn the navigational pathways to access new vocabulary that were not in his repertoire, such as "What about you?" and "What's yours?"

Generalisation and maintenance

A finding of the current study showed that three of the four participants demonstrated varying levels of generalisation across scripts without the video models. Prompts were provided in the generalisation measure. It is important to note that generalisation probes were conducted in every session, which may have led to a practice effect.

A maintenance effect was found in three (i.e., Nina, Sam and Pete) of the four participants. These participants demonstrated interaction skills above their baseline level of performance. For example, Nina had a mean score of 62.5% of independent conversational interaction for the VSM scripts in the maintenance phase, which was larger than her performance at baseline (average = 37.5%). As mentioned earlier, maintenance for the VM scripts could not be conducted with Nina as she was too distracted. Similarly, Sam had an average score of 75% independent conversational interaction in maintenance for both VM and VSM scripts, versus a maximum score of 50% at baseline. Pete also scored an average of 50% independent conversational interaction in maintenance for both VM and VSM, which was the same as his performance at baseline.

The decline in performance from intervention to maintenance may be attributed to the lack of meaningful opportunities to rehearse learnt skills. Bandura (1971) stated that long-term retention of behaviours is aided by rehearsal opportunities. Unless the learner can practise the observed actions, it is less likely that the learner will retain the knowledge and skills required for behavioural reproduction. Informal teacher reports about the participants' communication goals at school implied there was limited opportunity or demand for the participants to practice the acquired skills in the two weeks post intervention. The variability in performance across scripts for Sam and Pete was also likely, due to topic preference. The lack of maintenance for the other two participants, Lily and Dan,

was unsurprising. As previously stated, Lily was unmotivated to engage socially, other than to request desired items, and Dan was dependent on cues for interaction. Given that additional prompts and reinforcements were not a part of the maintenance phase, this outcome was expected. In other words, Dan may need a longer intervention phase to independently respond and take-turns in conversational interaction.

Furthermore, based on Collins' (2012) four basic phases of learning (i.e., acquisition, fluency, maintenance and generalisation), it can be said that the participants in this investigation may not have achieved full acquisition or fluency of targeted behaviour, to be able to consistently maintain the learnt skills, or demonstrate generalisation across untrained scripts. Therefore, for this group of participants, a longer intervention phase is required for achieving adequate levels of skill acquisition and fluency.

Additional observations

Relationship between preference for the type of model and performance in trained scripts

Despite noting differential effects between the VM and VSM treatments, observational data showed that the participants' attention to the video instructions was unaffected by the models in the video clips. The initial excitement and novelty of the video instruction wore off after the third intervention session for all but one participant. Lily was the only participant who exhibited a specific preference for the self-model, despite demonstrating no changes in targeted behaviour. Furthermore, the other participants required cues occasionally, to remain engaged in the video clips. This observation raised some important questions.

Firstly, a plausible explanation as to why Lily did not demonstrate any changes in her performance despite being the only participant to have been particularly interested in watching the video clips, specifically the VSM clips, may have been influenced by her fascination with her image in the video clips. Shukla-Mehta et al. (2010) postulated that VSM might be counterproductive for individuals

who are more fascinated by their image than the intended targeted behaviour. Moreover, her reinforcements and obsessive interests were movies and video clips, further clarifying her preference for watching the video clips, yet not socially engaging later.

Secondly, it is important to understand why differential effects were generated (i.e., VSM > VM) even though the participants did not demonstrate an inclination to one particular model in the video clips. For example, even though Sam and Dan demonstrated a larger intervention effect for VSM, they did not seem to specifically prefer the VSM clips over the VM clips. In fact, the participants' attention to the video clips was not affected by the model in the video clips, especially when the novelty of the video wore off. If so, why was there a difference between the interactions based on the VM and VSM scripts?

Topic preference may have shaped this treatment outcome. For instance, it may have been that the questions arising from VSM clips were more enticing than those from VM scripts for all three participants. Nonetheless, this cannot be conclusively verified as preference tests were absent in this investigation. One way to determine this would have been to alternate scripts for the VM and VSM clips for each participant (i.e., script 1 demonstrated in VM for participant 1, and VSM for participant 2). Although presentations of the video clips were alternated and balanced in this investigation, all participants were presented the same scripts for the same video model (i.e., Script 1 demonstrated in VM for both participants 1 and 2). The model and scripts for each participant should be varied in future research.

Three of the four participants demonstrated positive intervention effects for VSM, despite showing no specific preference for the self-model video clips. This finding questions Bandura's (1986) suggestion about the relationship between self-modelling, self-efficacy and better performance. Bandura (1986) postulated that viewing self in a positive light might increase self-efficacy, which in turn increases the likelihood of successful performance. However, because there was an overall lack of preference for the self as model video clips, versus the video clip with the peer

as model in three of the four participants, it is not possible to determine whether the participants' performance was influenced by their perceived self-efficacy. This investigation did not include measures of self-efficacy for two reasons. Firstly, since perceived self-efficacy is multifaceted and ever changing, there are no published assessments available to evaluate self-efficacy in specific contexts (Bandura, 2006). Secondly, even if a customised self-efficacy assessment was developed, the complexity and limitation imposed by the current participants' disability would not have made it feasible to estimate their self-efficacy reliably. Nevertheless, further research is required to pursue these issues.

Impact of speech production

Reports from the social validity questionnaire as well as observations indicated that Pete's vocal ability and speech production increased during the intervention. Pete exhibited echolalic tendencies before the treatment. He mainly echoed one-word utterances. Albeit inconsistently; Pete started using spoken language to communicate by the final intervention sessions. In these sessions, he verbalised "What's yours?" instead of using the communication device. This may have resulted from the increased opportunity for communication and exposure to the speech generating device. As mentioned in Chapter 6, Pete demonstrated a keenness to explore the different folders and buttons/keys in the communication application. He also tended to repeat/echo some of the words after activating the button/key, which may have led to the verbalisation of "What's yours?"

Social validity and treatment fidelity

Social validity

This part of the study focused on the benefits of the interventions as perceived by the participants' teachers. The results from the social validity measure showed that the teacher's perception about the frequency of turn-taking during conversational interactions increased during the intervention, as reported by the participants' teachers. Other comments by the teachers also indicated that all the

participants demonstrated positive changes in other aspects of communication (i.e., expanding beyond requesting, increased speech production) following the intervention. Furthermore, all the teachers reported an increase in the participants' interest and usage of the communication device post-intervention. However, the social validity results about the participants' interactions outside the intervention must be interpreted with caution, especially for Study 2, as the social validity evaluation was conducted several months after the completion of the investigation, and other factors may have influenced the participants' behaviours.

Treatment fidelity

Overall, the outcomes for treatment fidelity showed that the intervention was carried out as planned. The treatment fidelity scores for Sam and Pete were not 100% for all sessions, mainly due to the additional verbal prompts required to re-direct them to the task. These were unanticipated behaviours; hence they were not included in the protocol. Nonetheless, the overall treatment fidelity for both studies was above 90%.

CHAPTER 8: SUMMARY & CONCLUSION

Quality of the studies

This is the first study in which the effects of packaged VM and VSM interventions to facilitate conversation skills were investigated for adolescent AAC users with ASD. Following the single case research methodology employed in this investigation, several measures of quality indicators were implemented in the main intervention studies to ensure the validity of the research findings. This research included measures of (a) generalisation and maintenance assessments; (b) treatment fidelity; (c) social validity; and (d) inter-observer reliability across all dependent variables. Furthermore, effect size estimates were calculated to supplement visual analysis of the individual graphs, and to provide a better understanding of the significance of the research findings. Overall, the R-IRD estimates for the packaged interventions for all studies ranged between 0.11 and 1.00. The investigation also demonstrated adequate inter-observer reliability (i.e., Study 1 = 87.5%; Study 2 = 84.4%) and treatment fidelity (Study 1 = 94.4%; Study 2= 97.2%) estimates.

Limitations of the studies

Notwithstanding these quality measures and estimates, the findings of this investigation should be considered within the context of its limitations. Firstly, fewer participants were recruited than envisaged. Overall, four participants were involved in the main intervention studies, with two participants per study respectively. Although two participants are sufficient in demonstrating treatment effects (Kazdin, 2011; Kratochwill & Levin, 2014; Murphy & Bryan, 1980), the recommended benchmark for single case research is replication of the experimental effects across three or more units. Challenges during participant recruitment rendered this impossible. Nonetheless, this investigation replicated treatment effects across two individual studies, comprising two participants respectively.

Secondly, it was difficult to extrapolate the separate effects of the prompting instruction from the video instruction, as the intervention was implemented together. The findings of this study showed

that video-based modelling alone may not be effective in facilitating conversational skills in adolescent AAC users with ASD. However, it is not possible to provide specific conclusions about whether the systematic instructions alone would have sufficed or whether the video instruction also played a role in the changes observed.

Thirdly, the communicative competence of some of the participants was over-estimated prior to the start of the study. Although all the participants were deemed to be context-dependent communicators according to the definition [i.e., they were able to use their communication systems to communicate limited functions with a narrow range of communication partners and in limited contexts (school, home)], there was a mismatch between expectations of the target outcome and communicative competence demonstrated by the participants. All participants in this investigation demonstrated restricted operational competence, which may have impacted overall treatment effects. If the presentation of the video instructions were modified, such as demonstrating the navigational pathways in the video clips (i.e., using PoVM), perhaps the treatment effects may have been greater. This will be discussed below under implications for future research.

As expected, the production of VSM vignettes was more time consuming than the production of VM clips. The editing process for the VSM clips was more challenging as it required full removal of the prompts provided. Sometimes the participants required physical, hand-over-hand prompts, which were more difficult to edit out. In this instance, the clip had to be edited in one-second frames.

A further challenge was the participants' compliance with the AAC system. The absence or dysfunction of the device (i.e., flat battery) was a common problem throughout the intervention. The participants who were familiar with the general vocabulary set-up on the Proloquo2GoTM were able to use the school systems in the absence of their personal AAC system. However, for the participants who used a customised version, such as Lily and Dan, the lack or dysfunction of the communication system presented a substantial challenge. For example, many of Lily's intervention sessions had to be rescheduled because she either forgot to bring her device to school, or her device was out-of-

charge. Her scheduled maintenance test could not be conducted because her device had been updated, and she had lost her previous user profile.

On the other hand, Dan had the tendency to delete user profiles on his personal, customised Proloquo2Go™. Due to inconsistency with backups, it was not possible to retrieve the latest version of the user profile. Furthermore, since Dan's personal communication system was customised, it was difficult to recreate the pages accurately. Nonetheless, because Dan was familiar with the school profile, throughout the intervention, he used the general vocabulary set-up on the researcher's iPad; comparable with the school's set-up. The different systems used during baseline and intervention could have affected Dan results.

Finally, maintaining the participants' engagement with the video instruction was challenging once the initial novelty wore off. The participants required cues to remain engaged and focused on the video model. However, each time the participant was cued to attend to the video model, the video clip was restarted to ensure the effects of the video instruction were not impacted by the cue interruptions.

On the whole, the current investigation met several quality standards for single case research. Moreover, in addition to visual analysis, further data analysis was conducted to produce statistically comparable effect size estimates (i.e., R-IRD) to further substantiate the research findings. Nonetheless, given this is the first study of its kind (i.e., targeting conversation skills in adolescent AAC users with ASD), there were some unanticipated limitations and challenges (i.e., small number of participants, lack of adequate communicative competence, compliance with the communication device and attention to the video models), which may have affected the overall findings.

Implications and recommendations for future research

As a first investigation studying the effects of video-based modelling on conversation skill development for AAC users with ASD, further research is warranted to replicate the research findings. This research was focused on the differential effects of peer versus self-models, and the findings were consistent with comparative studies. Future research should also compare the differential effects between adult and self-modelling for this cohort of participants. The most recent systematic review (Mason et al., 2013b) indicated that adults as models yielded larger intervention effects than self and peers as models. This is an important issue from a practical perspective; the production of video clips with adults are more (time) efficient than a peer or self as models (Bellini & Akullian, 2007; Dowrick, 2000; Mason et al., 2013b).

Secondly, it will be valuable in the future to evaluate the method and time at which the additional instruction (e.g., prompting system) should be presented in the packaged video-based intervention. Previous systematic and literature reviews indicated that the presentation of additional instruction may likely distract the participants' attention away from the video clips, potentially subduing any treatment effects (Bellini & Akullian, 2007; Mason et al., 2012a ; Mason et al., 2016; Mason et al., 2013b; Rayner et al., 2009). Conversely, the findings of the current investigation and Copple et al's (2015) study showed that the additional teaching strategies were essential in increasing overall performance. These studies presented additional strategies after viewing the video while the actual implementation protocol was unclear from the previously reviewed studies. Hence, further evidence is required to understand the effects of packaged interventions and characteristics of learners who necessitate the use of additional teaching strategies.

Next, it might be important to further examine the impact of each component within the packaged intervention (i.e., video instruction versus the additional strategies) to determine the effectiveness of video-based modelling interventions for teaching conversation skills to AAC users with ASD. This can be clarified by directly comparing treatment effects for video instruction versus supplementary

strategies or systematic instruction. One way of doing this would be to introduce the additional teaching strategy as a separate intervention. This can be done by using an alternating treatment design to directly compare the effects of packaged video-based modelling (e.g., video modelling with prompting systems) and the additional teaching strategy or video modelling exclusively (e.g., prompts without the video model). By doing so, it will be possible to estimate the effects of the additional teaching strategies on the video-based modelling intervention.

Thus far, including the findings of the current study, the evidence demonstrates that supplemental teaching strategies are essential components of AAC interventions (Banda et al., 2010; Copple et al., 2015; Delano, 2007). The two investigations that have used additional strategies have utilised operant instructional procedures – mainly prompt-based instruction. Future research should also examine the effects of supplementing other AAC teaching strategies like aided language input/stimulation with the video-based modelling. Research in AAC interventions has demonstrated the positive effects of modelling based approaches [e.g., aided language stimulation, aided language modelling, augmented input) on the communication development of AAC users (Sennott, Light, & McNaughton, 2016)]. It can be assumed that the integration of AAC modelling strategies with well-established video-based instruction might promote quicker and smoother acquisition, maintenance and generalisation of social communication and interaction behaviours in AAC users with ASD, who are able to attend to the video model.

Furthermore, since this investigation assessed the generalisation of skills for video-based modelling components only (i.e., prompts were included in the generalisation measures), future research implementing the packaged intervention should evaluate generalisation across all components of the packaged intervention (i.e., excluding prompts in the generalisation measure). Future intervention research should also include a measure of different aspects of social validity, such as (a) time and cost efficiency of the intervention, (b) practicality and ease of intervention implementation by other stakeholders, etc. Treatment fidelity assessment should also include

questions about the learner's motivation and attention, given these processes are central to observational learning (Bellini & Akullian, 2007). Measures of self-efficacy may be a vital component for VSM studies, given the underlying theoretical assumptions. Assessing self-efficacy may also facilitate an understanding of the role of self-efficacy on overall performance, especially for individuals with ASD.

Future research should also explore the differential effects of the dosage and latency of video based modelling intervention. Besides the basic recommendation outlined by Shukla-Mehta et al. (2010), a consistent implementation guideline for video-based intervention is still needed. Specifically, there is still confusion about (a) how frequently the learner should engage with the video model, (b) the length of the video clips, and (c) time between watching the video clips and engaging in the target outcome. Further exploration of these factors may assist in establishing implementation guidelines for practitioners.

Finally, more research is needed to evaluate the effects of PoVM interventions to facilitate skill development for AAC users. Unlike natural speakers, AAC users require additional, unique skills, such as understanding the navigational pathways to access appropriate vocabulary, as well as understanding the linguistic symbols used in AAC systems to effectively communicate (Light, 1989; Light & McNaughton, 2014). PoVM has the potential to facilitate the development of these pre-requisites and the targeted behaviour (e.g., communication) simultaneously. This is because the video clip is presented from the vantage point of the viewer, which will enable the learner to view and acquire the navigational pathways required to achieve the targeted behaviour. Moreover, it is recommended that AAC interventions focus on integrating the distinct competence required by AAC users (i.e., linguistic, operational, social and strategic) operating within the demands of targeted behaviour and environmental contexts (Light, 1989).

Implications for clinical practice

The implications of the current findings are of importance to a variety of stakeholders including AAC

users, educators, caregivers, clinicians and researchers. Today, video-based instruction has ascended as a major teaching/learning method not just for individuals with disability, but also for the general population. This is not surprising considering how much technology and digital systems influence today's lifestyle. The evolution of video technology has eliminated some of the early apprehensions about the development and production of video models for instruction. Nowadays, the basic editing features in a generic camera phone are sufficient for creating simple video-based instruction, which means that learners are now able to access such instruction whenever and wherever needed.

The detailed protocols for developing and implementing video-based instruction provided in the current investigation can be used and easily modified by relevant stakeholders to facilitate skill development in AAC users with ASD. Because video-based instruction can be implemented as a general or individualised education tool, the educator or caregiver may be able to simultaneously facilitate various skills development for multiple learners at the same time. For example, while one student is learning greeting skills through video-based instruction, another may be able to learn appropriate requesting from another video clip. In the long run, video-based instruction may prove to be more efficient than live modelling, as once the video model is created, the intervention can be carried out independently across settings (Mason et al., 2016).

Furthermore, the application of video modelling creates more opportunity for the AAC users to be exposed to the targeted behaviour and the AAC system simultaneously. Specifically, the use of PoVM may be beneficial to facilitate the linguistic and operational competence of AAC users simultaneously. This investigation showed that the opportunity to interact increased participants' exposure to the AAC system, consequently intensifying their interest to explore and learn new navigational pathways and subsequently new vocabulary.

The findings from this investigation also demonstrated the importance of using core vocabulary and the limitations of customised vocabulary templates. Firstly, customised vocabulary templates limited opportunities to engage in a wide range of communicative functions, as only a limited

collection of words was made available to the AAC user. Secondly, the use of core vocabulary enabled the AAC user to use any device with the same generic vocabulary set-up, in the event of device malfunction. The participants with customised vocabulary template, like Lily and Dan, were not able to access other iPads with the Proloquo2Go^{TM} with the same set-up. In the instances when Lily's device was out-of-charge or left at home, she was unable to use the school system which was set up with the core vocabulary template. Meanwhile, because Dan was exposed to both systems, he was able to use the school system. Likewise, Sam and Pete could also use any Proloquo2Go^{TM} set up using the core vocabulary template.

Conclusion

This investigation was conducted to determine the effects of packaged VM and VSM to facilitate conversation skills for adolescent AAC users with ASD. The findings of this investigation demonstrated that VM and VSM had large and moderate-to-large treatment effects when implemented in conjunction with a least-to-most prompting system. However, because the independent effects of video-based instruction and additional instruction cannot be determined from this investigation, specific conclusions about the exclusive use of VM and VSM techniques to facilitate conversation skills in adolescent AAC users with ASD cannot be made. The findings of this investigation raised some important questions about the need for additional teaching strategies for AAC users and the factors contributing to individual differences. Prior research indicated that the need for additional teaching strategies is influenced by the learner's intellectual ability (Mason et al., 2013b). This investigation hypothesises that in addition to intellectual abilities, the necessity of auxiliary prompts for individuals with ASD is further impacted by other participant characteristics, specifically (a) preoccupation, (b) motivation, (c) prompt dependence, and (d) communicative competence.

Since this is the first investigation to the researcher's knowledge, to have employed VM and VSM techniques to target conversation development in adolescents with ASD and complex communication

needs, the results are preliminary and must be interpreted within the context of its limitations. Even so, important quality measures were carried out to ensure the methodological rigour and credibility of the research findings were not compromised. The findings of this investigation have been discussed within the context of Social Learning Theory (Bandura, 1971) and the existing literature on video-based social skills interventions for individuals with ASD. The implications for future research and practice were demonstrated to be applicable to a broad range of stakeholders and circumstances.

In conclusion, the current investigation offers an initial framework for implementing video-based modelling interventions to further develop social communication and interaction skills for AAC users with ASD. Further investigation is required to explore the use of PoVM to facilitate skill development for AAC users. It is assumed that PoVM can facilitate not only the development of specific targeted behaviours, but also integrate the development of individual proficiencies required for achieving communicative competence (i.e., linguistic, operational, social and strategic competence) for AAC users within the same context. And finally, it is hoped that this investigation has offered some valuable insights into the implementation of video-based modelling interventions for AAC users with ASD.

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APPENDICES

Appendix 1: Information Pack sent out to the participants' families

- Introduction Letter for the participants
- Introduction Letter for the peer participants
- Information Brochure for in English
- Information Brochure in Vietnamese
- Information brochure for peer participant
- Consent form for participants
- Consent form for peer participants
- Consent form for the teachers

Appendix 2: Social validity

- Social validity questionnaire
- Consent form for the teachers

Appendix 3: Inter-observer reliability

- Inter-observer scoring protocol

Appendix 4: Treatment protocol

- Treatment protocol for baseline and maintenance
- Treatment protocol for intervention

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LETTER OF INTRODUCTION

Dear Sir/Madam

This letter is to introduce **Abirami Thirumanickam,** who is a **Ph.D candidate** in the **Department of Speech Pathology & Audiology, School of Medicine** at Flinders University. She will produce her student card, which carries a photograph, as proof of identity.

She is undertaking research leading to the production of a thesis or other publications on the subject of **Video self-modeling: Facilitating conversation skills to non-verbal adolescents with Autism Spectrum Disorders (ASD).** This study involves teaching basic conversation skills to teenagers with ASD who depend on an alternative method for communication.

She would be most grateful if you would volunteer to assist in this project, by **participating in the video based intervention program**. The entire intervention program will be conducted within **two (2) to four (4) months**. The intervention will include training in two (2) conversational topics. Training in each conversation topic could take up to **nine (9) sessions.** Each session will be **no more than one (1) hour.** During the intervention, your child will also be asked to have a conversation about another topic that you are not trained in. This is to see if they can generalise their learned skills to a different topic.

Be assured that any information provided will be treated in the strictest confidence and none of the participants will be individually identifiable in the resulting thesis, report or other publications. You are, of course, entirely free to discontinue your participation at any time or to decline to answer particular questions without any effect or consequences.

Since the intervention is video based, Abi will seek your consent to video record the sessions (see attached consent form) prior to the commencement of the intervention, and to use the recordings in reporting the results of the study when preparing the thesis or other publications, on condition that your name or identity is not revealed. However, the video-clips may be used during presentations, during which your child may be recognised. It may be necessary to make the recordings available to other researchers, in which case you can be assured that they will also be required not to reveal your name or identity so that the confidentiality your name and of all materials are respected and maintained.

Any enquiries you may have concerning this project should be directed to me at the address given above or by telephone on **08 820459656**, fax on **08 82045935** or e-mail willem.vansteenbrugge@flinders.edu.au

Thank you for your attention and assistance.

Yours sincerely

Dr.Willem van Steenbrugge (PhD)
Senior Lecturer
Department of Speech Pathology & Audiology
School of Medicine
Flinders Medical Centre

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee. For more information regarding ethical approval of the project the Secretary of the Committee can be contacted by telephone on 82015962, by fax on 82012035 or by email human.researchethics@flinders.edu.au

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She is undertaking research leading to the production of a thesis or other publications on the subject of **Video self-modeling: Facilitating conversation skills to non-verbal adolescents with Autism Spectrum Disorders (ASD).** This study involves teaching basic conversation skills to teenagers with ASD who depend on an alternative method for communication.

She would be most grateful if you would volunteer to assist in this project, by **participating in the development of four (4) video clips** that will be used in the intervention program for non-verbal adolescents with ASD. Your involvement will include having a conversation with the primary researcher, Abi, using the conversation scripts provided. These interactions will be video-recorded and any prompts provided during the recording will be edited. The video clips will be used in the intervention sessions of participants with ASD and complex communication needs. No more than **one and a half (1 ½)** hours of your overall time will be required. You can choose for all the video-recordings to be conducted on the same day or on different days.

Be assured that any information provided will be treated in the strictest confidence and you would not be individually identifiable in the resulting thesis, report or other publications. You are, of course, entirely free to discontinue your participation at any time or to decline to answer particular questions without any effect or consequences.

Since the intervention is video based, Abi will seek your consent to video record the sessions (see attached consent form) prior to the commencement of the video-recordings, and to use the recordings in reporting the results of the study when preparing the thesis or other publications, on condition that your name or identity is not revealed. The video clips may be used for presentations, during which someone may recognise your face. It may be necessary to make the recordings available to other researchers, in which case you can be assured that they will also be required not to reveal your name or identity so that the confidentiality your name and of all materials are respected and maintained.

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Thank you for your attention and assistance.

Yours sincerely

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What next? …

If your child meets all the inclusion criteria, and interested to participate, please contact **Abi** on **8204 5960/ 8204 7010** or thir0008@flinders.edu.au

For your information…

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee **(5982)**. For more information re: the ethical approval of the project, the Executive Officer of the Committee can be contacted on **(P): 8201 3116**; **(F): 8201 2035; (E)** human.researchethics@flinders.edu.au

Confidentiality & Identity

Although all information provided will be treated in the strictest confidence, any information related to illegal activities will be disclosed to the appropriate authorities. The results of this study will be published/presented at conference, but all personal information will be de-identified. However, someone could recognise your child in the video when it is used for presentations. The information you provide will be saved stored in a locked cabinet in the Department of Speech Pathology & Audiology, Flinders University.

LOW RISK

This is a low-risk study. If you have any concerns regarding anticipated risks or discomforts, please raise them with the investigator.

Project Outcomes

Outcomes from the project will be summarised and given to you by the investigator if you would like to see them.

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Primary Researcher

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Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

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Information Sheet

VIDEO SELF-MODELING: FACILITATING CONVERSATION SKILLS IN NONVERBAL ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

What is this project about?

This project is about using **video based intervention** methods to **teach conversation skills** to **non-verbal teenagers with ASD, who use augmentative and alternative communication (AAC) system** – like speech generating device.

Video based intervention (VBI) includes techniques that use video clips to teach certain skills/behaviours. In this study, 2 types of VBI will be used: (1) **video modeling (VM)** and (2) **video self-modeling (VSM)**.

The actor in the VM video clips will be a typically developing peer matched according to age and gender. The actor in the VSM video clips will be the participant.

Why do we need your help?

- These techniques are found to be successful in developing and improving various skills in individuals with ASD.
- There is no conclusive evidence about its effectiveness in facilitating conversation skills in ***non-verbal individuals with ASD,*** who use AAC systems.

Why is this important?

- Conversation is a vital element of social interaction. Lack of conversational abilities may lead to social isolation and withdrawals, which may lead to psychological concerns like anxiety and depression.
- These risks may be increased for teenagers, particularly for one with ASD and has no speech.
- Conversational deficits are highlighted in the diagnostic characteristics of ASD.

How will this help?

Findings from this study will provide valuable information about whether VM and VSM should be used in future conversational intervention for non-verbal teenagers with ASD.

Time commitment

Overall **2 to 4 months** of your time will be required for a full participation in this study. **On average, no more than (1) hour of your time will be required per session.**

Your child's participation

Your child's participation in this study is **voluntary**. He/she is free to withdraw from the project at any time without consequences.

To participate in this study, your child must be:

- Between **10 and 18** years of age.

- Diagnosed with ASD according to DSM IV and the South Australian diagnostic guidelines.

- An interest in watching videos and no objection to being filmed

- Uses aided AAC systems for communication (preferably a Speech Generating Devices or tablet computer – iPads, iPods or Andriods)

- An ability to communicate by means of symbols – either context-dependent (reliable symbolic communicators but with few partners and in few environments) or independent (usually literate and effective communicators) communicators

- Able to recognise oneself in photographs, videos and/or mirror

- Able to understands simple instructions

- English as first language

What your child needs to do...

- You will be contacted to book an initial appointment.
- You will be required to complete a simple questionnaire about your child's communication and social networks.
- The researcher will ask you some simple questions about your child's conversational abilities.
- The researchers will conduct simple comprehension and self-recognition assessments on your child.
- ***BASELINE***: Your child will be observed having conversational interactions with the researcher about **(4) selected topics**, daily for **at least (5) days**. Your child may remain in this phase following the first (5) days, but observation will only be conducted intermittently, up to (2) times a week.
- ***Making of the self-modeling clips***: Your child will be prompted to use his/her communication device to initiate and take turns in **(2) conversational interactions** with the researcher. This will be video-recorded. Later, the prompts will be edited out from the final video clip.
- ***INTERVENTION***: This will be conducted **(2) to (3) times a week.** (2) Conversational topics will be trained. Each conversation topic could take **up to (12) sessions or sooner,** if they meet the criterion. Each session will be **no more than (30) minutes.**
    - Your child will watch a **2 – 2.5 minute** video clip of 2 people having a conversation on a selected topic. This could be a VM clip or a VSM clip.
    - After watching the first video clip, your child will be assessed on having the same conversation with the researcher using his/her communication device.
    - After that, your child will watch a second **2 – 2.5** minute video clip (either the VM or VSM clip) of another 2 people having a similar conversational interaction.
    - Again, your child will be assessed on having the same conversation with the researcher.
- Your child may also be observed having conversations about **(2) untrained topics**. This is to see if your child could transfer the learnt skills to different topics.
- ***After the intervention***: Your child will be observed **(3) times within (1) month** of completing the intervention to see if he/she has maintained the skills attained from the intervention.
- ***SOCIAL VALIDATION***: At the end of the program, you will be requested to watch (4) video clips of your child's conversational interaction and rate their interactions. This will be **no longer than 1.5 hours**.

Kế đến là gì? ...

Nếu con của quý vị hội đủ các tiêu chuẩn đề ra, và muốn tham gia, xin hãy liên lạc Abi số 8204 5960/ 8204 7010 hoặc thir0008@flinders.edu.au

Thông tin cho quý vị ...

Chương trình nghiên cứu này được chấp thuận bởi Hội Đồng Phê Chuẩn Đạo Đức Nghiên Cứu Hành Vi và Xã Hội Đại Học Flinders (5982). Để biết thêm thông tin về việc phê chuẩn đạo đức của chương trình này, xin liên hệ: Đại Diện của Hội Đồng số (Điện thoại): 8201 3116; (Fax): 8201 2035; (Email) human.researchethics@flinders.edu.au

Sự Bảo Mật & Nhận Dạng

Mặc dù tất cả các thông tin thu thập sẽ được đảm bảo bí mật ở mức nghiêm ngặt nhất, nhưng bất kỳ thông tin nào liên quan đến các hành vi bất hợp pháp sẽ được thông báo đến các giới chức có thẩm quyền liên quan. Các kết quả của việc nghiên cứu này sẽ được xuất bản/trình bày ở hội nghị, nhưng tất cả các thông tin cá nhân sẽ không nhận dạng được. Tuy nhiên, có người cũng có thể nhận ra con của quý vị trong phim video được chiếu khi trình bày. Thông tin quý vị cung cấp sẽ được lưu và cất giữ trong tủ được khóa lại ở Ban Bệnh Ngôn Ngữ & Thính Học, Đại Học Flinders.

RỦI RO THẤP

Đây là nghiên cứu có rủi ro thấp. Nếu quý vị có lo ngại về các rủi ro có thể tiên liệu trước hay không yên tâm, xin nêu lên với nhân viên điều tra.

Kết Quả Chương Trình

Các kết quả của chương trình sẽ được nhân viên điều tra tóm tắt và đưa cho quý vị nếu quý vị muốn xem.

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Nhà Nghiên Cứu Chính

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Cảm ơn quý vị đã dành thời giờ đọc tờ thông tin này và chúng tôi hy vọng quý vị sẽ chấp nhận lời mời của chúng tôi để tham gia.

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Tờ Thông tin

TỰ ĐỘNG PHIM VIDEO:

TRỢ GIÚP KỸ NĂNG ĐÀM THOẠI CHO THIẾU NIÊN KHÔNG BIẾT NÓI DO BỊ RỐI LOẠN TỰ KỶ

Chương trình này nhằm mục đích gì?

Chương trình này nhằm vào các phương pháp **can thiệp dựa trên video** để **dạy các kỹ năng đàm thoại** cho **các thiếu niên không biết nói do bị rối loại tự kỷ (ASD), các thiếu niên này sử dụng hệ thống giao tiếp hỗ trợ và thay thế (AAC)** – như thiết bị phát ra tiếng nói.

Can thiệp dựa trên video (VBI) bao gồm kỹ thuật sử dụng các đoạn phim video để dạy một số kỹ năng/hành vi. Trong nghiên cứu này, 2 loại VBI sẽ được sử dụng: (1) **làm mẫu trong phim video (VM)** và (2) **tự đóng phim video (VSM)**.

Diễn viên trong các đoạn phim video VM sẽ là người bạn hướng dẫn điển hình được chọn phù hợp với độ tuổi và giới tính. Diễn viên trong các đoạn phim video VSM sẽ chính là thiếu niên tham gia.

Tại sao chúng tôi cần sự giúp đỡ của quý vị?

Những kỹ thuật này cho thấy thành công trong việc phát triển và nâng cao các kỹ năng khác nhau của những cá nhân có ASD.

Không có bằng chứng cụ thể về hiệu quả của chúng trong việc trợ giúp các kỹ năng giao tiếp ở **những cá nhân không biết nói có ASD**, và có sử dụng các hệ thống AAC.

Tại sao chuyện này lại quan trọng?

Đàm thoại là một yếu tố thiết yếu của tương tác xã hội. Thiếu đi những khả năng đàm thoại có thể dẫn đến sự cô lập và rút lui khỏi xã hội, từ đó có thể dẫn đến lo ngại về tâm lý như lo âu và sầu não.

Những rủi ro này có thể gia tăng ở thiếu niên, đặc biệt là những thiếu niên có ASD và không biết nói.

Các khiếm khuyết đàm thoại được chỉ rõ trong các cá tính chẩn đoán của ASD.

Chương trình này sẽ giúp như thế nào?

Kết quả của nghiên cứu này sẽ cung cấp các thông tin quý giá về việc có nên sử dụng VM và VSM trong tương lai trong việc can thiệp về đàm thoại cho các thiếu niên không biết nói có ASD.

Thời gian tham gia

Tổng cộng quý vị sẽ cần thời gian từ 2 đến 4 tháng để tham gia trọn vẹn nghiên cứu này. **Trung bình, mỗi lần tham gia sẽ không quá (1) giờ thời gian của quý vị.**

Việc tham gia của con quý vị

Việc con của quý vị tham gia vào nghiên cứu này là **tự nguyện**. Con quý vị có thể rút ra khỏi chương trình này bất cứ lúc nào mà sẽ không bị ảnh hưởng gì.

Để tham gia vào nghiên cứu này, con của quý vị phải:

- từ **10 đến 18** tuổi.
- được chẩn đoán có ASD theo DSM IV và hướng dẫn chẩn đoán của Nam Úc.
- thích xem phim video và không phản đối được quay phim
- sử dụng các hệ thống hỗ trợ AAC để giao tiếp (tốt nhất là các Thiết Bị Phát ra Tiếng Nói hay máy tính bảng - iPad, iPod hay Andriod)
- có khả năng giao tiếp bằng việc dùng các dấu hiệu giao tiếp – hoặc theo hoàn cảnh (các dấu hiệu để giao tiếp đáng tin cậy nhưng với một vài người và trong một vài môi trường khác nhau) hoặc độc lập (thường thường là dấu hiệu giao tiếp hiệu quả và thấy được)
- có thể nhận ra mình trong hình, video và/hoặc gương
- có thể hiểu các hướng dẫn đơn giản
- tiếng Anh là ngôn ngữ chính

Con của quý vị cần phải làm gì...

Quý vị sẽ được liên hệ để làm cuộc hẹn khởi đầu.

Quý vị sẽ được yêu cầu trả lời một bản câu hỏi đơn giản về mạng lưới xã hội và giao tiếp của con quý vị.

Nhà nghiên cứu sẽ hỏi quý vị một số câu hỏi đơn giản về khả năng đàm thoại của con quý vị.

Nhà nghiên cứu sẽ thực hiện các trắc nghiệm đơn giản đối với con quý vị về khả năng hiểu biết và tự nhận dạng.

TIÊU CHUẨN: Con quý vị sẽ được quan sát khi giao tiếp đàm thoại với nhà nghiên cứu khoảng (4) đề tài được chọn lựa, mỗi ngày và ít nhất là (5) ngày. Con quý vị có thể sẽ tiếp tục ở giai đoạn này sau (5) ngày đầu, nhưng việc quan sát sẽ chỉ được thực hiện không liên tục, tối đa (2) lần mỗi tuần.

Làm phim mình tự đóng: Con quý vị sẽ được nhắc dùng thiết bị giao tiếp của mình để khởi đầu và thay đổi vai trong **(2) lần giao tiếp đàm thoại** với nhà nghiên cứu. Các giao tiếp này sau đó sẽ được quay video, những việc nhắc nhở sẽ được cắt bỏ trong đoạn video hoàn chỉnh.

CAN THIỆP: chuyện này sẽ được thực hiện **(2) đến (3) lần một tuần.** (2) Đề tài đàm thoại sẽ được tập luyện. Mỗi đề tài đàm thoại sẽ mất **đến (12) buổi hay nhanh hơn,** nếu hội đủ tiêu chuẩn. Mỗi buổi sẽ **không quá (30) phút.**

Con của quý vị sẽ xem một đoạn phim video từ **2 – 2,5 phút** của 2 người đàm thoại về một đề tài được chọn. Đoạn phim này có thể là VM hay VSM.

Sau khi xem xong đoạn phim video đầu tiên, con của quý vị sẽ được giám định khi thực hiện cùng cuộc đàm thoại đó với nhà nghiên cứu bằng cách sử dụng thiết bị giao tiếp của mình.

Sau đó, con của quý vị sẽ xem một đoạn phim video thứ hai từ **2 – 2,5** phút (hoặc phim VM hay VSM) của 2 người nữa đang giao tiếp đàm thoại tương tự.

Lại một lần nữa, con của quý vị sẽ được giám định khi thực hiện cùng cuộc đàm thoại đó với nhà nghiên cứu.

Con của quý vị có thể cũng được quan sát đàm thoại về **(2) đề tài không tập trước**. Để xem con của quý vị có thể áp dụng các kỹ năng đã học được về các đề tài khác nhau hay không.

Sau khi can thiệp: Con của quý vị sẽ được quan sát **(3) lần trong vòng (1) tháng** sau khi hoàn tất can thiệp để xem con của quý vị có còn giữ được những kỹ năng học được từ việc can thiệp không.

ĐÁNH GIÁ VỀ XÃ HỘI: Vào cuối chương trình, quý vị sẽ được yêu cầu xem (4) đoạn phim video về sự giao tiếp đàm thoại của con mình. Việc này sẽ **không quá 1,5 giờ đồng hồ**.

For your information...

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee **(Project number)**

For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on **8201 3116**, by fax on **8201 2035** or by email human.researchethics@flinders.edu.au

Confidentiality & Identity

Information you provide will be strictly confidential and will not be released to anyone outside the research team (primary researcher and supervisors). The results of this study will be published/presented at conference, but all personal information will be de-identified. However, someone could recognise you in the video when it is used for presentations. The information you provide will be saved in a password protected folder and all hard copy information will be stored in a locked cabinet situated in the Department of Speech Pathology & Audiology, Flinders University.

This is a low-risk study. The possible discomfort you may experience is your time commitment in this project. If you have any concerns regarding anticipated risks or discomforts, please raise them with the investigator.

Outcomes from the project will be summarised and given to you by the investigator if you would like to see them.

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Primary Researcher

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Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

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Information Sheet

VIDEO SELF-MODELING: FACILITATING CONVERSATION SKILLS IN NONVERBAL ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

Neurotypical peer

What is this project about?

This project is called ***Video Self-Modeling: Facilitating conversation skills in non-verbal adolescents with Autism Spectrum Disorder*** *(ASD).* It aims to find out if video self-modeling is effective in developing conversation skills in teenagers with ASD, who are non-verbal and rely on alternative methods of communication, like using a speech generating device (SGD).

Video modeling is a technique that uses video clips to teach individuals certain skills. Someone will model the targeted behaviour and the learner will learn by watching the clips. In **Video self-modeling,** the main actor who will model the behaviour is the learner him/ herself. The learner will be taught the skill with prompts and this will be video recorded. The recording will be edited to remove the prompts. The video clip that the learner watches will be a smooth demonstration of the behaviour/ skill.

Why do we need your help?

Previous studies have found this technique to be successful in developing communication, social, academic and life skills in individuals with ASD across a range of age. However, we do not know if this technique is effective in developing conversation skills in teenagers with ASD, who have no voice and who rely on alternative modes for communication, including speech generating device. This information is important because conversation skills are pivotal for social interaction and social interaction is necessary for human well-being. Moreover, deficits in conversation and social interaction is highlighted in the diagnosis of ASD. Lack of conversation skills can lead to social isolation and withdrawal, particularly in adolescence. Being a teenager is challenging even in the best of circumstances, but for a teenager with ASD and who is also non-verbal, the challenges are augmented. Information obtained from this study will inform whether VM and VSM should be used in future conversation intervention for teenagers with ASD, particularly for those who can't speak for themselves.

What you need to do...

You are invited to participate in an intervention program, where you will be requested to have 4 scripted conversations on selected topics with the primary researcher.

These conversational interactions will be video-recorded and will be used in teaching the main participants of this study (non-verbal teenagers with ASD between the ages of 13 and 18) conversation skills.

Time commitment

No more than 1.5 hours of your time will be required for your participation in this part of the study.

Your participation

Your participation in this stage of the study is voluntary. You are free to withdraw from the project at any time without consequences.

What next?

If you are interested to participate, please contact the primary researcher, Abi on 08-8204 5960. Her contact details are provided on the next page.

You will then be sent the information package and an initial appointment will be organised at a time of your convenience.

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PARENTAL CONSENT FORM FOR CHILD PARTICIPATION IN RESEARCH

CONSENT FORM FOR PARTICIPATION IN RESEARCH

Video self-modeling: Facilitating conversation skills in non-verbal adolescents with Autism Spectrum Disorder

I ….....

being over the age of 18 years hereby consent to my child .....

participating, as requested, in the **video based intervention** for the research project on **teaching basic conversation to non-verbal teenagers with ASD, who rely on alternative communication methods**.

1. I have read the information provided.
2. Details of procedures and any risks have been explained to my satisfaction.
3. I agree to video recording of my child's information and participation.
4. I am aware that I should retain a copy of the Information Sheet and Consent Form for future reference.
5. I understand that:
   - My child may not directly benefit from taking part in this research.
   - My child is free to withdraw from the project at any time and is free to decline to answer particular questions.
   - While the information gained in this study will be published as explained, my child will not be identified, and individual information will remain confidential.
   - Since the video-recordings may be used for presentation, someone could recognise my child
   - Whether my child participates or not, or withdraws after participating, will have no effect on any treatment or service that is being provided to him/her.
6. I agree to participate in the social validation study, which will be conducted at the end of the project.

Participant's signature……Date……..

I certify that I have explained the study to the volunteer and consider that she/he understands what is involved and freely consents to participation.

I have asked the child directly for his/her assent to participate in this study. Assent was provided by…… (e.g. head nod, using communication system, gesture, etc.)

Researcher's name……ABIRAMI THIRUMANICKAM.....

Researcher's signature……..Date……

NB: Two signed copies should be obtained.

PARENTAL CONSENT FORM FOR CHILD PARTICIPATION IN RESEARCH

CONSENT FORM FOR PARTICIPATION IN RESEARCH

Video self-modeling: Facilitating conversation skills in non-verbal adolescents with Autism Spectrum Disorder

I ….....

being over the age of 18 years hereby consent to my child .....

participating, as requested, in the **video recordings** for the research project on **teaching basic conversation to non-verbal teenagers with ASD, who rely on alternative communication methods**.

1. I have read the information provided.
2. Details of procedures and any risks have been explained to my satisfaction.
3. I agree to video recording of my child's information and participation.
4. I am aware that I should retain a copy of the Information Sheet and Consent Form for future reference.
5. I understand that:
   - My child may not directly benefit from taking part in this research.
   - My child is free to withdraw from the project at any time and is free to decline to answer particular questions.
   - While the information gained in this study will be published as explained, my child will not be identified, and individual information will remain confidential.
   - Since the video-recordings may be used for presentation, someone could recognise my child
   - Whether my child participates or not, or withdraws after participating, will have no effect on any treatment or service that is being provided to him/her.
6. I agree to participate in the social validation study, which will be conducted at the end of the project.

Participant's signature……Date……...

I certify that I have explained the study to the volunteer and consider that she/he understands what is involved and freely consents to participation.

I have asked the child directly for his/her assent to participate in this study. Assent was provided.

Researcher's name……ABIRAM THIRUMANICKAM.....

Researcher's signature……..Date……

NB: Two signed copies should be obtained.

SOCIAL VALIDATION: PROJECT OUTCOMES QUESTIONNAIRE

Name:
Participant name:
School:
Date:

You are requested to watch four (4) video clips of the participant's participant in this study. Each video is approximately 5 minutes long. ***Please watch each video and answer the questions below.*** *Watching and responding to the questions below should take no more than one (1) hour of your time.*

VIEW SESSION 1

Survey Item	Scale				
	Never	**Rarely/ Poorly**	**At times/ Fair**	**Often/ Well**	**Always/ Fluently**
1. How often did the participant use their communication device to initiate a conversation *(i.e. without a preceding question, comment or prompt from the communication partner)*?	1	2	3	4	5
2. How often did the participant initiate a conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
3. How often did the participant use their communication device to take turns during the conversation *(i.e. respond to the communication partner's question and then ask a follow-up question)*?	1	2	3	4	5
4. How often did the participant take turns *(i.e. respond to the communication partner's question and then ask a follow-up question)*? during the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
5. How often did the participant use their communication device to end the conversation?	1	2	3	4	5
6. How often did the participant end the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
7. How well did the participant use their communication device to have a conversational interaction?	1	2	3	4	5
8. How well did your child have a conversational interaction using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, etc.)*?	1	2	3	4	5

Name:
Participant name:
School:
Date:

VIEW SESSION 2

Survey Item	Scale				
	Never	Rarely/ Poorly	At times/ Fair	Often/ Well	Always/ Fluently
9. How often did the participant use their communication device to initiate a conversation *(i.e. without a preceding question, comment or prompt from the communication partner)*?	1	2	3	4	5
10. How often did the participant initiate a conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
11. How often did the participant use their communication device to take turns during the conversation *(i.e. respond to the communication partner's question and then ask a follow-up question)*?	1	2	3	4	5
12. How often did the participant take turns *(i.e. respond to the communication partner's question and then ask a follow-up question)*? during the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
13. How often did the participant use their communication device to end the conversation?	1	2	3	4	5
14. How often did the participant end the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
15. How well did the participant use their communication device to have a conversational interaction?	1	2	3	4	5
16. How well did your child have a conversational interaction using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, etc.)*?	1	2	3	4	5

Name:
Participant name:
School:
Date:

VIEW SESSION 3

Survey Item	Scale				
	Never	Rarely/ Poorly	At times/ Fair	Often/ Well	Always/ Fluently
17. How often did the participant use their communication device to initiate a conversation *(i.e. without a preceding question, comment or prompt from the communication partner)*?	1	2	3	4	5
18. How often did the participant initiate a conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
19. How often did the participant use their communication device to take turns during the conversation *(i.e. respond to the communication partner's question and then ask a follow-up question)*?	1	2	3	4	5
20. How often did the participant take turns *(i.e. respond to the communication partner's question and then ask a follow-up question)*? during the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
21. How often did the participant use their communication device to end the conversation?	1	2	3	4	5
22. How often did the participant end the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
23. How well did the participant use their communication device to have a conversational interaction?	1	2	3	4	5
24. How well did your child have a conversational interaction using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, etc.)*?	1	2	3	4	5

Name:
Participant name:
School:
Date:

VIEW SESSION 4

Survey Item	Scale				
	Never	Rarely/ Poorly	At times/ Fair	Often/ Well	Always/ Fluently
25. How often did the participant use their communication device to initiate a conversation *(i.e. without a preceding question, comment or prompt from the communication partner)*?	1	2	3	4	5
26. How often did the participant initiate a conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
27. How often did the participant use their communication device to take turns during the conversation *(i.e. respond to the communication partner's question and then ask a follow-up question)*?	1	2	3	4	5
28. How often did the participant take turns *(i.e. respond to the communication partner's question and then ask a follow-up question)*? during the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
29. How often did the participant use their communication device to end the conversation?	1	2	3	4	5
30. How often did the participant end the conversation using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, speech, etc.)*	1	2	3	4	5
31. How well did the participant use their communication device to have a conversational interaction?	1	2	3	4	5
32. How well did your child have a conversational interaction using other modes of communication *(i.e. gestures, facial expressions, body language, vocalization, etc.)*?	1	2	3	4	5

Name:
Participant name:
School:
Date:

Further information:

1. What are some of the functional changes that you noticed in the participant following the intervention?

2. Other information:

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CONSENT FORM FOR PARTICIPATION IN RESEARCH

Video self-modeling: Teaching conversation skills to non-verbal adolescents with Autism Spectrum Disorders

I ….....

being over the age of 18 years hereby consent to participate as requested in the …… for the research project on ……..

1. I have read the information provided.
2. Details of procedures and any risks have been explained to my satisfaction.
4. I am aware that I should retain a copy of the Information Sheet and Consent Form for future reference.
5. I understand that:
   - I may not directly benefit from taking part in this research.
   - I am free to withdraw from the project at any time and am free to decline to answer particular questions.
   - While the information gained in this study will be published as explained, I will not be identified, and individual information will remain confidential.
6. I have had the opportunity to discuss taking part in this research with a family member or friend.

Participant's signature……Date……...

I certify that I have explained the study to the volunteer and consider that she/he understands what is involved and freely consents to participation.

Researcher's name…….....

Researcher's signature……..Date……

NB: Two signed copies should be obtained. The copy retained by the researcher may then be used for authorisation of Items 8 and 9, as appropriate.

Data Analysis: Scoring Rules

LEGEND		Score
F	Full score, Unprompted	6
R	Repetition of question	5
V	Verbal prompts	4
N	Navigation	3
G	Gestural prompts. Until folder	2
M	Gestured at the final answer (not including folder).	1
P	Physically placing hand activate symbol	0

F = Full score is given for unprompted response. An unprompted response is one that is appropriate to the preceding question or an appropriate turn. A full score is given even if the turn is interchanged, i.e. “What’s yours?” instead of “What about you?” or vice versa.

R = Repetition of question score is given when the question is repeated verbatim or with minimal variation, i.e. “What do you do on the weekends?” vs. “What do you like to do on the weekends?”.

V = Verbal prompt score is given when the participant is prompted only verbally either by reinforcing the question or request. I.e. If the participant didn’t take his/her turn, he or she may be verbally prompted by saying “it is your turn” OR” whose turn is it?”.This is score as 4.

N = Navigation prompt score is given when the participant is verbally provided the navigational pathway to access the required symbol. I.e. “Go to GRID” OR “Go to CHAT”.

G = Gestural prompt score is given when any gestural indication is provided for the participant to access the AAC system or symbol. i.e. *pointing to the location of the folder, etc.* If CP points to the actual final answer or response or symbol, this should be considered as a modeling prompt.

M = Modeling prompt score is given when CP either models the pathway or answer, OR when CP points directly at the final answer/response/turn/symbol for the participant to access.

P = Physical prompt score is given when CP physical moves the participant’s hand or finger to access the symbol for activation.

- Total/full score per conversation script is 12 or 100%

- Any prompts offered after three (3) errors is given a 0. I.e. If the participant doesn’t take his/her turn, score 0 (1st error). Then provide a verbal prompt and if participant provides no/erroneous response, score 0 (2nd error). Then offer another prompt (verbal or navigational or gestural) and if the participant continues to provide no/erroneous response, score 0 (3rd error). Any prompt offered following the 3rd error, even if it produces the right response, should not be given any score (or score 0).

- Each time the same level of prompt is offered before the participant responds appropriately, minus 1 point. I.e. If following the first question the participant doesn’t respond, repeat the question (5 points). If the participants continues to be distracted and talks about something else, re-direct the participant and repeat the question again. The second repetition score should be given 4 point (5-1) as it was a repeated prompt.

PROTOCOL

Session: **Baseline**

Video clip number:

Participant: Observer: Date of session:

Components	YES	NO	Comment
Ensure that the speech generating device is ready to be used			
Researcher will inform the participant that they are going to chat, or talk			
Researcher will ask a question and wait between 5-10 seconds for the participant to respond			
If participant does not respond spontaneously within 5-10 seconds, researcher may repeat the question or prompt the participant to respond			
If participant does not respond following the prompt move on to the next step in the script			
If participant does not spontaneously take his/her turn and ask the follow-up question within 5-10 seconds, researcher should provide her answer.			
At the end of the session, offer the participant a break and choice of activity. Break should be between 1-3 minutes Have a timer or other visuals like “first and next” if and when required. If it is the last script and break, at the end inform participant that the session for the day has finished and take them back to class.			

Other comments:

PROTOCOL

Session: **Intervention** Video clip number/ type:

Participant: Observer: Date:

Components	YES	NO	Comment
Ensure that the speech generating device is ready to be used			
Researcher will inform the participant that he/she is going to watch a video, and start the clip			
When the video clip is finished, put the iPad away or switch over the communication app*.			
Ensure that the SGD (communication app) is ready for use			
Researcher will ask a question and wait between 5-10 seconds for the participant to respond			
If participant does not respond spontaneously within 5-10 seconds, researcher may repeat the question or prompt the participant to respond.			
If participant does not respond following the initial prompt move on to the next level of prompt (according to the prompting hierarchy)			
If participant does not spontaneously take his/her turn and ask the follow-up question within 5-10 seconds, researcher should prompt (following the prompting hierarchy)			
At the end of the session, offer the participant a break and choice of activity. Break should be between 1-3 minutes Have a timer or other visuals like “first and next” if and when required			

Other comments:

*In main intervention study 2, we had to use researcher’s communication app on the iPad for chatting.