A comparative evaluation of Social Stories™, Self Video Modelling and Peer Video Modelling in the teaching, maintenance and generalisation of Social Behaviour skills with children aged 36-72 months on the Autism Spectrum

Author:

Jamie Szymanski

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Abstract/Summary

Children with Autism Spectrum Disorder (ASD) have difficulties with social interaction that affect their early learning through play. Systematic reviews were conducted on the effectiveness of Social Stories™ (SS™), Self Video Modelling (SVM) and Peer Video Modelling (PVM) to teach social behaviour to such children. Study 1 compared their effectiveness for teaching three core play skills to 18 young children with ASD: initiating play, turn taking and finishing play; using a counterbalancing design across skills and play materials so that each participant received each intervention. At intake, participants' ages, Vineland Adaptive Behavior Scale and PLS-3 scores were assessed. The three core skills were observed with good interobserver (97.3%) and procedural (100%) reliability and quantified using a specifically designed scale. The social validity of target skills and interventions was assessed using a Likert scale.

All interventions showed evidence of significant improvement. Non-parametric repeated measures ANOVA and post-hoc Wilcoxon tests showed that SVM was superior to SS™ and PVM. Such superiority was evident for initiating play and turn taking but not for finishing play. There was no significant association between the intake variables and either the degree of change between baseline and post-intervention or the post-intervention scores themselves for SS™. Change following SVM was positively related to the Vineland composite score and its motor skills domain score. Post-intervention scores for SVM were positively related to the Vineland composite scores and its communication, daily living and motor skills domain scores as well as all three PLS-3 scores. Change following PVM was related to the Vineland maladaptive score. The target skills and interventions had high social validity.

Study 2 showed that more sustained intervention over time resulted in improvement for those who did less well initially.

Overall, the research provides encouraging evidence that these interventions are effective in teaching play behaviours to young children with ASD.

Declaration

I, Jamie Szymanski, declare that, except where indicated by specific reference, the work submitted is the result of my own investigation and the views expressed are my own.

Signed: _____

Jamie Szymanski.

I declare that no portion of the work presented has been submitted in substance for any other degree or award at this or any other university or place of learning, nor is it being submitted concurrently in candidature for any degree or other award.

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This thesis is being submitted in partial fulfillment of the requirements for the degree of PhD.

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Chapter 1: Introduction

The Autism Spectrum

The word "autism," comes from the Greek word "autos", meaning "self." The term describes conditions in which a person has difficulties in social interaction, therefore, an isolated self. Autism is a general term that is often used interchangeably with "Pervasive Developmental Disorders." Pervasive Developmental Disorders (PDDs) include a spectrum of behavioural problems commonly associated with autism. The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV, American Psychiatric Association, 1994, see Appendix 2) grouped a number of disorders together on the basis of common difficulties in the areas of social interaction and communication. Other symptoms include stereotyped behaviours, restricted interests or activities, and cognitive deficits. Within this broad category, at the time of conducting this study, there were five currently accepted official diagnoses:

- Autism Spectrum Disorder (ASD)
- Asperger Syndrome (AS)
- Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)
- Rett Disorder (RD)
- Childhood Disintegrative Disorder (CDD).

In DSM-IV, Autism Spectrum conditions are diagnosed by the presence of social and communication difficulties, alongside unusually strong, narrow interests and/or repetitive and stereotyped behaviour. In ASD, language delay is invariably present and cognitive ability may extend into the below-average range. In Asperger Syndrome, language develops at a typical age and cognitive ability is in the average range or above. In PDD-NOS, autistic features are present but the criteria for Autism and Asperger Syndrome are not met. Rett Disorder is a neurodevelopmental disorder of the grey matter of the brain. Most people with Rett Disorder are females. The clinical features include small hands and feet and a deceleration of the rate of head growth. Repetitive hand movements, such as wringing and/or repeatedly putting hands into the mouth may also be present. The child typically has no verbal skills. Children with Childhood Disintegrative Disorder develop normally for a relatively long period (usually 2 to 4 years) before developing a condition that resembles

autistic disorder. Typically language, interest in the social environment, and often toileting and self-care abilities are lost, and there may be a general loss of interest in the environment.

In the DSM-5 (American Psychiatric Association, 2013), published in May 2013, the name Autism Spectrum Disorder now encompasses Autistic Disorder (Autism), Asperger Syndrome and Pervasive Developmental Disorder - Not Otherwise Specified. The reasons for this change, according to the American Psychiatric Association (APA), are twofold:

1. "*Differentiation of Autism Spectrum Disorder from typical development and other "Non-Spectrum" disorders is done reliably and with validity; while distinctions among disorders have been found to be inconsistent over time, variable across sites and often associated with severity, language level or intelligence rather than features of the disorder.*
2. *Because Autism is defined by a common set of behaviours, it is best represented as a single diagnostic category that is adapted to the individual's clinical presentation by inclusion of clinical specifiers (e.g., severity, verbal abilities and others) and associated features (e.g., known genetic disorders, epilepsy, intellectual disability and others.) A single spectrum disorder is a better reflection of the state of knowledge about pathology and clinical presentation; previously, the criteria were equivalent to trying to "cleave meatloaf at the joints*".

Therefore, throughout this study the term "Autism Spectrum Disorder" (ASD) refers to Autism, Asperger Syndrome and Pervasive Developmental Disorder - Not Otherwise Specified, as this reflects that there is no clear demarcation between these conditions.

The new criteria as delineated in the DSM-5 require demonstration of deficits in two domains (DSM-IV required three domains):

1. persistent communication and social interaction. This includes deficits in social-emotional reciprocity, non-verbal communicative behaviours used in social interaction, and deficits in understanding and maintaining relationships.

2. Restricted and repetitive patterns of behaviour. At least two types of these should be demonstrated including stereotyped/repetitive motor movements, adherence to routines/sameness, highly restricted interests or hyper-reactivity to sensory input.

Some other changes were made in DSM-5 in addition to the above. Symptoms as above can be currently present, or reported in past history. In addition to the diagnosis, any known genetic cause, intellectual or medical disability will be described for the individual being evaluated: e.g. fragile X syndrome, Rett syndrome, seizures, gastrointestinal problems, depression and/or anxiety. A new category, Social Communication Disorder (SCD) was added in the DSM-5, allowing for a diagnosis of a disorder in social communication in the absence of repetitive behaviour.

As the recruitment for this study was conducted before the DSM-5 was published, all recruited participants had been diagnosed using the DSM-IV.

The History of Autism Spectrum Disorder

Eugen Bleuler (1857-1939), a Swiss psychiatrist, was the first person to coin the term "autism" in the American Journal of Insanity in reference to a group of symptoms of schizophrenia. In the 1940s, researchers in the United States began to use the term "autism" to describe children with emotional or social problems. Dr. Leo Kanner, a doctor at Baltimore's John Hopkins Hospital, is credited with recognizing autism as its own unique disorder. Kanner created the label "Early Infantile Autism", which he discussed in 1943 in the journal "The Nervous Child". In his report, Kanner discussed his research which was based on a group of eleven children whom he felt differed "*so markedly and uniquely from anything reported so far, that each case merits…a detailed consideration of its fascinating peculiarities".* According to Howlin (1998), Kanner described 3 major features that distinguished these children from others in the clinic. These were: first, the "*children's inability to relate themselves in the ordinary ways to people and to situations from the beginning of life, second was their failure to use language for the purpose of communications. Third was their anxiously obsessive desire for the maintenance of sameness".* Kanner used the term autism to describe the main characteristic of all the children he studied – little to no interest in socialising with other people.

It was Dr. Hans Asperger, who in 1944, defined Asperger Syndrome, a specific type of high functioning autism, when he studied 4 young boys and, like Kanner, found that each child displayed similar characteristics. He identified these characteristic behaviours as 'autistic psychopathy'. Although Asperger identified most of the same traits as Kanner, he didn't note his group having delayed echolalia. Rather, he observed that the children had clumsy movements and irregular motor skills compared to typically developing children, and that they spoke much like adults. Asperger referred to them as "little professors". Unfortunately, the findings of Dr. Hans Asperger were not widely discovered until the late 1980s as his findings were delayed due to World War II and to the fact that his work was not translated into English until almost 50 years later.

Autism and schizophrenia remained linked in many researchers' minds until the 1960s. It was only then that medical professionals began to have a separate understanding of autism in children.

In 1978, the consensus estimate for Autism Spectrum Disorder was 4 in 10,000 while the current prevalence figures for Autism Spectrum conditions stands at 1 in 100 (Baird et al., 2006; Baron-Cohen et al., 2009). This increase, according to Baron-Cohen et al. (2009) is likely to be due to several factors: "*improved recognition and detection; changes in study methodology; an increase in available diagnostic services; increased awareness among professionals and parents; growing acceptance that Autism can coexist with a range of other conditions; and a widening of the diagnostic criteria*". A number of researchers agree, hypothesising that the increase in prevalence figures may be a reflection of a broadening of the concept of ASD rather than a true increase in the prevalence figures (Fombonne et al., 2003).

Social Interaction and Autism Spectrum Disorder

As described above, the lack of meaningful social interaction is one of the core difficulties in ASD. According to Perry et al. (2003), intervention with children with ASD should include strategies to enhance social understanding, social relating and play skills. According to Weiss et al. (2001), children with ASD need supports to scaffold the development of appropriate social interactions if they are not to face further stigmatisation from their peers and develop antisocial behaviours in an effort to engage those peers.

Development of Play

Play is a vital part of childhood development: it is the medium through which children learn in a variety of adaptive domains and is indeed "the work of childhood" (Piaget, 1962). Through play, children learn about their environment, including physical aspects such as cause and effect, colours and shapes, about relating to other people, and about themselves. It allows children to practice new skills in a safe, supportive environment. Thus play is central to the development of physical, cognitive, social and emotional wellbeing for any child (Singer, 2006).

At 6 months, a typical infant may play with a single object, e.g. banging it, or shaking a rattle. At 9 months, relational acts develop e.g. putting the lid on a pot or putting a spoon in a bowl (Bayley Scales of Infant and Toddler Development, 2005). Cause and effect is understood and the concept of object permanence emerges, and the child can enjoy cause and effect toys such as a pop-up toy. At 12 months, a child will engage in simple reciprocal play with an adult, will watch peers play (onlooker play) and will imitate play when an immediate model is present. At 18-24 months, a child will demonstrate deferred imitation when the model is not present and may begin some parallel play alongside peers. At 2.5 years parallel play is developed and sharing begins, such that at 3 years a child typically participates in associative play, beginning cooperative play, and group play (Boyer Children's Clinic, 2012).

Symbolic or pretend play in typical development is seen from approximately 18 months (Piaget, 1962) concurrently with gross and fine motor development as an understanding develops of a distinction between the "signifier" (the child) and the "signified" (object/toy), with development of symbolic representational thought. Children with ASD have significant deficits in pretend play (Baron-Cohen, 1987, Lam et al., 2012). This is also an important area for research, but has not been within the scope of this study.

Play promotes the development of both gross motor and fine motor skills (Case-Smith, 2000; Fjortoft, 2001). As a child repeats certain movements or manipulates objects for pleasure, greater motor control develops. As many children with ASD have motor difficulties, this again may be a significant benefit in teaching play skills to this population.

Play also aids cognitive development in children (Singer et al., 2006). As a child plays, their ability to problem solve increases as does their knowledge as they test their beliefs about the world around them, e.g. learning about size, shape, texture in completing a puzzle. Piaget (1952) regarded play as an essential adaptive skill necessary for cognitive development. This extrapolates to more advanced academic learning as children develop: for example, children during free play are often building mathematical concepts and means of counting (Seo et al., 2004, Gelman, 2006). Play also facilitates emotional development and improves mental health (Burdette et al., 2005): it enables a child to learn about themselves and how to express emotions including joy, anxiety and sorrow, their anxieties and concerns around their emerging understanding of the world (Haight et al., 2006) and improves emotional regulation (Barnett et al., 1981). Emotional regulation and wellbeing is in turn necessary for positive social interactions with others and enables successful learning (Barnett et al., 2005).

Play in Children with ASD

Wolfberg (1995) defines play as an activity that is pleasurable, intrinsically motivated, flexible, non-literal, voluntary, and involves active engagement. Whereas typically developing children develop a diverse imaginative and social repertoire of and skill set in relation to play, children with ASD in contrast tend to demonstrate restricted, inflexible repetitive and stereotyped patterns of behaviour, and often play alone (APA, 2012). They may become fixated on certain objects of components of an object without a clear purpose beyond a sometimes ritualistic activity. Wing and Gould (1979) identified a "triad" of features seen in children with ASD: impairments in imagination, and the presence of restricted, repetitive behaviours.

Research has shown that play and friendship are important for emotional, cognitive, linguistic and cultural development as well as physical and mental well being (Howlin et al., 2000; Lord, 1995). Difficulties with play highlight the differences of children with ASD from their peers. Howlin et al. (2000) also state that problems in play and friendship formation can create barriers and can reduce the child's ability to learn from their peers.

Repetitive behaviours in typical development are present in infancy, but tend to wane as social and emotional development progress by approximately four years of age (Evans et

al., 1997). However in ASD, repetitive behaviours are both more common (Barber et al., 2012, Watt et al., 2008) and persist with age (Berkson et al., 2000). Children with ASD spend less time playing functionally, have more limited motor imitation skills in the context of play, and spend less time interacting with toys and using them appropriately than typically developing children (Stone et al., 1990), and show less variety and elaboration in their functional play (Williams et al., 2001). Children with ASD who demonstrate more repetitive behaviours engage in fewer play acts than those with ASD who exhibit less repetitive behaviours (Honey, Leekam et al., 2006). Play skills including toy play, imitation and joint attention have been found to be predictive of language ability at later ages in children with ASD (Toth et al., 2006).

A major area in which play has a role is in social development. Play is a medium through which children interact with others and engage in social learning (Howes et al., 1992). Vygotsky (1978) observed that children, through play, learn about social rules and also, in play, "push the boundaries" of their abilities, which aids development in many domains. Children learn how to express themselves socially (Singer & Singer, 2005), how to share, and, often, what behaviour is acceptable or not acceptable in the situation of play. Later, the medium of reciprocal play develops and has a major role in early friendship formation (Howes et al., 1998, Gifford-Smith et al., 2003), and this is further developed through more complex games in co-operative play. In general, having friendships in childhood is associated with positive outcomes in terms of academic achievement, psychological wellbeing and coping skills in later childhood and adulthood (Parker et al., 2006).

It has been suggested that social play involves two strands of development that are affected in children with ASD: social and emotional development, and cognitive development through play (Jordan, 2003). Children with ASD can often have difficulty planning, organising and integrating play scripts. Some children may be interested in toys that reflect the play preferences of younger children. Others present with fascinations or preoccupations with unusual objects. Play scenarios can be carried out as rituals with little variation and seem to be well rehearsed scenes rather than spontaneous play. These difficulties clearly impact on a child's ability to participate in reciprocal interactions with their peers and so often these children remain isolated or on the fringes of groups.

Social skills can be defined as specific behaviours that result in positive social interactions (Elliot & Gresham, 1987). A social skill is therefore any skill facilitating positive interaction or communication with others. Impairment in social relations is a core deficit of ASD (Kanner, 1944). Impairment in social skills can adversely affect social, emotional and cognitive development (Bellini et al., 2007). Peer integration is a key component of social development. Due to these deficits in social interaction including that which occurs during play, children with ASD are at high risk of being excluded by peers. Without consistent support and an emphasis on teaching social skills, they are likely to miss out on consistent interactive play experiences and the peer relationships which can develop therefrom. It has been observed that preschool children with ASD who avoid peers continue to do so and also use less language as older children (Ingersoll et al., 2001), and thus intervention at preschool level to improve this is both desirable and appropriate.

Children with ASD also demonstrate fewer discernible social initiations towards peers (Sigman et al., 1999) and respond inconsistently when peers initiate play with them (Volkmar 1987). Barriers towards spontaneous social play in children with ASD include difficulties with both verbal and non-verbal communication, impairment in eye contact and appropriate facial expressions and anxiety in social situations among others (Sigman et al., 1999). Children with ASD also have significant impairments in imitation skills (Smith & Bryson, 1994), including vocal and gestural imitation which is key to many forms of communication and interactive play with peers (Sigman et al., 1984).

Thus there is a role for teaching play skills in children with ASD, and for studying the success and feasibility of different intervention approaches. Play skills are appropriate skills necessary for social interaction at this age, which, as suggested in the literature above, might improve access to this important medium of learning, which may translate into improvements in other domains. Thus play skills were selected as the target skills for this study. The skills selected were initiating play, turn taking and finishing play. As the core focus for these skills was interaction and communication with others, these skills were felt to be primarily defined as social skills, although there were motor and linguistic elements comprised within them. These social skills included getting the other person's attention,

playing in co-operation with another person, sharing a toy and waiting while the other person took a turn, and finishing play appropriately in a timely manner.

Many studies in the literature have reported improvements in play/social skills in children with ASD with numerous different teaching interventions. For example, Barry et al. 2003 demonstrated an improvement in play skills and greeting skills when those skills were specifically taught. The literature review section will also demonstrate that there is extensive evidence that these skills can be taught with various different interventions and some studies have shown that improvements in these skills can be sustained over time. Therefore the teaching of social skills in children with ASD, including social skills within the context of play, is a worthwhile objective.

Early intervention and Autism Spectrum Disorder

Studies have shown that valid clinical diagnosis of ASD can be carried out from approximately 2 years of age (Lord, 1995; Cox et al, 1999). According to the National Autism Plan for Children (National Initiative for Autism Screening and Assessment, 2003, p.41): "*Early identification and intervention increases the likelihood of individuals attaining their full potential"*. Research has recognised that early intervention is vital in achieving meaningful and functional long term positive results (Dawson et al., 1997; Rogers, 1996; Rogers et al., 1989; Smith et al., 1998). According to a number of best practice guidelines, early intervention with children with ASD should focus on the development of social skills, increasing social communication, fostering peer integration, building functional communication skills and the generalisation of skills to new situations and people (National Autism Plan for Children, 2003).

Summary and Aim of this Study

One of the core difficulties in ASD is the lack of meaningful social interaction. Research has shown that early intervention with children with ASD increases the likelihood of those children reaching their full potential. With this in mind, the aim of this study was to examine the efficacy of three multimedia interventions: Social Stories™, Self Video Modelling and Peer Video Modelling, for teaching social behaviour skills in a preschool age population of

children on the Autism Spectrum. In the next chapter, Chapter 2, effect size calculation and the quantitative basis for comparing results across studies are discussed as a prelude to the three systematic reviews. Chapter 3 provides an overview of Social Stories™ and a systematic review of the literature on the evaluation of the approach when used with pre-school children with ASD. Chapter 4 provides an overview of video modelling and its application within ASD. Chapter 5 then provides an overview of Self Video Modelling and a systematic review of the literature on the evaluation of the approach when used in teaching preschool children with ASD. Chapter 6 provides an overview of Peer Video Modelling and a systematic review of the literature on the evaluation of the approach when used for preschool children with ASD. Subsequent chapters describe the development, methodology, results and discussion of the study undertaken and of the follow up study which was conducted thereafter.

Chapter 2: Effect Size Calculation

The American Psychological Association (APA*, 2001) recommended that all studies submitted for publication should include effect size calculations to support interpretations of intervention outcomes. Individuals with ASD do not comprise a homogenous group and therefore it is often difficult to conduct large scale research on intervention techniques. For this reason, the majority of research in the field utilises single case or small group studies. Previously, single participant studies have relied on strong internal validity and on the visual inspection of graphs to determine if the intervention is successful. However such research has well-documented flaws (Parker et al., 2006). Efforts to improve the reliability and external validity of studies through use of larger, more consistent group designs, with randomization if possible, is needed, particularly given the increasing emphasis on evidence-based interventions in the fields of psychology and behaviour. Kazdin (1982) discussed the reasons why statistical calculations were often not used in single case studies to support the research conclusions. These reasons include that the participants in single case studies often do not meet the assumption of homogeneity and that the data in single participant designs are auto correlated, increasing the likelihood of Type 1 errors during calculations (where the test rejects a true null hypothesis). One of the major difficulties as pointed out by Allison et al., (1993) in analysing single-participant research is in identifying a metric that can accurately and impartially characterise the largest number of intervention outcomes.

According to Alison et al., (1993), the basic unit of observation in any meta-analysis is the effect size. An effect size (ES) is a measure of the extent of the effect of one variable on another variable. Mitchell et al. (1981) described the advantages of ES calculations over statistical significance testing in single case research. First, effect sizes provide a guide of the strength of association between the target intervention and outcome, implying how much of the outcome can be explained, controlled, and predicted by the intervention. Second, effect sizes provide a continuous guide of a successful treatment, supporting decisions of degree of use or successful increments. Third, effect sizes are not affected by sample size, so a strong effect may be determined even within a small data set. Busk et al. (1992) concluded that ES is the "obvious choice" for calculating single-case study effects.

There are several types of ES measurement currently discussed in the literature to support the quantitative synthesis of single participant research, each with various strengths and weaknesses.

One type of ES calculation is the regression approach (R2 index) (Allison et al., 1993). This approach uses linear-estimation techniques to model repeated observations. It is based on the assumption that linearity exists. It allows the calculation of confidence intervals to indicate reliability, the data can be used in both baseline and intervention phases and it can be expanded for more complex analysis. A number of researchers have argued that the regression approach is inappropriate for single case studies (Scruggs et al., 1994; Olive et al., 2011). According to Scruggs et al. (1994), these approaches are not appropriate in single case research due to the lack of sufficient data points on which to base reliable regression estimates in both baseline and treatment phases. According to Allison et al. (1993), *"any regression estimate based on so few data points (i.e. 3-4) must be highly suspect"*. This view was supported by Campell et al. (2004). According to Parker et al. (2007), regression analysis can also be unduly affected by outlier scores, and expertise is required to complete and interpret the analysis and to judge whether the hypothesis was met. Olive et al. (2011) felt that the regression approach was inappropriate as single participant studies are not generally linear. They felt that non-regression ES calculations were more appropriate as they were based on dependent measures. Several types of non-regression calculations exist and have been described in the literature.

One of the main existing non-regression ES calculations is Standard Mean Difference (SMD) as first described by Busk et al. (1992). SMD is the difference between the mean baseline and the mean intervention data divided by the standard deviation of the baseline. There are two types of SMD: SMD_{all}, which calculates the mean from all the baseline and intervention points to calculate SMD, or SMD_3, which uses the mean from only the last three data points of each phase. Olive et al. (2011) felt that SMD_{all} was the most appropriate to support the analysis of single participant research. They felt that the use of all data points highlighted the variability of the data and that it was the easiest measure to calculate. However, according to *The Cochrane Handbook for Systematic Reviews of Interventions* (2011), SMD does not lend itself to meta-analysis unless the outcomes

measured for each of the studies included in such analysis are the same. The studies included in this review measured many different behaviours as endpoints, albeit all social behaviours. For this reason it was felt that these outcomes were not of sufficient homogeneity to be amenable to this method for meta-analysis.

Another type of non-regression calculation is Percentage of Non-Overlapping Data, (PND) (Scruggs et al., 1987). PND equals the percentage of data points in the treatment phase which are greater than the highest point of the distribution in the baseline phase (or below the lowest point of data points in the baseline phase if the behaviour is expected to decrease after the intervention is introduced). Scruggs et al. recommend that PND should not be used when a zero value is present in the baseline, as this renders the calculation unreliable. Specifically, if reduction of a behaviour is the target of a study and a zero is present in the baseline, then the PND will automatically be 0%, whatever the other data points are in the study. Olive et al. (2011) state that the first baseline data set should be used to calculate PND in a return to baseline design. If multiple treatments were tested, it is recommended to use the last implemented intervention.

According to Allison et al. (1993) and Salzberg et al. (1987), PND has a number of drawbacks. PND does not capture patterns across time and could miss idiosyncrasies in data. They also argue that PND is significantly affected by atypical baseline data and may lead to misinterpretation. If one or more data points in the baseline phase have reached the ceiling or floor level, then the PND scores will be unreliable, albeit that there may be a clear treatment effect by visual inspection.

However the PND approach has a number of advantages: it is a nonparametric approach (and thus is free from the constraint of the assumptions of parametric statistics) and it is easy to calculate directly from graphic displays. It is easy to interpret qualitatively, as a PND of 90% and higher indicates highly effective, 70% to less than 90% represents moderate (or fair) effect, and 50% to less than 70% indicates mild or questionable effect, whereas below 50% is considered as an ineffective treatment (Cohen, 1988). In a study by Campell (2004), the labour intensive process of calculating regression based effect sizes produced equivalent results to those of non-regression indicators. Empirical reviews of

PND have found that results were both practically meaningful and consistent with the original research (Scruggs et al., 1998). Therefore PND was chosen as the assessment of effect size to be used in the evaluation of results for the papers included in this literature review.

Chapter 3: Social Stories™

Overview of Social Stories™

Scattone et al. (2002) describe a Social Story™ (SS™) as a short story written in a specific format that teaches a person to manage their behaviour during a given social situation by describing where the activity will take place, when it will occur, what will happen, who is participating and why the person should behave in a particular manner. Gray (2003) states that the result is a

> "*renewed sensitivity of others .....and an improvement in the response of the person with ASD"*

SS™ are written in a specific format based on Gray's guidelines, originally developed in 1995 but most recently updated in 2010 (Gray, 2010). The evolution of these guidelines over time is described below. All of the studies included in the literature review referred to the 1995 or 2000 guidelines (Gray 1995, 2000) for the creation of SS™. The researcher for this study used Gray's updated 2010 guidelines which are described later in this section.

In her 1995 guidelines, Gray outlined four basic types of sentences: descriptive, perspective, affirmative and directive, (see Table 1 for an explanation of each sentence type). Gray in 2000 discussed how Social Stories™ should have the "basic Social Story™ ratio", which is that for every directive sentence there should be 2-5 descriptive and/or perspective sentences. This ratio has not been investigated independently by other authors. Any of the four basic sentence types can also be written as a partial sentence. Partial sentences offer the person with ASD the opportunity to predict the next step in the situation; the responses of another individual or his/her own response by leaving a portion of the sentence blank for the individual to complete.

Two sentence types were added to SS™ guidelines in 2000: control sentences: those that use analogies to explain situations, and cooperative sentences: those that indicate who can assist the individual in a given situation (Gray, 2000).

Table 1: Summary of the possible sentence types contained in Social Stories™ based on Gray (1995, 2000).

Sentence Type	Description	Sentence Ratio:10
Original (1995) Sentence Types:		
Descriptive	Truthful, opinion and assumption free statement of fact. They contain answers to "why" questions.	2-5
Perspective	Statements that refer to an individual's internal state-thoughts, feelings, beliefs or physical condition.	2-5
Directive (renamed Coaching 2010)	Desired responses to social situations.	1
Affirmative	These express a commonly shared value or opinion within a given culture.	2-5
Partial	These sentences encourage the individual to make guesses regarding the next step in the situation-such as the possible responses of others, their own thoughts and feelings and possible responses.	1 (additional to basic ratio)
Sentence Types added in 2000:		
Control	Statements written by the individual to identify strategies that they could use to help them in a situation.	1 (additional to basic ratio)
Co-operative	Sentences that identify what others will do to assist the individual	1 (additional to basic ratio)

An important criterion in a Social Story™ is that it is written from the person's perspective (Gray, 2003). Gray advises that SS™ be individualised, that is, that they take into account the person's strengths and needs. Stories need to be within the person's comprehension and cognitive level and use the print size and vocabulary appropriate to the person's age and ability. Gray et al. (1993) stated that Social Stories™ were the most beneficial to students functioning "intellectually in the trainable mentally impaired range or higher, who possess basic language skills". SS™ can contain pictorial elements. However, Carol Gray in 1998 cautioned that pictures should only be used where they do not distract the child and restrict his/her ability to generalise the principle beyond the depicted situation.

According to Gray et al. (1993), SS™ can be presented to the person in one of three ways: written form, on cassette or video modelled, dependent on the needs and abilities of the person. Departure from the written form allows a non-reader to "read" the story independently. The person's understanding is checked during introduction of the story, with the person answering questions about the story. The story should be read to the person and recall of the story prompted when the target situation occurs. The story can then be faded by increasing the time between rereading, fading of prompting, rewriting the story, and omitting or revising sentences.

In 2010, an updated set of guidelines was published by Gray in The New Social Story™ Book. These were as follows:

Guidelines in the Development of Social Stories™ (GRAY, 2010, based on 10 criteria)

Criterion 1: The goal in creating a Social Story™ is to share information regarding the target skills with the Audience in an Audience-centred, constructive, patient and supportive manner. The physical, social and emotional wellbeing of the Audience is of primary concern when writing the SS™, avoiding self deprecating or critical sentences.

Criterion 2: Two-Step Discovery. Descriptive individualised information pertaining to the context and setting of the target behaviours is gathered for the Audience. Information is obtained e.g. through standardised assessments and discussion with parents, teachers, carers etc. This is then collated to produce an appropriate intervention within the context of the

target situation, in a format suitable to the language and comprehensive ability of the Audience in question. At least two statements are required for the process of "two-step discovery": one in the third person describing a situation from a "fly on the wall" viewpoint, and one in the first person relating that situation/course of action to the Audience him/herself.

Criterion 3: Every SS™ must have a title and introduction clearly identifying the topic, a body adding detail, and a conclusion to reinforce and summarise the information. Therefore each SS™ must have at least three sentences.

Criterion 4: The format of each SS™ including the construction and arrangement of text and illustrations where used, should be tailored towards the individual needs of the Audience. To cater for those with language and cognitive difficulties and for younger participants, a shorter Story can be written, with the aim of sharing maximal information with minimal, simple, clear text and appropriate illustrations.

Criterion 5: Statements within each SS™ should be written from a first-person or third-person perspective (as per criterion 2 above), with care taken to ensure that a consistently patient and positive tone is maintained throughout, keeping the self-esteem of the Audience intact. Every effort should be made to ensure that the most accurate and comfortable vocabulary for the Audience is used. Positive rather than negative verbs should be used.

Criterion 6: The SS™ should be constructed such that they answer "wh" questions (who/what/where/when/how), with the aim of helping the Audience to understand their surroundings better and what is asked of them in game play/social situations.

Criterion 7: Seven types of SS™ sentences are described. The sentence types used include descriptive, perspective, coaching, affirmative, co-operative, control and partial sentences (see changes to sentence types for the 2010 guidelines below).

Criterion 8: The Social Story™ Formula should be adhered to in creating SS™. This refers to the relationship between the different types of sentence in a Social Story. The

formula limits the number of coaching sentences while allowing for an unlimited number of sentences of other types (i.e. sentences that describe). Thus

$$\frac{\text{\# of sentences that describe}}{\text{\# of sentences that coach}} \geq 2 \qquad \text{(complete or partial)}$$

Criterion 9: Each SS™ should be tailored as much as possible to the individual preferences, talents and interests of the Audience.

Criterion 10: Implementation. Following its creation, each SS™ must then be edited and reviewed to ensure that it has maximum potential for meaning and interest. The Story and its illustrations are reviewed with comprehension in mind. The "voice" of the SS™ is reviewed to ensure that it has a consistently patient, positive and supportive tone. Praise should also be incorporated into the implementation. A positive introduction to the story is planned to ensure maximum interest, e.g. "This is a story that I wrote for you!" Monitoring of Audience comprehension once the SS™ has been read is planned.

In the 2010 guidelines, some alterations were made to the definition, names and description of sentence types. The sentence type ratios were also simplified. Directive sentences were renamed coaching sentences, as this was felt to be a more Audience-centred description. Coaching sentences were described as referring to suggested rather than desired responses. Guidance on control sentences refers to the usefulness of analogies. The nature of perspective sentences in describing the feelings of others is expanded. Also, the sentence type ratio is simplified. Coaching sentences must be less than half of the total sentence number. These new guidelines allow for an unlimited number of descriptive, perspective and affirmative sentences, as well as one optional control, co-operative or partial sentence in addition to the basic sentence ratio.

Social Stories™ and Social Behaviour

At first glance, interventions using SS™ appear to have a lot to offer in supporting the development of social behaviour in young children on the autism spectrum. Gray (2006) states that

> "*although the goal of a Social Story™ should never be to change the individual's behaviour, that individual's improved understanding of events and expectations may lead to more effective responses"*.

A number of explanations have been offered for the purported success of SS™ interventions in supporting social behaviour development. The perspective sentences in SS™ are thought to address the Theory of Mind (ToM) deficit that is said to exist in people with ASD (Greenway, 2000). According to Greenway (2000), individuals who lack ToM have an inability to understand other people's intentions, beliefs, needs and desires. Consequently, supporting the development of ToM is thought to support social behaviours. Another explanation is that of "shared schemata". Rowe (1999) believes that SS™ support the understanding of a schema (mental representation) that the individual with ASD does not yet understand. This is also discussed by Myles et al. (2001) who describe how SS™ help individuals with ASD to understand and adhere to the social rules that are innately understood by others who are not on the spectrum.

A number of previous studies on the effectiveness of SS™ report improvements in social behaviour skills through decreased challenging behaviours, increased on-task behaviours, sharing of toys, frequency of social communication and appropriate play. The specific effects of SS™ alone in supporting positive social behaviour in preschool children with ASD, are unclear. Several limitations exist in previous research such as non-conformity to the recommended SS™ guidelines, flawed or weak research designs and additional interventions being used.

Two main reviews on the effectiveness of SS™ interventions have been carried out: Kuoch et al. (2003) and Reynhout et al. (2006), but they do not provide clear insight into the effectiveness of SS™ with the preschool population.

The reviews both contained a limited number of studies. Kuoch et al. (2003) included only 10 studies and Reynhout et al. (2006) contained only 16 studies. The reviews were not specific to preschool children with ASD. The studies reviewed included children without a diagnosis of ASD and the participants' ages ranged from 3-15 years. The targets of intervention were also not specified for the review and included a number of behaviours which could not be deemed social behavioural targets (e.g. hand washing in Hagiwara et al. 1999). A number of studies also included additional strategies: e.g. physical prompting (Rogers et al., 2001; Stanley, 2002) and tangible rewards (Kuttler et al., 1998, Stanley, 2002). The majority of studies relating to SS™ are single- case designs due to the individualised nature of SS™ interventions, and thus there are inherent limitations to the results obtained.

The author concluded that while some studies showed the intervention was effective, this was not consistent across all studies. The single case design in the majority of the studies raised the possibility that undetermined factors (e.g. story construction, story implantation, participant characteristics) may have been important in the success of the interventions.

The aim of following literature review is to provide a comprehensive and detailed review of studies relating to the effectiveness of SS™ interventions for preschool children with ASD. The studies included will be those that targeted social behaviours. The review will focus on the characteristics of the participants, the use of the recommended SS™ guidelines, the short term results, maintenance and generalisation, and the quality of the research designs.

Methodology of Literature Search

Studies included in this systematic review were located by utilising the Educational Recourses Information Centre (ERIC), PsychINFO and Medline databases. The following combinations of descriptors were used:

1. Autism Spectrum Disorder
2. Asperger Syndrome
3. Pervasive Developmental Disorder-Not Otherwise Specified.
4. Social Story
5. Social Stories

The following combinations of terms were used:

1 AND 4 OR 5

2 AND 4 OR 5

3 AND 4 OR 5

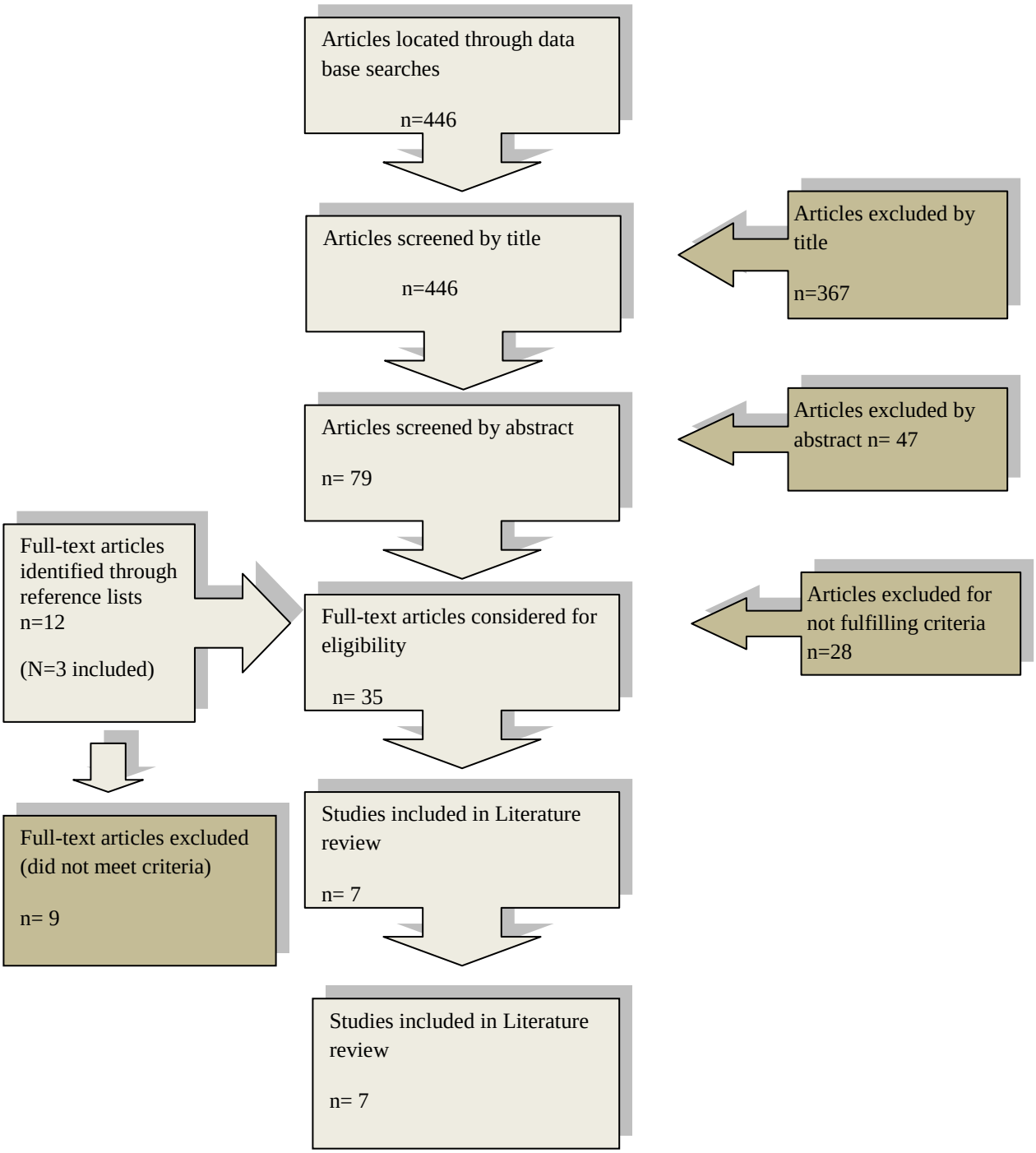
A search of studies using the reference lists of each study located was also carried out. The abstract and methodology section of each article was examined to determine if they met the criteria for inclusion in the study. The criteria were as follows:

1. Participant must have been identified as having a diagnosis of Autism Spectrum Disorder, Asperger Syndrome or PDD-NOS.
2. Participants must be aged between 36-72 months (early intervention age group). For example Coyle et al. (2004) was excluded as in this paper, children between 9-11 years of age were studied. For those studies which included some participants within and some outside the researcher's target age range, those participants who fell within the age range only were included.
3. The study must have targeted social behaviours.
4. The study must have assessed the efficacy of SS™ alone or compared with another intervention.
5. Studies were excluded if they did not follow Gray's (1995, 2000, 2010) SS™ guidelines to maximise fidelity of the treatment procedure.

6. Due to the relatively small body of research in this area, unpublished dissertations were included in this review when accessible. Studies had to be written in English.
7. Studies that utilised single participant and group experimental designs were included in the review.

The flow chart below describes the initial search results and the exclusion process which was used to filter these results according to the inclusion criteria.

Figure 1: Article selection process for Social Stories™ with the number of studies screened at each review stage. Adapted from: Moher et al. (2009) the PRISMA Group.



446 articles were found using only the key term “Social Stories™”. This was the largest list of articles. A comparison of the paper yields for each combination of key words was done against the largest list so as to eliminate duplicates. The reference sections of all located sources were reviewed for additional sources that did not appear in the online search.

The process resulted in 7 articles being located which fulfilled the inclusion criteria: Leaf et al. (2012), Schneider et al. (2010), Chan et al. (2008), Crozier et al. (2007), Ivey et al. (2004), Kuoch et al. (2003), and Lorimer et al. (2002). Please see Appendix 3 for a list of the studies excluded when examined at the full text stage and Table 2 below for a list of papers included in the review.

Table 2: Summary of Social stories™ research – included papers (PND = Percent of Non-overlapping Data)

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
1. Comparing the Teaching Interaction Procedure to Social Stories™ for people with Autism. Leaf et al (2012).	Hank: 5 yrs, PDD-NOS Nick: 5yrs, ASD Lang: 5 yrs, Asperger's The 3 other participants were outside the age group of interest	Parallel treatment design.	Facing person, eye contact, relaxed posture, voice tone, smiling, no aggression, swear words or crying. Negotiation statements.	Inter-observer agreement on 40% of performance probes, 46% of generalisation probes, 37% of generalisation probes with peers. Reliability was 97%. Procedural: 100%	Both techniques improved skill performance. Teaching interaction superior to SS™: all participants met mastery criteria for all 18 skills taught with interaction procedure, whereas with SS™ only 4 of 18 skills were achieved on average at mastery level.	Again teaching interaction was superior to SS™.	N/A (floor effect with zero in baseline)
2. Using Social Stories™ and visual schedules to improve socially appropriate behaviours in children with Autism. Schneider et al (2010).	Nolan: 5 yrs 2 mths. ASD. No data on cognitive levels. The 2 other participants were outside the age group of interest	Multiple baseline design across participants.	Appropriate behaviour in circle time.	Inter-observer agreement on 25% of observation: 88% Nolan. Treatment fidelity: 98%.	Nolan: Less variable behaviour during intervention. Mean on-task behaviours increased by 13%.	Maintenance and generalisation data not discussed. Authors conducted a follow up study with visual schedules and SS™.	Nolan: Treatment PND was 0% (due to 100%ceiling effect in baseline)
3. A Social Stories™ intervention package for students with autism in inclusive classroom settings. Chan et al. (2008)	Ted: 5 yrs, ASD No information on cognitive or language levels. The other participant was outside the age group of interest	Multiple probe design across behaviours.	Ted: hand raising, social initiations and inappropriate vocalisations.	Inter-observer: On 32% of sessions. Ted: 94% hand raising, 100% social initiations and 92% vocalisations. Procedural: on 39% of treatment sessions mean 96% integrity.	Ted: increase in hand raising to higher and variable levels- from 0 to 100, increase in appropriate social initiations from 0 to 4 and vocalisations decreased throughout baseline so interventions were not introduced.	Maintenance: Positive behaviour changes maintained at 1, 3, 5, 10 mths for both. Anecdote suggests performed similar to peers following intervention. Generalisation: skill level maintained.	Ted: PND was not calculated due to zero in baseline
4. Effects of Social Stories™ on Prosocial Behavior of Preschool Children with Autism Spectrum Disorder. Crozier et al. (2007)	Thomas: 3 yrs 9 mths. ASD. Cognition: 13th %ile of the Differential Ability Scale. Daniel: 3 yrs 9 mths. ASD. Mullen Scales of Early learning: Visual reception: 52, receptive language: 41. James: 5 yrs 1 mth. No diagnostic/assessment profile available.	ABAB reversal design for Thomas and James. ABCACBC multi-component reversal design for Daniel.	Thomas: sitting appropriately in circle time. Daniel: talking to peers at snack. James: play appropriately with peers in the block center.	Inter-observer agreement: Thomas: 27% of sessions-97%, Daniel: 33% of session: 94% James: 34.7% of sessions: 91%. Procedural (treatment integrity): Thomas 99%, Daniel 100%, James 100%.	Overall reduction in inappropriate behaviours and increase in appropriate across all participants. Thomas: increase of 64% in sitting time. Daniel: increase of 5.8 verbal interactions- required verbal prompts with social stories™. James: increase of 15.86 in appropriate play behaviours.	Maintenance probes 2 weeks and 3 weeks after final intervention. Thomas: sat in circle time 89.9%. Daniel: 3,5 unprompted verbal interactions James: 3 appropriate play behaviours.	PND was not calculated due to zero in baseline scores

Table 2: Summary of Social stories™ research Table continued – included papers

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
5. The use of Social Stories™ to Promote Independent Behaviours in Novel Events for Children with PDD-NOS. Ivey et al. (2004)	Adam: 5 yrs 1 mth Hal: 5 yrs 8 mths Both PDD-NOS A third participant was outside the age group of interest.	Reversal (ABAB) design	Attention, vocabulary, requesting, remaining on task, commenting appropriately on events.	Inter-observer reliability: on 20% of sessions. Mean reliability: 89% Procedural: no quantification but treatment fidelity checklist adhered to	Adam: improvement of skill performance by 30% (from 55% to 85%) with Social stories™, Hal: improvement of skill performance by 15% (45% to 60%) with Social stories™	Maintenance: Adam: scores 35% lower when SS™ was withdrawn (). Hal: scores 10% lower decreased when SS™ was withdrawn No generalisation data	Adam: 50% for 1st session Hal: 25% for 1st session (second sessions could not be calculated due to zero in baseline)
6. Social Story™ interventions for young children with Autism Spectrum Disorder. Kuoch et al. (2003)	Andrew: 3 yrs 10 mths. Autism. PPVT-R 95. (AE-3:7 year) Henry: 5 yrs 9 mths. PPVT-R: 44 (AE: 2:7 years) Autism. Had experience of Social Stories™. A third participant was outside the age group of interest.	Andrew and Henry: ABA design. Neil: ACABA design.	Andrew: crying, yelling, aggression when asked to share toys or possessions with older brother. Henry: eating problems at summer school: throwing up food, making sounds, putting hands in pants.	Inter-observer: Mean of 23.5% of all sessions, mean agreement 97.5%. Procedural: 98.4%	Andrew and Henry showed immediate decrease in rate of problem behaviours on intervention- means and variability were both lower.	Maintenance: decrease in behaviour targeted reported on return to baseline for two participants. Generalisation: reported generalisation of sharing and appropriate game playing skills for two participants.	PND baseline to intervention Andrew: could not be calculated due to zero in baseline Henry: Treatment PND was calculated at 100%
7. The use of Social Stories™ as a Preventative Behavioural Intervention in a home setting with a child with Autism. Lorimer et al. (2002)	Gregg: 5 yrs. Autism. Average to above average cognitive ability.	ABAB design	Tantrums- screaming, hitting, kicking and throwing objects.	Interobserver: Calculated for 33% of observations. Mean agreement 96.1%.	Tantrums on 5/7 days during 1st baseline phase. Dramatic decrease in tantrums after introducing SS™ - none on 6/7 days. Tantrums during 2nd baseline = 2/3 days. No tantrums on 6/7 days after intervention.	Not reported	Gregg: PND from baseline 1 (A) to intervention (B), & baseline 2 (A) to intervention (B) for rate of interrupting vocalisations (B) 86% (rate of tantrums could not be calculated due to zero in baseline

Results of Literature Search

Participants

In total, there were 13 preschool aged participants with ASD in the reviewed studies. The 13 included 8 children with diagnoses of ASD, one child with a diagnosis of Asperger Syndrome and 3 children with a diagnosis of PDD-NOS. One child, James, in Crozier et al. (2007) had no diagnostic information reported. All of the children in the studies were male.

The communication abilities of the participants in the studies ranged from children who spoke in single words to children who were highly verbal. A number of studies gave observational descriptions of the communication ability of the participants. Four studies gave information on communication ability as measured by standarised assessments, but this information was limited. Ivey et al. (2004) and Kuoch et al. (2003) used the Peabody Picture Vocabulary Test Revised (PPVT-R: Dunn & Dunn 1981) to determine that their participants ranged in their language abilities from severe difficulty to above average. Lorimer et al. (2002) stated that the expressive and receptive language abilities of their participants were now commensurate with the child's chronological age but did not give details of the assessments used to determine this. Crozier et al. (2007) used the communication section of the Vineland Adaptive Behavior Scale II (Sparrow et al., 2005) to determine that their participants had mild communication difficulties. Ivey et al. (2004) used several different language assessments for their participants, including for example Test of Early Language Development – Third Edition (Hresko et al., 1991) and the Expressive One-Word Picture Vocabulary Test (Brownwell, 2000). The use of different language scales for different participants in this study may perhaps limit comparison between them.

Three studies referred to the cognitive abilities of participants (Crozier et al., 2007, Ivey et al., 2004 and Lorimer et al., 2002). The cognitive abilities of the participants ranged from above average (Lorimer et al., 2002, Ivey et al., 2004) to below average (Crozier et al., 2007). For assessment of cognition, Ivey et al. (2004) used the Wechsler Preschool Primary Scale of Intelligence (WPPSI) – Third Edition (Weschler, 2002) for one participant but did not comment on the cognitive ability of the second participant. Leaf et al. (2012) used

different scales to assess cognition for different participants including the Wechsler Intelligence Scale for Children (WISC IV) (Weschler, 2003), the Kaufman IQ score (KBIT-2, Kaufman et al., 2004) and the WPPSI (Weschler, 2002).

Reading ability of the participants was mentioned in some of the studies (e.g. Crozier et al., 2007 and Lorimer et al., 2002). Two of the participants presented with hyperlexia and two of the participants presented with emerging reading skills and were able to sight read a number of words. Ivey et al. (2004) commented that none of their participants were able to read the SS™ independently. Only one study, Kuoch et al. (2003) discussed previous experience with SS™. Two of their participants had experience of SS™ while the other had not.

All of the studies discussed the educational placements of the participants. Two of the 13 participants attended a special preschool for children with developmental disabilities. One child received one-to-one home tuition while also attending a Montessori preschool one day a week. Five children attended a special preschool class with some level of integration into mainstream, with one of these children moving to mainstream kindergarten half way through the study. One child attended mainstream kindergarten with no extra supports. Six children were in mainstream kindergarten classes with teaching assistants. Some children also received speech & language therapy, occupational therapy and/or behavioural therapy sessions at home in addition to preschool placements.

None of the studies discussed the additional diagnoses of their participants.

Research design

Three out of the seven studies were single-participant studies and the experimental designs of these studies ranged in complexity and included: ABAB (Ivey et al., 2004, Kuoch et al., 2003; Lorimer et al., 2002), multi-component reversal (Crozier et al., 2007); multiple baseline across the participants (Schneider et al., 2010), multiple baseline across skills (Chan et al., 2008) and parallel treatment (Leaf et al., 2012) designs.

Interobserver and Procedural Reliability

All of the studies provided measures of interobserver reliability. In general, reliability measures in the studies ranged from 88–97.5%, calculated on between 20% and 40% of sessions (20% being the conventional minimum standard).

Procedural reliability was reported in six studies (Leaf et al., 2012; Schneider et al., 2010; Chan et al., 2008; Crozier et al., 2007; Ivey et al., 2004; Kuoch et al., 2003). Procedural reliability ranged from 93-100%. Ivey et al. (2004) did not calculate a percentage for procedural reliability but instead commented that a checklist was used to ensure adherence to treatment fidelity.

Target behaviour and settings

The studies addressed various types of social behaviours (e.g. sharing, initiating comments and requests to peers, approaching peers, behaviour in 'circle time' and encountering novel events). Three of the studies focused on social behaviour with peers: initiating requests and comments to peers, appropriate behaviour with peers, approaching peers, talking to peers (Chan et al., 2008; Crozier et al., 2007; Kuoch et al., 2003). One study focused on appropriate ways to express needs and desires with adults (Lorimer et al., 2002). Kuoch et al. (2003) also focused on problem eating behaviours.

All but three of the studies took place in a school setting, with Kuoch et al. (2003) also taking place in at the participant's home. Ivey et al. (2004) took place in various locations across a children's hospital, Lorimer et al. (2002) took place in the home and Leaf et al. (2012) took place in a research room or at the participant's home.

Social Story™ strategy

All seven studies reported using Gray's SS™ guidelines (1995; 1998; 2000). Kuoch et al. (2003) used a modified ratio of sentence types from the Social Story™ guidelines. Lorimer et al. (2002) claimed to follow Gray's guidelines but on examination of the stories used in the research, one of the stories "talking with adults" had a ratio of 5:6 directive to other

types of sentence. The directive sentences included “I will wait my turn”, “I don’t have to yell” and “I will remember”.

Six studies used visual aides (photos, line drawings) in their SS™. Chan & O’Reilly (2008) was the only study using text only SS™. Only two studies report using comprehension questions when delivering the SS™ (Chan et al., 2008; Schneider et al., 2010).

Teachers/Education staff read the SS™ in two of the studies, the researchers read the story in three of the studies and the parents read the S™ in two studies. Two studies reported that the SS™ was available outside of the intervention session (Ivey et al, 2004 and Lorimer et. al, 2002.)

Three of the studies (Ivey et al., 2004; Lorimer et al., 2002; Chan et al., 2008) used more than one SS™ in their study.

Additional strategies

In some studies, concurrent use of additional intervention strategies with SS™ may have confounded the results so that the efficacy of the SS™ in isolation is difficult to assess. In two studies, verbal and/or physical prompting was used (Ivey et al., 2004, Kuoch et al., 2003). Leaf et al. (2012) used an extensive range of reinforcers including bouncy balls and a token system which could be exchanged for preferred activities, gift cards and fountain pens. Other strategies included teacher modelling along with the SS™ (Chan et al., 2008).

Short term results

The authors of five studies (Leaf et al., 2012, Schneider et al., 2010, Ivey et al., 2004, Kuoch et al., 2003, Chan et al., 2008) reported an increase in the target social behaviours and two studies (Lorimer et al., 2002, Kuoch et al., 2003) claimed an appropriate decrease in targeted undesirable behaviours from baseline to intervention, or from pre-test to post-test, resulting in more appropriate social interactions.

Percentage of Non-overlapping Data (PND)

PND values were obtained for four studies (Schneider et al., 2010, Ivey et al., 2004, Kuoch et al., 2003, Lorimer et al., 2002). In many cases, the data overlap did not provide an accurate measure of treatment effectiveness, for example, when baseline data shows an inappropriate trend, or when ‘‘floor or ceiling’’ effects occur (Scruggs et al., 1987). For example, a “ceiling” effect where a data point of 100% occurred in the baseline for the participant in Schneider et al. (2010) meant that the consequent PND as calculated was 0%. For several of the studies, a data point of zero was present in the baseline, rendering PND unsuitable (as discussed in the section on PND above). For those studies where PND values were obtained, this zero effect also limited the number of sessions and target skills for which it could be calculated (see Table 2 above).

The mean PND values (52.2%) place SS™ in the non-effective range or at very best, in the low end of the mildly effective range as an intervention. There was a wide degree of variation in responses to intervention across participants and behaviours (see Table 2). The raw percentage scores reported would however suggest that SS™ do improve target behaviours to an encouraging degree. Therefore, the mean PND calculated here may be misleading, and perhaps the raw scores comprise a truer representation of the effectiveness of Social Stories™.

Unfortunately, as the studies all had such low participant numbers, and did not provide exact data sets, it was not possible to calculate a unifying measure of ES for all. None of the studies included PND values, SMD or ES. SMD would have been another appropriate way in which to calculate ES for the studies. However SMD was not calculated by any of the authors and the absence of exact data points and standard deviation values meant that a formulaic calculation of effect size based on SMD was not possible. It was felt that deriving exact data points and standard deviations from the graphs would be unreliable, as often it was difficult to determine exact data values from these graphs.

Maintenance and generalisation

Maintenance results were reported for six of the studies (Leaf et al., 2012; Chan et al., 2008; Crozier et al., 2007; Ivey et al., 2004, Kuoch et al., 2003). Some studies reported that the intervention results were maintained on follow up (e.g. Chan et al., 2008). Others reported that the results decreased from post-intervention but remained above the baseline level on follow-up (e.g. Kuoch et al., 2003). Please see Table 2 above for further maintenance results.

The provision of generalisation data is of central importance, especially for children with ASD, who experience difficulties in generalisation across settings (Wing, 1996). Generalisation data were discussed in three studies (Leaf et al., 2012; Chan et al., 2008; Kuoch et al., 2003). Generalisation data were generally limited in terms of the target behaviour or skill being demonstrated in a new setting and with new people. Leaf et al. (2012) commented that skills were maintained to a level above baseline for generalisation with the teaching interaction procedure found to be superior to SS™. They also reported generalisation of skills from adult to peer. Kuoch et al. (2003) reported anecdotal evidence of generalisation of skills to other family members and settings in two of their participants. Chan et al. (2008) reported that the skill level maintained in a new classroom and with a new teacher.

Social Validity

Three of the studies reviewed examined an aspect of social validity. Chan et al. (2008) and Ivey et al. (2004) both indicated the treatment was considered acceptable using a 5-point Likert scale (Likert, 1932). Crozier et al. (2007) used questionnaires and an interview with the teaching staff to evaluate the social validity of their interventions. Overall, SS™ was deemed a socially valid intervention.

Discussion of Included Literature

The majority of the studies in this review report positive results, that is, an increase in the target social behaviours or a reduction in the targeted undesirable behaviour. This suggests that SS™ may be an effective intervention in supporting the development of social behaviour skills in young children with ASD. However the mean PND of the studies was 52.3%, which places the intervention in the minimally-effective range. The review highlighted a number of inconsistencies and limitations of the studies included.

Firstly, three of the studies reviewed in this analysis were single-subject studies or had only one participant within the age range of interest. One of the main criticisms of single-subject design is that it has low external validity (i.e. amenability for generalisation beyond the immediate study). This weakness can be addressed through replication. However, in order to conduct replication and draw rational conclusions, one must be sure of the characteristics of the participants in the research. The studies reviewed were generally inadequate in their descriptions of the participants. It is important that the levels of cognitive and language functioning are documented so as to inform practice with children of differing abilities. This is particularly relevant in the studies in this review, which concentrated on children with ASD, considering the wide variation in presentation of such children. Some studies in the review have provided information on the effect of the SS™ intervention with children with an intellectual disability and language difficulties compared with those with no intellectual disability. Previously, two of the studies with higher functioning school aged children reported that SS™ were not effective (Hanley-Hochdorfer et al, 2010 and Watts, 2008), whereas Lorimer et al. (2002) and Kuoch et al. (2003) report positive results with their high functioning participants. Moreover relevant information on cognitive and language ability is incomplete or entirely lacking in many of the studies. Further research is needed to answer questions as to how SS™ may best be used with those of differing cognitive and linguistic abilities.

A number of criticisms have been discussed regarding PND. A high degree of variability in baseline data may reduce the PND value of a treatment phase that follows. Extreme outlier values in baseline data may overlap a large percentage of the treatment phase data points,

even if overall the treatment phase appears highly successful (Faith et al., 1996). In this review there was a high degree of variability in the PND scores ranging from 0- 100 percent. For three studies PND could not be calculated as the value of zero was present in the baseline, which yielded a "floor" effect.

A range of social behaviours was targeted in the studies reviewed. All seven of the studies reported an increase in appropriate behaviours and/or a decrease in disruptive behaviours during the intervention phases. It is unclear from the results if SS™ are more effective as an intervention with one certain type of social behaviour target or skill over another. This could be an area for future research.

All seven studies claimed to follow Gray's Social Story™ guidelines in the construction of the SS™. However on closer inspection, two studies used modified ratios. Few studies provide examples of the SS™ used and so it is unclear if the sentence ratios were used as recommended in the guidelines. Six studies used visual aides in their stories and there is no evidence as to whether use of visual aides made a difference to the outcome of the studies.

A range of other intervention strategies were also employed in some of the included studies, most commonly physical and verbal prompting and various reinforcements. In these studies, it becomes difficult to ascertain which of the treatments: prompting, reinforcement or the SS™ itself, might be the crucial element of the intervention, or whether the combination has an additive effect. In this analysis there appears to be no clear evidence of difference between SS™ using additional strategies and those that did not. This could be an area for future research.

The use of more than one SS™ to target a social situation, or the use of several SS™ to target several behaviours, the frequency with which the SS™ are read and reviewed, the addition of comprehension activities and the access to the story outside the intervention setting, were all variables which could affect the efficacy of SS™ as an intervention. This information was only available in a limited number of studies, making analysis according to these variables difficult to determine. The import of these issues in terms of effectiveness of the treatment requires further examination.

Maintenance and generalisation measures were insufficiently addressed in the studies reviewed. Maintenance was described in six studies and generalisation in only three studies. These issues are of central importance, especially for children with ASD, due to reported difficulties in generalisation across settings (Wing, 1996). Maintenance and generalisation are essential components for an effective treatment and critical in drawing conclusions about the efficacy of SS™ interventions.

Social validity refers to the acceptability of the interventions themselves, whether they are appropriate, fair and reasonable procedures to improve behaviour (Hastings et al., 2005). It is important for therapists to understand the social validity of an intervention because the success of an intervention can depend not only on its effectiveness but also on its acceptability (i.e. consumers are unlikely to carry out a treatment if they perceive it to be unacceptable). Only three of the studies reviewed included social validity measures. However, SS™ were rated highly acceptable in these three studies.

Some aspects of reliability measures in the studies were problematic. Interobserver reliability (IOR) was reported in all of the studies, but procedural reliability was reported in only six. The apparent simplicity of SS™ as an intervention may lead to the belief that procedural reliability does not need to be measured. However examination of the studies revealed that there were deviations from the recommended means of construction of SS™ and that it is therefore likely that there were deviations from the intended implementation. Reliability measures, including measures of procedural reliability are essential to a good research design and thus a lack of these measures weakens confidence in the research.

Implications for practice

The current research literature includes claims that SS™ can be beneficial in supporting the development of social behaviour skills in children who present with ASD and there are a number of limitations in the studies reviewed that constrain these findings. SS™ have shown to be considered socially valid across settings.

Concluding Comments

Although the studies report positive results, the mean PND of the studies was 52.3%, which place the intervention in the minimally-effective range. The review highlighted a number of inconsistencies and limitations in the studies which raises a number of questions regarding the effectiveness of SS™ to support positive change in children with ASD. This review emphasises the need to adopt a systematic, rigorous scientific approach to future research if the efficacy of SS™ in supporting social behaviour is to be fully determined.

Chapter 4: Video Modelling Introduction

Video Modelling Overview

The concept of modelling was first described by Albert Bandura. In 1961, he showed that children behaved more aggressively towards a toy after observing an age-matched (peer) model being aggressive towards that toy (Bandura et al., 1961a). Imitation and modelling form a large part of how all children learn. In a later study, Bandura et al. (1961b) demonstrated that observing another person receiving a reinforcement for a particular behaviour increased the rate of performance of that behaviour, both for the onlooker and the model. With the advent of video technology in later decades, use of video as a means of observing models emerged as a possible alternative to live "*in vivo*" modelling. The possibilities of modelling various skills using video were explored at this time in relation to motor skills (Dowrick et al., 1980) and social skills (Charlop et al., 1989).

Video modelling is defined as "*the instances of modelling in which the model is not a live one, but one that is videotaped, in an effort to change existing behaviour or learn new ones*" (Dowrick, 1991) quoted in Nikopoulos et al. (2006, p.75). The learner views the video model on the screen and is given the opportunity to imitate the observed behaviours (Reagon et al., 2006). A typical video model is a videotaped sample of a person engaging in scripted actions and/or verbalisations. After viewing the videotape a number of times, the individual is provided with an opportunity to perform the target behaviour. Imitation is considered one of the basic processes of learning new behaviours. Imitation skills have been shown to have a significant relationship on future language skills, communication and social development in children with ASD (Charman et al., 1994; Stone, 2005).

Video modelling is an umbrella term that encompasses a number of different types of video interventions, including Peer Video Feedback, Point-Of-View Video Modelling, Computer-Based Video Instruction, Self Video Modelling and Peer Video Modelling. Video Feedback involves videotaping the participant individually performing specific behaviours and then co-reviewing the videotape so that the person can evaluate his or her own behaviours.

Participative (Point-Of View) Video Modelling is when the video is filmed from the perspective of the participant. Within Participative (Point-Of-View) Video Modelling there is a distinction between first-person type video modelling, which shows the hands and other parts of the model's body, and videos that do not show the model at all. Computer Based Video Instruction is when a computer is used to present a variety of media (text, music, pictures, video footage) interactively to the participants. To date, there is little evidence to support the use of these three types of video modelling interventions for children with ASD. For example, only two studies have so far investigated the use of video feedback with individuals with ASD. One was aimed at teaching self-help skills to two adolescents (Lasater et al., 1995), while the other incorporated video feedback as one component of a multi-element intervention to teach peer directed social communication skills to young children (Thiemann et al., 2001).

The two types of video modelling interventions that have been used and researched more widely are Self Video modelling (SVM) and Peer Video Modelling (PVM). Self Video Modelling involves a child watching him/herself perform the target behaviour on video. Peer Video Modelling involves the child watching others carrying out the target behaviours on the video. A review of video modelling interventions for people with ASD by Delano (2007) found that 5 of the reviewed studies used SVM and 12 used PVM. A review by McCoy et al. (2007) found that self and peer models had the most impact on supporting the development of skills in people with ASD, compared to adult and point-of-view models. Sherer et al. (2001) compared self versus peer models and found them both to be effective in increasing the target behaviour. However, they hypothesised that PVM may be more appropriate for teaching functional skills and that SVM may be more appropriate in increasing compliant behaviour. A second comparison study by Marcus et al. (2009) found that SVM was more effective in teaching skills to children with ASD.

A number of procedural variations within video modelling interventions have been reported in the literature. For example, in the majority of studies on video modelling, video priming is used where the learner watches a video model and later has an opportunity to engage in the desired response with similar materials, people, and/or settings (e.g., Charlop et al.,

1989; Lasater et al., 1995; Hine et al., 2006; Nikopoulos et al., 2007). Other studies have included opportunities to interact with materials and engage in the target imitation responses while the learner is watching the video, allowing the instructor to provide prompts and reinforcers directly during the training experience. A comparison of traditional video priming and simultaneous video modelling of procedures was examined in a study by Sancho et al. (2010). Overall, both procedures were shown to be effective in teaching play skills to two young children with ASD. The procedures appeared to be equally effective for one child. The other child appeared to acquire the skills more quickly in the simultaneous condition. However the lack of substantial increases during simultaneous video modelling means that the results needs be considered with caution.

Video Modelling and ASD

There are a number of reported advantages of using video modelling as an intervention strategy for people with ASD. Technological advances have made video modelling a readily available intervention that is easy to use and has minimal costs in terms of time and money. Also, many children with ASD find watching videos/DVDs to be reinforcing and are highly motivated to watch them (Lasater et al., 1995). Charlop-Christy et al. (2000) found that video modelling was superior to live modelling for supporting the acquisition, maintenance and generalisation of new skills. Video modelling can present a variety of behaviours and skills in realistic contexts. It can also be useful for people who are unable to take advantage of print materials. This medium can also compensate for the social deficits of people with ASD as it reduces the quantity of interpersonal interaction required for learning. Video modelling can reduce the amount of attention and language demands placed upon an individual with limited language abilities in order to learn a skill.

Children with ASD often exhibit stimulus over selectivity: that is, excessive attentiveness to certain stimuli in the environment to the neglect of other stimuli which may be of relevance to tasks or social cues. This phenomenon was first described in 1971 by Lovaas et al. who compared responses to two stimuli (one a red light, one “white” noise) in 9 children with ASD. These children demonstrated a high level of over selectivity in that 7 out of these 9 demonstrated responses to only one of these stimuli. The use of video

models may compensate for this over selectivity as the camera can zoom in on a relevant cue to highlight target behaviours.

In 1982, Steinborn et al. reported the first empirical evidence on the use of video modelling as an intervention for children with ASD (to teach pedestrian skills). Since then, there has been a growing body of literature that supports the use of video modelling in teaching children with ASD a range of skills. These include perspective taking (Charlop-Christy et al., 2003; LeBlanc et al., 2003), language (Charlop et al., 1989, Nikopoulos et al., 2003), play (D'Ateno et al., 2003; Dauphin et al., 2004; Hine et al., 2006; MacDonald et al., 2005; MacDonald, et al., 2009; Nikopoulos et al., 2003; Paterson et al, 2007; Reagon et al., 2006; Taylor et al., 1999), and daily living skills (e.g., Shipley-Benamou et al., 2002). However, few studies have shown that video modelling alone is effective in teaching skills to children with ASD. A meta-analysis by Bellini et al. (2007) reported that 65% of the 23 studies required additional elements such as reinforcement and in-vivo prompting, to increase effectiveness. However Bellini et al. (2007) also concluded that video modelling and SVM should be recognised as an evidence–based practice for children with ASD. Charlop-Christy et al. (2000) found that video modelling was more effective than live models in supporting the acquisition and generalisation of the target behaviours. Research has also found that video modelling interventions are seen as socially valid as watching videos is considered a socially acceptable activity among typically developing peers (Rayner et al., 2009).

According to Rayner et al. (2009), there is no definite evidence to indicate which individuals would and which would not benefit from video modelling interventions. McCoy et al. (2007) and Kleeberger et al. (2010) believe that the abilities to attend to and imitate the videos are requisites for video modelling because the child must be able to take account and imitate the model if it is to be successful. They believe that a basic imitative repertoire should be achieved through discrete trial training before video modelling. However Nikopoulos et al. (2006) believe that the only requisite is the ability to attend to the video for 1 minute. A study by Tereshko et al. (2010) found that delayed object to picture matching could be used as a prerequisite to video modelling in an 8-step construction task. Delano (2007) found in a review that there were a number of studies that

reported variable results among participants. Delano felt that individual characteristics such as visual processing, language skills and the level of problem behaviours may influence the effectiveness of video modelling interventions. However, as yet, there are no empirically evaluated tools and measures to ensure that individuals have the necessary skills to benefit from video modelling.

The following two chapters focus on the effectiveness of SVM and PVM, respectively, as interventions for preschool children with ASD. These two types of video modelling interventions were chosen for this study due to the considerable attention that these intervention types have received in relation to this population.

Chapter 5: Self Video Modelling

Overview of Self Video Modelling

Self Video Modelling (SVM) is a specific application of video modelling. SVM is defined as "a procedure in which people see themselves on videotapes showing only adaptive behaviour" (Dowrick, 1983, pp. 105). In other words, the person acts as their own model. The first published article on SVM was in 1970 by Creer et al. Since the 1970s there has been a growing number of studies into the value of SVM. SVM has been used successfully across multiple disciplines and populations to teach a variety of skills such as motor skills, social skills, communication skills, vocational skills and emotional regulation. Studies have included research on parenting skills (Meharg et al., 1991), teaching swimming (Scraba, 1989), depression (Dowrick et al., 1990), selective mutism (Holmbeck et al., 1992), life skills (Miklick et al., 1977) and aggressive behaviours (Creer et al., 1970).

Researchers have described two main procedural categories of SVM: feedforward and positive self-review (Bellini et al., 2007; Dowrick, 1999). In feedforward, the video depicts the person performing a level of performance not yet attained, or at least in a setting that they have been able to demonstrate the target behaviour. In positive self-review, the video is edited to remove any behaviour that is not positive in relation to the target behaviour. Dowrick (1999, pp.26) created seven categories of SVM applications to support the practical application of both types of SVM (see Table 3).

Table 3: Seven Categories of Self-Modelling Applications Designated as Positive Self Review or Feedforward (Dowrick, 1999).

1. Increased adaptive behaviour currently intermixed with non-desired behaviours	Positive Self Review
2. Transfer of setting-specific behaviours to other environments	Feedforward
3. Use of hidden support for disorders that may be anxiety based	Feedforward
4. Improved image for mood-based disorders	Positive Self Review
5. Recombining component skills	Feedforward
6. Transferring role-play to the real world	Positive Self Review and Feedforward
7. (Re)engagement of disused or low frequency skills	Positive Self Review

The basic procedure in conducting SVM according to Buggey (2005) involves the following principal steps: (a) videotaping the behaviours (b) editing the video to depict the desired behaviours, and (c) allowing the individual to watch the video. Buggey describes two major methods of obtaining videos of the desired behaviours. The first is to video the individual role-playing or imitating the behaviours and the second is to tape the person's behaviours over time and edit the tape to only show the desired behaviours. For creation and implementation of SVM, various guidelines are available but no set guidelines have been internationally agreed to date.

Self Video Modelling and Autism Spectrum Disorder

There is an emerging body of research suggesting the potential of SVM in supporting the development of social behaviours of children with ASD. A number of reviews of SVM have been carried out (Dowrick, 1999; Hitchcock, et al., 2003) but these were not specific to ASD. Delano (2007) reviewed the SVM literature in relation to ASD and found only 5 studies that used SVM. All 5 studies reported positive results. However, one study by Nikopoulos et al. (2003) did not report gains in the target behaviour using SVM with the participant who had also not shown progress using PVM. A limited number of comparison studies using SVM have also been carried out. Sherer et al. (2001) found that there was no difference between the effectiveness of SVM and *in vivo* modelling in answering questions. Marcus et al. (2009) found that SVM was more effective than PVM in teaching textual responses. However, with regard to this study, one would have to question the social validity of a study that taught children to name Arabic and Greek letters that had no functional outcomes.

There have been a number of arguments put forward as to why SVM may be successful for children with ASD. Some researchers feel that children might enjoy watching themselves more than watching an age-matched model and, thus, may be more motivated to attend to self videos. Also the familiarity of the self model might help visual processing, and thus make learning easier. Kehle et al. (2002) hypothesised that watching an edited self video that depicts only positive and effective behaviours may alter the viewers' memories of their past behaviours (i.e. that their memories of maladaptive behaviours are replaced with the target behaviours). Dowrick (1999) felt that children not only acquire skills by observing themselves on video but that it also increases self-efficacy through the viewing of their own efficacious behaviour. Bandura (1986, pp. 94) felt that SVM provided essential elements to support self-efficacy as it "*provides clear information on how best to perform skills and it strengthens beliefs in one's capability*". Buggey, as reported in Rayner et al. (2009) felt that the development of self-recognition and the ability to attend were pre-requisite skills for SVM. These skills would typically be present by the age of 2 years (Mayo clinic 2013).

The specific value of SVM in supporting positive social behaviours in preschool children with ASD is unclear to date. There is currently little comprehensive research into the use of

SVM for preschool children with ASD. The purpose of the following literature review is to provide a comprehensive and detailed review of studies relating to the effectiveness of SVM interventions for preschool children with ASD. The studies included will be those in which targeted social behaviours. The review will focus on the characteristics of the participants, the short term effects, maintenance and generalisation, and the quality of the research designs.

Methodology of Literature Search

Studies included in this systematic review were located by utilising the Educational Recourses Information Centre (ERIC), PsychINFO and Medline databases. The following combination of descriptors was used:

1. Autism Spectrum Disorder
2. Asperger Syndrome
3. PDD-NOS
4. Video
5. Video Modelling
6. Video Modeling
7. Video Tape Modeling
8. Video Self Modeling (VSM)
9. Self Video Modelling (SVM)
10. Self Video Modeling (SVM)
11. Video technology
12. Video feedforward
13. Video feedback
14. Multimedia

The following combinations of terms were used:

1 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

2 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

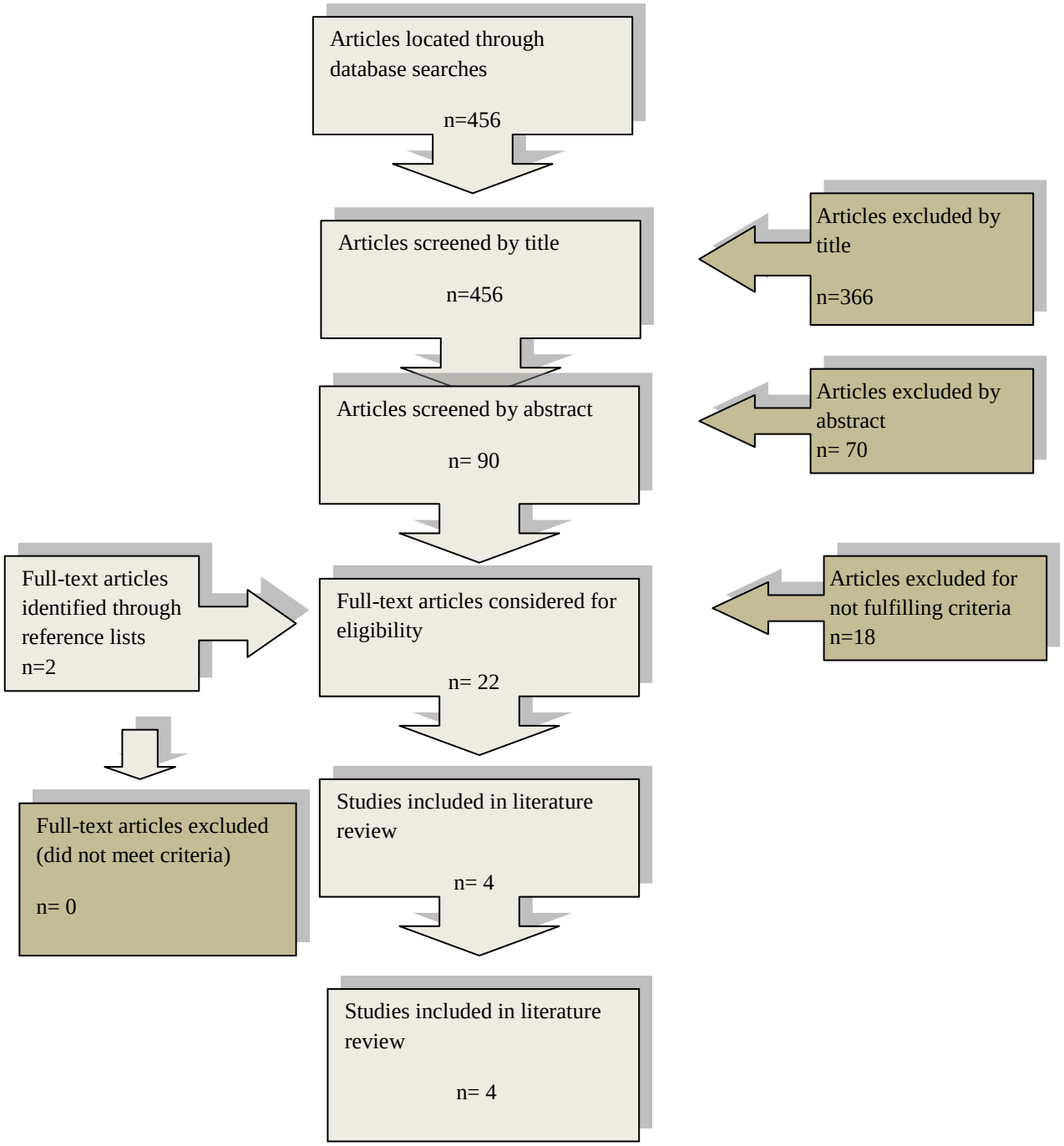
3 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

A search was also conducted using the reference lists of each study located. The abstract and methodology section of each article were examined to determine if they met the criteria for inclusion in the study. The criteria were as follows:

1. Participant must have been identified as having a diagnosis of ASD, Asperger Syndrome or PDD-NOS. For example, the study by Possell et al. (1999) was excluded as their participants did not have diagnoses of ASD, Asperger Syndrome or PDD-NOS.
2. Participants must be aged between 36-72 months (early intervention). For those studies which included some participants within and some outside the researcher's target age range, only those participants who fell within the age range were included.
3. The study must have targeted social behaviours. For example, Marcus et al. (2009) was excluded as the target skill was letter naming.
4. Due to the relatively small body of research in this area, unpublished dissertations were included in this review in addition to peer reviewed journal articles. Studies had to be written in English.
5. The study must have assessed the efficacy of SVM alone or in contrast to another intervention. Interventions that did not depict a video representation of "self" were excluded (i.e. point of view, cartoon videos)
6. Studies were included if they used specifically created videos. Studies relating to commercially available videos were not included in the review.
7. Studies that utilised subtitles in their videos were not included to maximise consistency within study results.
8. Studies that included videos as part of a computer based program were excluded to maximise consistency within interventions.

Below is a flow chart which describes the initial search results and the exclusion process which followed based on the inclusion criteria as described.

Figure 2. Article selection process for Self Video Modelling with the number of studies screened at each review stage. Adapted from Moher *et al* (2009). The PRISMA Group.



Four articles studying SVM were located that fulfilled the study criteria, one of which compared PVM to SVM. The following studies were included in the literature review: Bellini et al. (2007), Buggey (2005), Wert et al. (2003) and Sherer et al. (2001). For a list of studies excluded from the review, see Appendix 4. See Table 4 below for a list of papers included in the review.

Table 4: Summary of Self Video Modelling research – included papers (PND=Percentage of Non-Overlapping Data)

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalization	PND
1. Increasing social engagement in young children with autism spectrum disorders using video self modelling Bellini et al. (2007)	Roger: 4 yrs, 4 mths PDD-NOS. Dylan: 5 yrs. Autism.	Multiple baseline across participants.	Unprompted social engagement with peers.	Roger: IOR calculated for 25% of the baseline and 20% of the intervention sessions- averaged 94%. Dylan: IOR calculated for 17% of the baseline and 20% of the intervention sessions- averaged 100%. IOR was not calculated during the maintenance phase.	Roger: mean percentage of social engagement during baseline of 3% which increased to 53% after the intervention phases. Dylan: mean percentage of social engagement during baseline of 6% which increased to 24% after the intervention phases.	Roger: mean of 52% during maintenance. Maintenance PND = 100%. Dylan: increased to mean of 33% during maintenance Maintenance PND = 100%. Generalization was not discussed.	Roger: Treatment PND = 80%, Dylan: Treatment PND = 80%,
2. Video self-modelling applications with students with autism spectrum disorder in a small private school. Buggey (2005)	John: 5 yrs 5 mths. PDD-NOS. Note: 3 participants comprised children aged 5-11 years.	Multiple baseline.	John: Pushing and language production.	John: IOR for this study was 100% agreement for the pushing behaviours, 96% for verbalizations and 94% for utterances.	John:, Only one occurrence of pushing noted following intervention. Unprompted utterances: Tape 1- mean rate of responding to questions rose (0.2-1.8 responses/day). Tape 2: mean rate of unprompted verbalisations rose (0-3), mean rate of responding to questions rose (3/10 during the first intervention to 3.67 in Intervention 2).	John: maintenance phase showed a 100% decrease in pushing behaviour. Responding to questions was at a mean of 4.67 out of 10 during maintenance.	John: Treatment PND = 90%, for pushing. Treatment PND for responses to questions not calculated due to zero in baseline

Table 4: Summary of Self Video Modelling research Table continued– included papers

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalization	PND
3. Effects of video self-modelling on spontaneous requesting in children with autism. Wert & Neisworth (2003)	Participant 1: 5yrs 6 mths, male. Autism. Participant 2: 4yrs 6 mths male. Autism. Participant 3: 4 yrs, male, Autism. Participant 4: 5 yr male, Autism.	Single subject design using multiple baselines across subjects.	Spontaneous requesting (SR).	IOR was assessed in 50% of the baseline Phase, 60% of intervention phase, and 100% of maintenance phase. The IOR for all phases of the study was 100%.	Participant 1: SRs were variable but increasing, mean of 10.2 SRs (range=5–19) from baseline 0.83. Participant 2: Variable but increasing SRs, mean of 17.5 (range=11–26) from baseline 2.7. Participant 3: Variable but increasing SRs, mean of 12.6 (range = 7–23) from baseline 1.0. Participant 4: Mean SRs was 13.2 (range = 2–27) from baseline 1.2.	Participant 1: maintained a high frequency of SRs, with a mean of 23.6 Participant 2: The mean number of SRs was 20.5 (range = 19–22). Participant 3:The mean frequency of spontaneous requests was 21 for that occasion. Participant 4: was unable to continue with the study through the maintenance phase.	PND not calculated due to zero in baseline.
4. Enhancing conversations skills in children with autism via video technology: which is better, "self" or "other" as a model? Sherer, Pierce, Paredes, Kisacky et al. (2001).	Luke 5 yrs. Autism. Mental age: 3.0. Language age: 2-9 years Joey: 4 yrs. PDD-NOS. Mental age: 4 years. Language age: 3-3 years. (Note: 3 other children in study aged 7-11 years).	Combination of single participant multiple baseline and alternating treatment designs.	Answering a series of conversation questions.	IOR data were collected for 33% of sessions across all participants and experimental phases Reliability averages at 99%	Luke: reached acquisition for correct responding after 7 session in peer video but did not reach acquisition after 15 sessions in self video. Joey: increased to 25% correct conversation engagement in both conditions. He did not increase above this level after 18 sessions.	Follow up probes for maintenance taken 2 months later. Luke and Joey maintained levels of responding. Generalization probes were used to assess settings, questions and peer.	Luke: not calculated as baseline had only zero points. Joey: not calculated as baseline had only zero points.

Results of Literature Search

Participants

In total, there were 9 participants of preschool age in the studies that fit the above criteria. These participants included six children with diagnoses of ASD and three children with diagnoses of PDD-NOS. All of the participants included in this review were male.

The communication ability of the participants in the studies ranged from non-verbal to verbal. Three out of the four studies gave observational descriptions and broad results regarding communication assessment scores of the participants. Bellini et al. (2007) gave a description of observations: that the child spoke mainly in single words and that any 2 or 3 word phrases were generally echolalic. Wert et al. (2003) described the language age of their participants (i.e. language was one year behind his chronological age), but they did not give details of the assessments used, a breakdown of the assessment or when the assessment was administered. Sherer et al. (2001) were the only authors who gave some description of the assessment used to assess communication ability. They gave the overall age equivalence from the Peabody Picture Vocabulary Test (PPVT-R; Dunn et al., 1981); however they did not give observational data or a breakdown of the results.

Only one study, Sherer et al. (2001) made reference to the cognitive ability of the participants, one child having no intellectual disability and one child having a chronological age of 5 years 10 months and a mental age of 3 years. The Standord-Binet Intelligence Test Scale – Fifth Edition (Roid, 2003) or the Leiter International Performance Scale - Revised (Leiter-R: Roid et al., 1997) was used to assess the mental age of the participants. No standard scores were reported. Buggey et al. (2005) stated that all of their participants were assessed using the Weschler Intelligence Scale – Fourth Edition (WISC-IV, Weschler, 2003), Peabody Picture Vocabulary Test - Revised (PPVT-R: Dunn et al., 1981) and the Woodcock-Johnson Achievement Test – Third Edition (Woodcock-Johnson III: Mather et al., 2002), but that all assessment results were ruined in a flood in the school and so were unavailable for the study.

The ability for the participants to attend to video or television prior to the study was not reported in any of the studies. Only one study, Buggey (2005), checked if the participants

were able to imitate behaviours, through use of a questionnaire with parents, teachers and staff.

All of the participants were in preschool education either full time or on a half day basis. Extra one-to-one home tuition was not mentioned in any of the studies. Buggey (2005) was the only study to mention other interventions taking place. He reports that all of his participants also received Sensory Integration Therapy.

Only one study, Buggey (2005), mentioned additional difficulties of the participants. One of his participants had two of his left fingers joined together at birth. One of the studies (Wert et al., 2003) noted that their participant had previously been taught to request using discrete trial drills.

Research design

The experimental designs of these studies included: multiple baseline across participants (Bellini et al., 2007; Wert et al., 2003; Buggey, 2005) and multiple baseline across skills (Buggey, 2005). Sherer et al. (2001) used a combination of a single participant multiple baseline design and an alternating design.

Interobserver and Procedural Reliability

All of the studies provided measures of interobserver reliability. In general, reliability measures in the studies ranged from 88–100%, calculated for between 17% and 100% of sessions (20% being the conventional minimum standard). Bellini et al. (2007) measured the interobserver reliability for Dylan on 17% of the baseline.

Procedural reliability measures were only reported in one study (Bellini et al., 2007) who discussed the use of an "intervention fidelity form", which was filled out each day by the teacher and then reviewed weekly by the research team. While these forms provided descriptive data, they did not provide statistical data on procedural reliability.

Target behaviour and settings

The studies addressed various types of social behaviours, such as, answering a series of conversational questions, unprompted social engagement, spontaneous requesting, language production, reducing pushing behaviours and appropriate reaction to criticism and frustration.

All of the studies except one took place in a preschool setting. Wert et al. (2003) took place in the home setting. Two of the studies (Wert et al., 2003; Bellini et al., 2007) specify that their films were watched at the start of the day. Wert et al. (2003) had their participants watch the videos at home before coming to school and those of Bellini et al. (2007) watched the videos at school before classes started. One study (Sherer et al., 2001) instructed that the participants view the videos prior to going to bed. The videos were shown only once a day to the participants in all of the studies and the videos were not available to the participants at other times of the day.

Video Modelling strategy

Three of the studies verbally and/or visually cued the participants to give the correct responses before editing the video to remove the cues (Bellini et al., 2007; Sherer et al., 2001; Wert et al., 2003). Buggey (2005) used a scripted situation which was later edited. The length of the films ranged from 2 to 5 minutes. Sherer et al. (2001) did not give information on the length of their film. Buggey (2005) added a trailer to the start of his video clips and a sound of hand clapping at the end of the clips. None of the studies clarified the number of scripted actions and verbalisations in the video models. It is not clear from the studies how they decided on the scripted actions and verbalisations; normative data are not discussed in the studies. The number of video sessions ranged from 7- 24. None of the studies noted how many times the participants watched the videos.

Two of the studies (Buggey, 2005; Bellini et al., 2007) used more than one video clip. Buggey (2005) used two videos with one child and Bellini et al. (2007) used three video clips that were played on different days.

In two of the studies, the parents showed the video to the participants (Sherer et al., 2001; Wert et al., 2003). In Bellini et al., (2007) and Buggey (2005), either educational staff or paraprofessionals showed the videos to the participants.

Additional strategies

None of the studies used additional strategies to support the production of the target behaviour. Three of the four studies (Bellini et al., 2007; Wert et al., 2003; Sherer et al., 2001) specified that no prompting or reinforcement took place. Sherer et al., (2001) did reinforce correct on-task behaviour that was not the target behaviour with verbal praise (e.g. "good sitting!").

Short- Term Results

The authors of three of the studies reported an increase in the target social behaviours (Bellini et al., 2007, Buggey, 2005; Wert et al., 2003). Buggey et al. (2005) also demonstrated a decrease in undesirable (pushing) behaviours, which again was a positive outcome. Wert et al. (2003) found that all of their participants showed a variable but increasing trend in the number of spontaneous requests. Buggey (2005), motivated by the lack of unprompted utterances and an only slight increase in responding to questions by his participant, had to further edit his video to support language production. He found that his original video was "too busy". He showed more footage of the participants, added sentences and eliminated all but three questions. He found that this edited video resulted in an increase of unprompted verbalisations and an increase in response to questions. Sherer et al. (2001) found that one of their participants did not acquire the skill after 15 sessions of SVM, yet did acquire the skill after 7 sessions of PVM. The other participants failed to reach criteria level, only reaching 25% for both SVM and PVM after 18 sessions.

Percentage of Non-overlapping Data (PND)

PND values were calculated for two out of the four studies. The mean PND was 83.3% (range 80-100%), indicating that SVM is in the highly effective range. For the remaining two studies, and for one of the outcomes for Buggey (2005), PND was unsuitable due to the presence of zero points in the baseline, creating a "floor" effect which would have rendered

the PND calculations unreliable (Scruggs et al., 1987). PND was calculated by the study authors themselves for only one study (Bellini et al., 2007). The raw scores and percentages reported for the other studies indicated a positive effect consistent with these PND scores (see Table 4 above).

Maintenance and generalisation

Maintenance results were reported in all studies. All of the studies reported that the intervention results were maintained at follow-up. Wert et al. (2003) found that two of their participants had a mean increase in spontaneous requesting during the maintenance phase. They did not have maintenance data for one of their participants. Buggey (2005) also found that the mean language production and response to questions increased and that the incidence of negative behaviours decreased to a level described as "rarely exhibited". Bellini et al. (2007) report that the PND figures for the maintenance phases was 100% indicating that the results were maintained. Sherer et al. (2001) reported that one of the participants continued to maintain the skills at follow-up, while the other participant continued to fail to meet criteria.

Generalisation data were discussed in general terms in two of the studies. Buggey (2005) reported anecdotal incidents where his participant generalised the scripted verbalisations to other contexts and the teacher reported the child as using a wider range of language. Bellini et al. (2007) also reported that both of their participants engaged in increased parallel play with their peers following the intervention. However no statistical data on generalisation were reported in the studies.

Social Validity

Only one of the studies, Bellini et al. (2007), reported social validity data. During this study the teacher was provided with a weekly questionnaire consisting of a series of questions on a 4-point scale. The teacher reported that she did not find that the intervention interfered with the normal activities of the classroom or distracted the other children. She also found that the intervention was easy to implement, that she enjoyed being part of the intervention, and found it beneficial to the participants. She found that one of the participants enjoyed

watching the videos. One initially found it difficult to attend to the screen but within a week was able to do so with ease.

Discussion of Included Literature

The majority of the studies in this review reported positive results: an increase in appropriate behaviour and/or a reduction in challenging behaviour. The mean PND of the studies was 83.3% which places it in the highly effective range**.** This indicates that SVM can be effective in supporting social behaviours in children with ASD. This review has highlighted a number of inconsistencies and limitations of the studies relating to SVM which could be addressed in future research.

The paucity of studies, each with low numbers of participants, means that heterogeneity of participants, their attributes, intervention procedure and target skills limits the extent to which conclusions can be drawn from a meta-analysis of such studies. Controversy still exists regarding what skills children require if SVM intervention is to be effective (i.e. language levels, cognitive ability, attention levels and other attributes). Therefore, it is important that the levels of cognitive and language functioning and attention levels are documented. This is particularly relevant for children with ASD, considering the wide variation in presentation in children with ASD. As for the included studies for SS™, in the studies included in this review there is little norm-referenced and specific information regarding cognitive and language function and no information regarding attention levels and imitation skills.

A number of criticisms have been discussed regarding PND. A high degree of variability in baseline data may reduce the PND value of a treatment phase that follows. Extreme outlier values in baseline data may overlap a large percentage of the treatment phase data points, even if overall the treatment phase appears highly successful (Faith et al., 1996). This study showed that the mean PND was 83.3%, indicating a highly effective intervention. However due to the limited number of studies in this review and the even smaller number for which PND could be reliably calculated, these results should be interpreted with caution, and perhaps the raw scores comprise a truer representation of the effectiveness of SVM.

Similarly to the studies included in the literature review for SS™ (see chapter 3), the studies all had low participant numbers, and did not provide exact data sets, so it was not possible to calculate a unifying measure of effect size for all. None of the studies included PND values, Standard Mean Difference or Effect Size. Again SMD was not calculated by any of the authors and the absence of exact data points and standard deviation values meant that a formulaic calculation of effect size based on SMD was not possible.

A range of social behaviours was targeted in the studies reviewed. All four studies targeted increasing social and communicative behaviours, and one also targeted reducing inappropriate behaviours. Three studies reported an increase in appropriate behaviours and a decrease in disruptive behaviours during the post-intervention phases. However, one study did not report positive results for SVM (The increase achieved was 25%, which did not meet criteria) but did for PVM. It is unclear from the results if SVM intervention is more effective with a certain type of social behaviour or participant. This could be an area for future research.

A range of procedures was used in the studies during the SVM interventions. All of the studies prompted their participants to perform the target behaviour and then edited the video. One researcher added trailers and sound to the videos; three studies specified where and when the video was to be watched. However, there was no evidence that these differences impacted on the results. Future research should consider examining procedural differences in the effectiveness of SVM.

The use of more than one video to target a social behaviour, the frequency with which the videos are viewed and reviewed, the time of day at which the videos are viewed, and the number of scripted actions/verbalisations are all variables that could affect the efficacy of the SVM intervention. The import of these issues in terms of effectiveness of the treatment requires further examination.

Maintenance results were reported in all studies and the results indicate that the post-intervention levels were maintained at follow-up in all studies. Generalisation measures were addressed in two of the studies reviewed, but were reported anecdotally rather than

through formal scoring. Maintenance and generalisation are essential components for an effective treatment and therefore it is not possible to draw conclusions about the efficacy of SVM interventions in supporting preschool children to generalise their skills outside the learning setting.

Only one of the studies reviewed included social validity measures; however SVM was rated as highly acceptable in this study.

Some aspects of reliability measures in the studies were problematic. Inter-Observer Reliability was reported in all of the studies, but procedural reliability was reported in only one, and this lack of procedural data does weaken confidence in the research. SVM is a relatively new intervention for children with ASD. Therefore, it is essential that its effectiveness is evaluated rigorously.

Implications for practice

The current evidence indicates that SVM can be beneficial in supporting the development of social behaviours with preschool children who present with ASD. There is some evidence, though limited, that SVM is considered socially valid and is easy to implement across settings.

Concluding Comments

The majority of the studies in this review report positive results, that is, a reduction in challenging behaviour or an increase in appropriate behaviour. The mean PND of the studies was 83.3%, which places it in the highly effective range. However, due to the small number of studies in the review, a number of inconsistencies and limitations in the studies, a definitive conclusion regarding SVM cannot be reached. Further research efforts with group designs, homogeneity of participants, set target skills, and uniformity of procedures and guidelines are required to provide a higher level of evidence which can more reliably inform practice as to the role of SVM in the ASD population.

Chapter 6: Peer Video Modelling

Overview of Peer Video Modelling

Peer Video Modelling (PVM) is a specific application of video modelling. "Peer or "other" Video Modelling refers to the use of a typically developing peer or adult as the model in the video. Peer modelling is a major influence in normal development. Many studies have shown that typically developing children learn rapidly through modelling (Bandura, et al., 1961). PVM can use peers or adults as the model of the target behaviours. However, there is still no consensus as to which model types may be more appropriate. Adult models can be familiar to the child, such as a parent or teacher, or be a stranger. Peer models are typically the same age and gender as the participant. Peer models can include individuals familiar to the participant, such as a sibling or classmate, or can be unknown. Nikopoulos et al. (2006) feel that PVM refers to the use of models that are close to the skills, age or status of the observer. They feel that similarity will increase the likelihood of the child acquiring the modelled behaviour. In their review, McCoy et al. (2007) found that peer models were superior to adult models in teaching skills to individuals with ASD.

For creation and implementation of PVM interventions, there are various guidelines available, but no set guidelines have been internationally agreed to date.

Peer Video Modelling and Autism Spectrum Disorder

The majority of studies on Video Modelling involving people with ASD have used Peer Video Modelling (other-as-model) interventions (Delano, 2007; Bellini et al., 2007). A number of studies have examined the effectiveness of PVM in supporting the development of pro-social behaviours in people with ASD, including social initiation (Nikopoulos et al., 2003; 2004), play skills (Baharav et al., 2008)conversational skills (Charlop et al., 1989) and social language (Maione et al., 2006).

There is disagreement in the literature regarding the effectiveness of PVM versus *in vivo* modelling in teaching social behaviour skills. Results from Charlop-Christy et al. (2000) and Kroeger et al. (2007) found that PVM produced more rapid acquisition and greater generalisation of skills than *in vivo* modelling. However, this was not replicated in a study by Gena et al. (2005) who found that the two interventions were equally effective in

teaching social behaviour. Thelen et al. (1979) discussed the advantages of using PVM as compared with *in vivo* modelling. Their arguments in support of PVM included the ease of making videos in a variety of settings, greater control over the modelling procedures, ability to repeat the observation of the model and the ability to reuse the video with a number of clients.

The following literature review intends to provide a comprehensive review of studies relating to the effectiveness of PVM interventions for preschool children with ASD. The studies included will be those that targeted social behaviours. The review will focus on the characteristics of the participants, the types of model used, the video modeling procedures used, the short term results, maintenance and generalisation, and the quality of the research designs.

Methodology of Literature Search

Studies included in this systematic review were located by utilising the Educational Recourses Information Centre (ERIC), PsychINFO and Medline databases. The following combination of descriptors was used:

1. Autism Spectrum Disorder
2. Asperger Syndrome
3. PDD-NOS
4. Video
5. Video Modelling
6. Video modeling
7. Video Tape modeling
8. Video Peer modeling (VPM)
9. Peer Video modelling (PVM)
10. Peer Video modeling (PVM)
11. Video technology
12. Video feedforward
13. Video feedback
14. Multimedia

The following combinations of terms were used:

1 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

2 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

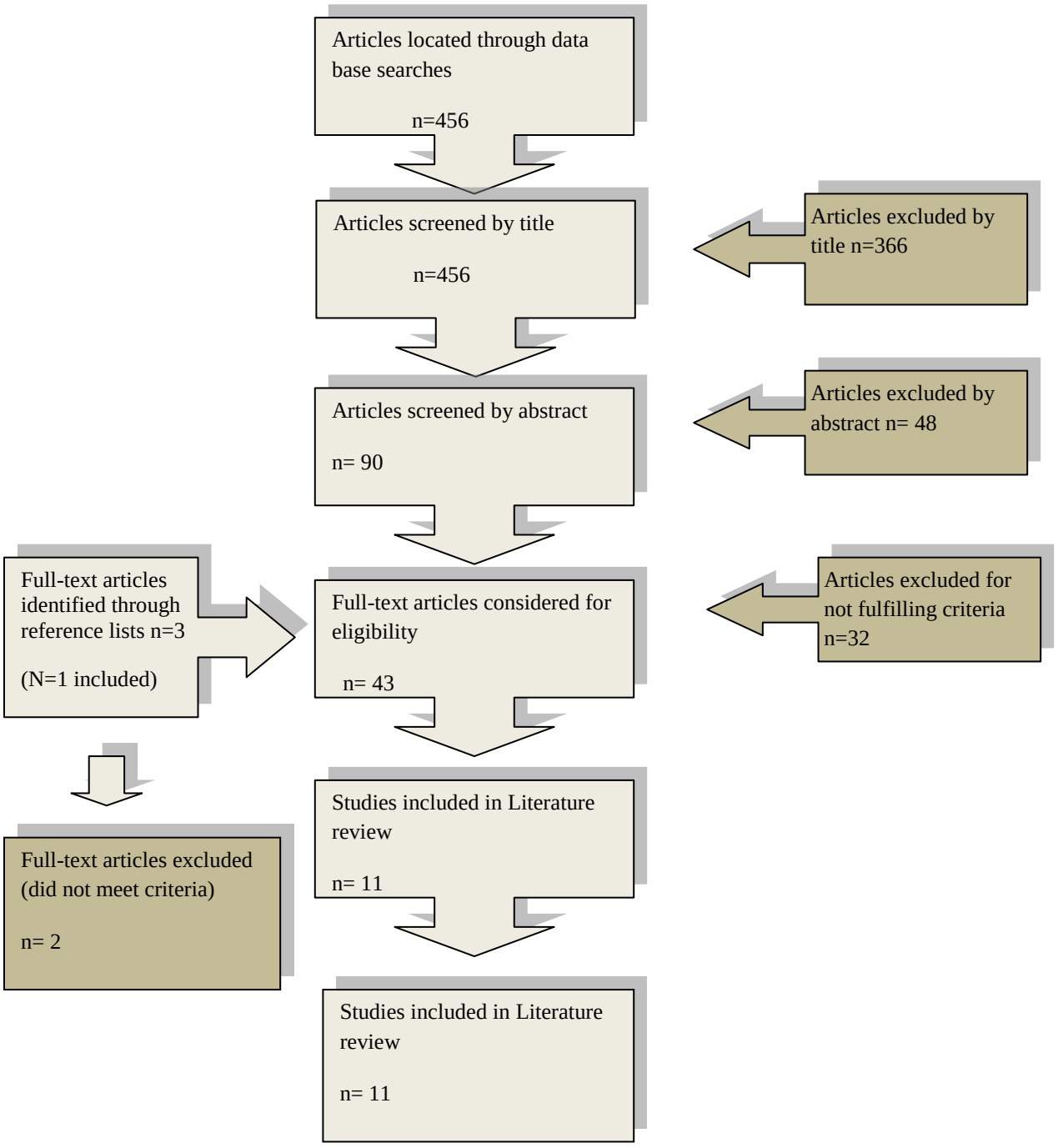
3 AND 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14

A search was also conducted using the reference lists of each study located. The abstract and methodology section of each article were examined to determine if they met the criteria for inclusion in the study. The criteria were as follows:

1. Participants must have been identified as having a diagnosis of ASD, Aspergers Syndrome or PDD-NOS.
2. Participants must be aged between 36-72 months (early intervention). For those studies which included some participants within and some outside the researcher's target age range, only those participants who fell within the age range were included.
3. The study must have targeted social/communication skills or behavioural functioning.
4. Due to the relatively small body of research in this area, unpublished dissertations, where accessible, were included in addition to peer reviewed journal articles. Studies had to be written in English.
5. The study must have assessed the efficacy of PVM alone or in contrast with another intervention. Interventions that did not depict a video representation of "peer" were excluded (i.e. point of view, cartoon videos).
6. Studies were included if they used specifically created videos. Studies relating to commercially available videos were not included in the review.
7. Studies that utilised subtitles in their videos were not included, in order to maximise consistency within study results.
8. Studies that included videos as part of a computer based program were excluded, again to maximise consistency between interventions.

Below is a flow chart describing the initial search results, and the subsequent exclusion process based on the inclusion criteria.

Figure 3: Article selection process for Peer Video Modelling with the number of studies screened at each review stage. Adapted from: Moher *et al* (2009) The PRISMA Group.



Eleven studies were located that fulfilled the criteria: Cardon et al. (2011); Boudreau et al. (2010); Kleeberger et al. (2010); MacDonald et al. (2009); Maoine et al. (2006); Reagon et al. (2006); Apple et al. (2005); MacDonald et al. (2005); Gena et al. (2005); D'Ateno et al. (2003); Sherer et al. (2001). For a table of excluded studies see Appendix 5. Table 5 provides list of the papers included in this review.

Table 5: Summary of Peer Video-Modeling research– included papers (Percentage of Non-Overlapping Data=PND)

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
1. Promoting imitation in children with autism: a comparison of reciprocal imitation training and video modelling. Cardon & Wilcox. (2011).	Isaac: 3 yrs 7 mths, Autism Five other participants were younger than the age range of interest.	Multiple baseline across participants and two treatment conditions.	Imitation of play skills with toys.	IOR rated on 25% of sessions was 97.8% . Procedural reliability 99.8%	Frequency of imitations increased from 0 at baseline to between 15 and 20 imitations per session in the treatment phase, where 25 was the maximum no. of imitations per session	Imitation skills maintained and generalised at 1 and 3 week follow up sessions.	Treatment PND could not be calculated due to zero points at baseline.
2. Improving the pretend play skills of preschools with autism spectrum disorder: the effects of video modelling. Boudreau & D'Entremont. (2010)	Child 1: 4yrs 1 mth, male. PDD-NOS. Cognitive functioning mildly delayed, language skills moderately to severely delayed. Child 2: 4 yrs 1 mth, male, PDD-NOS. Cognitive & language skills moderately delayed.	Single subject design with multiple baselines across participants.	Modeled and un-modeled actions, scripted and unscripted verbalisations during play.	IOR coded for 32% & 20% of children's 1 and 2 sessions. Child 1: 1.0 for modeled actions, 0.84 for unmodelled actions, 0.99 for scripted verbalisations, 1.0 for unscripted verbalisations. All significant at $p>0.01$ Child 2: 0.99 for modeled actions, 0.91 for unmodelled actions, 0.99 for scripted verbalisations. All significant at $p<0.01$.Un -scripted verbalisations were 0.08 (not significant)- due to a tendency to speak quietly/mumble.	Results indicated that video modelling led to rapid acquisition of modelled actions and scripted verbalisations for child 1 & 2. Child 1: verbalisations increased from a mean of 2.5 per session at baseline to a mean of 11.25 during the treatment phase, and for child 2 this increase was from a mean of 2.14 at baseline to a mean of 16 during the treatment phase.	Generalisation probes were carried across toys sets. Maintenance probes were carried out 4 weeks following the generalisation sessions. Child 1: Score dropped to zero for maintenance and generalisation sessions Child 2: Mean score 10 for scripted and 6.25 for unscripted verbalisations	Child 1: Treatment PND was calculated at 100% from Baseline to VM. Child 2: Treatment PND was calculated at 100% from baseline to VM
3. Teaching generalisation imitation skills to a preschooler with autism using video modelling. Kleeberger & Mirenda. (2010).	Paul: 4years 4 months. Autism. Language: PLS-4: 1years 11 months.	Multiple baseline design across 3 imitation activities.	Imitation of play actions and finger play songs.	IOR calculated for 35.7% of the videos. Across all three activities, inter-rater reliability ranged from 73.3% and 100%. Treatment fidelity to video viewing protocol 100% throughout the study.	Video modelling alone did not affect the child's ability to imitate motor actions. A functional relationship established between accurate imitation and video modelling with highlighting, in, vivo prompting and reinforcement.	Generalisation probes carried out to actions in songs, finger play and toy play. There was an increase in both mastered and not mastered generalisation behaviours across all 3 activities. There was little evidence to novel settings and adults.	Treatment PND could not be calculated due to zero points at baseline.

Table 5: Summary of Peer Video-Modeling research Table continued – included papers

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
4. Using video modelling to teach reciprocal pretend play to children with autism. MacDonald, et al. (2009)	Alden: 5 yrs. Autism. Enrolled in ABA specialised preschool-received 16 months of intensive interventions prior to study. One other participant who was outside the age range of interest.	Multiple probe design across play sets.	Scripted verbalisations and play, unscripted verbalisations and play, cooperative play and reciprocal verbal interaction chains.	IOR calculated on 45% of sessions for scripted verbalisations and actions. 95% for play actions with airport & zoo play, 92% for grill play. Agreement for verbalisations was 96% for airport play, zoo play and grill play. Agreement for unscripted behaviours were collected in 33% of sessions. Agreement for unscripted play was 100% for zoo & 96% for grill and airport. Agreement for cooperative play was collected in 83% of sessions. Agreement was 95% for cooperative play and reciprocal verbal interaction chains across the play sets.	Alden acquired and maintained scripts and play actions. Increase in number of unscripted verbalisations and reciprocal verbal interactions and cooperative play.	Follow up probe was conducted 1 month following mastery of airport and zoo play. Alden showed continued increases in unscripted verbalisations, reciprocal verbal interactions and cooperate play on the mastery probes.	Treatment PND could not be calculated due to zero points at baseline.
5. Effects of video modelling and video feedback on peer-directed social language skills of a child with autism. Maione & Mirenda (2006).	Ryan 5 yrs 7 mths boy with Autism.	Multiple baseline across 3 play activities.	Social language verbalisations and frequency of initiations and responses.	IOR calculated on 35.7% of the sessions. Mean IOR for initiations and responses across all activities was 93.7% (Play Doh: 95.6%, Chevron cars: 94%, Caillou's tree house: 91.1%). Mean IOR for scripted /unscripted verbalisations was 92.4% (Play Doh: 95.7%, Chevron cars: 93.3%, Caillou tree house: 83.3%).	Video modeling was effective in increasing social language in two of the three activities but video feedback and prompting was required in the third activity (Chevron Cars) to affect increased social language.	Follow up probes were conducted 7, 16 and 18 days after completion of intervention. Follow up session indicated an increase in verbalisations across all three activities.	PND for total: Play Doh: 86% PND for total: Cars: 0% PND for total: Treehouse: 100%
6. Teaching pretend play skills to a student with autism using video modelling with a sibling as model and play partner. Reagon et al. (2006).	4 yr old boy with Autism.	AB design.	Pretend play actions and verbalisations.	IOR calculated for 30% of sessions. Agreement for modeled behaviour ranged from 86-100% and for scripted statements and spontaneous words was 100%.	Child increased both the specific actions and scripted statements for the 4 scenarios.	Play skills maintained over time and generalised to new play partners and settings.	Treatment PND could not be calculated due to zero points at baseline.

Table 5: Summary of Peer Video-Modeling research Table continued – included papers

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
7. Modifying the Affective Behaviour of Preschoolers with Autism using In-Vivo or Video Modeling and Reinforcement contingencies. Gena, Couloura & Kymissis. (2005).	Eleni: 5 yrs 7 mths. Mild ID. Autism. Billy: 4 yrs 4 mths, average IQ. Autism. Mike: 3 yrs11 mths, average IQ. Autism.	Multiple baseline across subjects with a return to baseline condition.	Showing sympathy, appreciation and disapproval.	IOR was calculated on 30-50% of sessions. Agreement on the dependent measures across all experimental conditions ranged from 90-100% on both probe and training trials. Agreement on independent variable was 100%.	Both treatments-video modeling and in-vivo modeling-increased appropriate affective responding for all participants. The results generalised across responses to untrained scenarios, the child's mother, new therapist and time Increase from baseline to treatment phase: 0% to 100% for all participants.	New therapist and child's mother tested for generalisation across people. 3 generalisation sessions conducted during initial baseline and 3 additional sessions following final treatment session. Primary therapist conducted 1 and 3 month follow up session for maintenance probes. Elena: 80%, Billy 75-100%, Mike 50-75% in generalisation sessions.	Treatment PND could not be calculated due to zero points at baseline.
8. Effects of video modelling alone and with self-management on compliment-giving behaviours of children with high-functioning ASD. Apple, Billingsley & Schwartz. (2005).	**Experiment 1:** Roger: 5 yrs, Asperger Syndrome PPVT-III: 119 standard score. Erik: 5yrs 1mth, High Functioning Autism. PPVT-III 86 (low average). **Experiment 2: 6months later** Roger plus 2 other children: Abbey: 4yrs1mth, Autism. PPVT-III: 93 (low average) Alex: 5 yrs 9 mths, Asperger syndrome, PPVT-III: 125.	Multiple baseline across participants.	Compliment giving	**Ex 1:** IOR calculated on 33% of sessions. Agreement for both children in all phases was 100%. Procedural reliability calculated on 50% of sessions and average reliability was 95% across all session and participants. **Ex 2:**IOR was calculated on 50-54% of sessions and for all children in all phases was 100%. Procedural reliability was 93% for Abbey and Alex for video modeling and 95% for Abbey and 100% for Alex in the generalisation phases. 100% for the self-management phases of all 3 children.	**Ex 1:** Both participants were able to learn the skill of compliment giving following video modeling and were able to make a compliment once the video model was removed. **Ex 2**: Abbey and Alex showed an increase in compliment giving responses following video modeling.	4 Generalisation probes of 15minutes carried out-results remained similar to treatment phase results.	Treatment PND could not be calculated due to zero points at baseline.

Table 5: Summary of Peer Video-Modeling research Table continued – included papers

Study	Subjects	Design	Target behaviours	Reliability	Results	Maintenance and generalisation	PND
9. Using video modelling to teach pretend play to children with autism. MacDonald et al. (2005).	Andrew: 4 yrs, PDD-NOS. Prior experience of video modelling. Not included in review: James (7 yrs)	Multiple probe design within child across play sets.	Pretend play.	IOR calculated on 40% of sessions for scripted verbalisations and actions. Agreement = 97% for play actions, 99% for ship script, 96% for house script. IOR for play verbalisations = 90% for the town script, 96% for the ship scripts, 99% for the house script. IOR calculated for unscripted actions in 33% of the probe sessions. Mean agreements = 96% for scripted actions with different characters & 98% for unscripted actions. Procedural Reliability: no information	Child acquired the sequences of scripted and play actions and maintained during follow up probes.	Follow up probes (interval not specified). Child's performance in scripted verbalisations and actions decreased slightly for town and shops scripts but returned to mastery levels after one training session.	Treatment PND not calculated due to zero points at baseline.
10.Using video modelling to teach complex play sequences to a preschooler with autism. D' Ateno & Mangiapanello. (2003)	Rachel: 3 yrs 8 mths. Autism. PPVT-III: standard score of 98.	Multiple baseline across responses categories.	Number of scripted and unscripted verbal statements & modeled and not-modeled motor responses during play.	IOR calculated for 50% of baseline and intervention sessions. Motor responses: Modelled-99.7%, not modeled: 95%; Scripted verbal response: 99.7%, unscripted verbal responses 99.2%. Procedural Reliability: no information	Acquisition of verbal and motor responses for all play sequences. Mean verbalisations per session increased from 2.0 to 9.8, 4.2 to 9.8 and 0.5 to 4.4 from baseline to treatment phase for the 3 play sequences respectively.	No maintenance or generalisation data collected.	PND: Tea party modeled motor 100%. Shopping modeled motor 92%. Baking modelled motor 75%. N/A for not-modeled motor or scripted/unscripted verbal responses
11.Enhancing conversation skills in children with autism via video technology: which is better, "self" or "other" as a model? Sherer et al. (2001).	Luke: 5 yrs 10 mths. Mental age: 3yrs, language age: 2yrs 9 mths. Autism Joey: 4 yrs, mental age: 4 yrs, language age: 3 yrs 3 mths. Autism. Not included in review: Sam: 7 yrs1 mth, Jack: 11 yrs 2 mths. Chuck: 9yrs	Single participant multiple baseline and alternating treatment designs.	Answering a series of conversational questions.	IOR calculated for 33% of sessions across all participants and phases. Reliability averages at 99%	Luke: acquisition for correct responding after 7 sessions in peer video but did not reach acquisition after 15 sessions in SVM. Joey: increased to 25% correct conversation engagement in both conditions. Did not increase level after 18 sessions.	Follow up probes for maintenance taken 2 months later. Luke and Joey maintained levels of responding. Generalisation probes were used to assess settings, questions and peer.	Luke & Joey: not calculated as the baseline had only zero points.

Results of Literature Search

Participants

In total, there were 18 preschool aged children with ASD in the studies that fit the above criteria. The studies involved 13 children with diagnoses of ASD, two children with a diagnosis of Asperger's Syndrome and three children with diagnoses of PDD-NOS. 16 of the participants included for this review were male; 2 were female.

All of the studies mentioned the communication ability of the participants in some context. The communication ability of the participants in the studies ranged from functionally non-verbal (Boudreau et al., 2010) to highly verbal (Gena et al., 2005; Apple et al., 2005; MacDonald et al., 2009). The majority of the studies gave observational descriptions of the communication ability of their participants while three of the studies (Kleeberger et al., 2010; Maoine et al., 2006; Sherer et al., 2001) used standarised language assessments to determine the language abilities of their participants. Many of the participants reported that some or all of their participants had communication difficulties (Reagon et al., 2006; Maoine et al., 2006; Kleeberger et al., 2010; Boudreaux et al., 2010, Cardon et al., 2011; MacDonald et al., 2005, D'Ateno et al., 2003; Sherer et al., 2001).

Six of the studies (Cardon et al., 2011; Boudreau et al., 2010; Gena et al., 2003; D'Ateno et al., 2003; Apple et al., 2005; Sherer et al., 2001) made reference to the cognitive ability of the participants. The cognitive ability of the participants ranged from moderate difficulty (Boudreau et al., 2010) to above average (Apple et al., 2003). Cognitive scales used included the Vineland Adaptive Behavior Scale II (Sparrow et al., 2005, used by Cardon et al., 2011), the Bayley Scales of Infant and Toddler Development – Third Edition (Bayley-III, Bayley, 2005, used by Boudreau & D'Entremont, 2010) and the Stanford-Binet Intelligence Scale – Fifth Edition (Roid, 2003, used by Gena et al., 2005; D'Ateno et al., 2003). The ability for the participants to attend to video or TV prior to the study was reported in two of the studies (Cardon et al., 2011; Kleeberger et al., 2010) and prior positive experience of video modelling interventions was mentioned in two studies (MacDonald et al., 2009; MacDonald et al., 2005). The ability to imitate was discussed in three studies (Gena et al. 2003, Kleeberger et al., 2010; McDonald et al., 2005) and Boudreau et al. (2010) noted that their participants presented with severely delayed imitation skills. Kleeberger et al.

(2010) noted that their participant had little spontaneous imitation and tended only to imitate when reinforced by adult praise.

The educational placement of the participants was discussed in eight studies (Gena et al., 2003; D'Ateno et al., 2003; MacDonald et al., 2005; Apple et al., 2003; Boudreau et al., 2010; Kleeberger et al., 2010; MacDonald et al., 2009; Maoine et al., 2006). None of the participants were in full time mainstream preschool placements. The participants in six studies had either been attending intensive individual behavioural programmes prior to or during the study (Boudreau et al., 2010, MacDonald et al., 2009, Maoine et al., 2006, Kleeberger et al., 2010; Gena et al., 2005; MacDonald et al., 2005). Four of the studies reported that their participants were in preschool for part of the day (Gena et al., 2003; Apple et al., 2005; Kleeberger et al., 2010; Maoine et al., 2006), while in one study the participants were integrated for 1 hour a day into the mainstream preschool (MacDonald et al., 2009). One of the studies (D'Ateno et al., 2003) was conducted in special preschool settings for children with Pervasive Developmental Disorders. One of the participants in the study by Maoine et al. (2006) also had peer play sessions at home for 6 months prior to the study.

None of the studies mentioned additional difficulties of the participants.

Research design

10 of the studies were single-participant studies and the experimental designs of these studies ranged from AB design (Reagon et al., 2006) multiple baseline across the participants (Cardon et al., 2011; Boudreau et al., 2010; Apple et al., 2005; Gena et al., 2005) to multiple baseline across skills (Kleeberger et al., 2010; MacDonald et al., 2009; Maoine et al., 2006; D'Ateno et al., 2003; MacDonald et al., 2005). Sherer et al. (2001) used a combination of a single participant multiple baseline design and an alternating design.

Interobserver and Procedural Reliability

All eleven of the studies provided measures of interobserver reliability. In general, reliability measures in the studies ranged from 83-100%, calculated for between 20 and 50% of sessions (20% being the conventional minimum standard).

Procedural reliability measures were only reported in three studies (Cardon et al., 2011; Kleeberger et al., 2010; Apple et al., 2005). Kleeberger et al. (2010) had the parents complete a form specifying the procedural steps, the duration that the participant watched the video each day and other behavioural observations, such as, number of prompts needed to encourage him to sit and watch and number of times he left the room. Apple et al. (2005) calculated interobserver and procedural reliability on 33% and 50% of the observation periods respectively.

Target behaviour and settings

The studies addressed various types of social behaviour skills, including: play skills (Boudreau et al., 2010; MacDonald et al., 2009; Reagon et al., 2006; Macdonald et al., 2005; D'Ateno et al., 2003), conversational skills (Sherer et al., 2001; Maoine et al., 2006), compliment giving (Apple et al., 2005), appropriate affective behaviour (Gena et al., 2005) and imitation skills (Cardon et al., 2011).

Four of the studies took place in the participant's preschool setting (Reagon et al., 2006; Apple et al., 2005; MacDonald et al., 2005; D'Ateno et al., 2003) and four studies took place in the home setting (Maoine et al., 2006; Kleeberger et al., 2010; Sherer et al., 2001 and Gena et al., 2005). Three of the studies took place in a clinic setting (Cardon et al., 2011; Boudreau et al., 2010; Macdonald et al., 2009).

Video Modelling strategy

A number of differences were noted in the video modelling strategies used in the studies. Three studies (Gena et al., 2005; Reagon et al., 2006; Sherer et al., 2001) used peers as the model in the videos while seven studies used adults as the model (Maoine et al., 2006; MacDonald et al., 2009; Boudreau et al., 2010; Cardon et al., 2011; D'Ateno et al., 2003; MacDonald et al., 2005; Kleeberger et al., 2008). Apple et al.

(2005) used classroom peers as the models but also had adults in the video giving explicit instructional rules regarding the target social behaviour. Maione et al. (2006) used different adults in the videos to promote flexibility and variety in the target social behaviours. Two studies (Gena et al., 2005; MacDonald et al., 2009) specified that the models were gender or gender and age matched to support imitation of the target skills.

The length of the films ranged from 20 seconds to 4 minutes.

The number of target actions to be imitated ranged from 7 to 30 and the number of target verbalisations ranged from 4 to 16 per video. The number of videos shown to the participant during the interventions ranged from 3 to 9. The number of video modelling sessions per week ranged from 2 to 3 per day (Nikopoulos et al., 2006) to 5 sessions per week (Boudreau et al., 2010) The length of the sessions ranged from 5 minutes (Nikopoulous et al., 2006) to 1 hour (Kroeger et al., 2007). Four studies mentioned that they allowed the participants to watch the video 3 times during the intervention sessions (Charlop et al., 1989; Taylor et al., 1999; Gena et al., 2005; Sherer et al., 2001) and three studies mentioned that they allowed the participants to watch the videos twice (MacDonald et al., 2009; Charlop-Christy et al., 2003; MacDonald et al., 2005). Seven studies allowed the participants to immediately imitate the target behaviours in the video, while three studies delayed the post-intervention probe session. The delays ranged from 30 minutes to the next day. Only one study mentioned that the parents showed the videos to the children (Sherer et al., 2001). The other studies showed the videos to the participants in the intervention setting. Only one study used normative data to guide their target behaviours (MacDonald et al., 2009).

Additional strategies

A number of additional strategies were used to support the production of the target behaviour: praise (Kleeberger & Mirenda, 2010; Boudreau & D'Entremont, 2010; Sherer et al., 2001), physical contact (Boudreau & D'Entremont, 2010) and tangible rewards (Apple et al., 2005; Boudreau & D'Entremont, 2010). Five of the studies (Reagon et al., 2006; MacDonald et al., 2005; 2009; D'Ateno et al., 2003; Sherer et al., 2001) specified that no prompting or reinforcement took place.

Short- Term Results

The authors of ten studies reported an increase in the target social behaviour skills following PVM interventions (Cardon et al., 2011; Boudreau et al., 2010; MacDonald et al., 2005; 2009; Maoine et al., 2006; Reagon et al., 2006; Gena et al., 2005; Apple et al., 2005; Sherer et al. 2001; D'Ateno et al., 2003). A number of studies also reported increases in unmodelled social behaviours (e.g. MacDonald et al., 2009). A number of studies used additional strategies after the initial PVM intervention phase. Boudreau et al. (2010) used reinforcement strategies to support an increase of unmodelled behaviours. They felt that, while reinforcement had maintained the modelled behaviours, it may have reduced the emergence of unmodelled behaviours. Kleeberger et al. (2006) found that feedback and prompting was required with the PVM intervention in the third activity to achieve significant stable changes. Apple et al. (2005) found that reinforcement was required with the PVM intervention to increase initiation of compliments whereas PVM alone led to an increase in responses to compliments.

Two studies compared PVM with other interventions. Cardon et al. (2011) found that PVM led to a rapid increase in imitation skills while Reciprocal Imitation Training (RIT) led to more steady increases over a number of sessions. Sherer et al. (2001) found that PVM was more successful than SVM in teaching play skills.

Only one paper reported negative results. Kleeberger et al. (2010) found that PVM alone did not increase imitation behaviour with their participants and that prompting and reinforcement were required for change.

Percentage of Non-Overlapping Data (PND)

None of the included studies had PND values calculated by the study authors themselves. A PND value was obtained in this review for three studies (Boudreau et al., 2010; Maoine et al., 2006; D'Ateno et al., 2003). For the other studies, PND was not a suitable test due to zero data points in the baseline. In some studies, PND was not calculated for all participant target behaviours due to zero baseline figures for these behaviours. The calculated mean PND was 77.2% (range 0–100%). This mean PND

value places PVM in the moderately effective range. There was a large degree of variation in response to intervention across participants and behaviours. Overall, the majority of PND scores (4/5) were in the highly effective range (86-100%). The only PND score that showed PVM to be in the ineffective range was in Maoine et al. (2006) in the Chevron car activity, which scored a PND of 0%. However, as PND could be calculated for so few of the studies, the raw scores again may represent a truer reflection of the effectiveness of PVM.

The studies all had low participant numbers, and did not provide exact data sets, similarly to those included in the reviews for SS™ and SVM, and thus it was again not possible to calculate a unifying measure of effect size for PVM. None of the studies included PND values, Standard Mean Difference or Effect Size and the absence of exact data points and standard deviation values meant that a formulaic calculation of effect size based on SMD was not possible.

Maintenance and generalisation

Maintenance data were discussed in nine studies (all except Kleeberger et al., 2010 and D'Ateno et al., 2003). In the majority of studies, the participant maintained the target behaviours at the mastery level or at a level above baseline but slightly below mastery level (MacDonald et al., 2005; Cardon et al., 2011; Reagon et al., 2006; Boudreau et al., 2010; Maoine et al., 2006; Sherer et al., 2001; Apple et al., 2005; Gena et al., 2005). Apple et al. (2005) found that the initiation of compliments behaviour by both of their participants maintained for the first maintenance observation but decreased to zero on the two remaining sessions. Gena et al. (2005) found that, while the use of facial expressions maintained during the maintenance observations, anecdotal reports indicated that facial expression did not maintain as well as verbal responses 3 months following intervention. Boudreau et al. (2010) showed that one of their participants did not show long-term maintenance of the target behaviours, and modelled and unmodelled verbalisation and actions dropped to zero. Macdonald et al. (2009) indicated that they had a follow-up probe at 1 month but reported no data.

Generalisation data were reported in seven studies (MacDonald et al., 2005; Cardon & Wilcox, 2011; Sherer et al., 2001; Gena et al., 2005, Reagon et al., 2006; Boudreau et al., 2010; Kleeberger et al., 2010). Generalisation probes included the generalisation of

the script to different characters within the same play set (MacDonald et al., 2005), to novel toys and tasks (Cardon et al., 2011, Boudreau et al., 2010); to novel partners (Kleeberger et al., 2010; Cardon et al., 2011; Sherer et al., 2001; Gena et al., 2005), to novel conversation topics and questions (Sherer et al., 2001), and to novel settings (Boudreau et al., 2010, Kleeberger et al., 2010; Sherer et al., 2001, Reagon et al., 2006). The majority of studies indicated positive results in the generalisation of target behaviours. Gena et al. (2005) found that Billy's and Mike's generalisation of affective responses ranged from 50-100%. Kleeberger et al. (2010) found that there was no generalisation of finger play to a new adult and new setting, but did observe generalisation of gross motor play. Boudreau et al. (2010) found that one of their participants lost three previously mastered verbal behaviours but increased unscripted verbalisations. Reagon et al. (2006) found that their participant spontaneously generalised to the untrained role on the video model with a new peer. D'Ateno et al. (2003) did not collect any maintenance or generalisation data.

Social Validity

Social validity was discussed in three studies (Boudreau et al., 2010; Reagon et al., 2006; Cardon et al., 2011). All three studies used Likert-type rating scales to assess the social validity of the intervention. All three studies assessed parental opinions and one study (Reagon et al., 2006) also assessed sibling satisfaction with the study. All three studies reported positive social validity results.

Discussion of Included Literature

The great majority of the studies in this review reported positive results in terms of a reduction in a targeted behaviour or an increase in appropriate behaviour, indicating that PVM can be effective in supporting social behaviour skills in children with ASD. The mean PND of the studies was 77.2%, which places it in the moderately effective range. The review did however highlight a number of limitations of the studies.

Firstly, seven of the studies used a single study design or had only one participant within the age range of interest. This predisposes the research to bias leading in turn to low external validity and generalisability to the ASD population at large. Descriptive data on participants were lacking and uncertainty remains regarding what language, cognitive and other skills children need to have at baseline if PVM is to be effective as

an intervention. In future research, levels of cognitive and language functioning and attention levels of participants should be documented.

A range of social behaviour skills was targeted in the studies reviewed, including conversational skills, compliments, imitation and play skills. PVM did not appear to be more successful in supporting one skill type over another. A range of models was used - peers as models, adults as models, different adults in each video *et cetera*. The type of model used did not appear to consistently affect the results.

Maintenance results were reported in the majority of studies, and results indicate that post-intervention levels of skill performance were maintained at follow up in all studies. Generalisation measures were addressed in seven of the studies reviewed.

Only three of the studies reviewed included social validity measures, but PVM was rated as highly socially acceptable and relevant in these. Some aspects of reliability measures in the studies were problematic. Interobserver reliability was reported in 10 of the studies, but procedural reliability was reported in only two, again weakening confidence in the research and reproducibility of results.

Implications for practice

The current evidence indicates that PVM can be beneficial in supporting the development of social behaviour skills with preschool children with ASD. However there is limited information regarding either the types of behaviours and participants for which it is most suitable, or the most effective procedures for a video modelling intervention in a given context. There is some evidence, although limited, that PVM is considered socially valid and can be implemented across settings.

Concluding Comments

The majority of the studies in this review report positive results, that is, an increase in appropriate behaviours and/or a reduction in undesirable behaviours. The mean PND was 77.2%, placing PVM in the moderately effective range. A number of inconsistencies and limitations within the studies mean that robust evidence is still lacking regarding many issues concerning its effectiveness for different audiences, maintenance and generalisation and how to design and implement PVM interventions to

ensure maximum effectiveness. Many research questions remain to be answered in relation to this intervention. Robust study design, examination of procedures and provision of consistent maintenance and generalisation data are among the issues to be addressed by future research.

Chapter 7: Literature Review Overview

The following discussion will aim to examine the evidence from the three reviews to address the question of the most effective intervention to support social behaviour skills for preschool children on the Autism Spectrum.

1. Participants

Altogether there were 40 participants in the early intervention age range in the studies identified by the three reviews. In terms of diagnostic information, for just under half of the participants, the diagnosis was described as Autism Spectrum Disorder. The Self Video Modelling review included no child with a diagnosis of Asperger Syndrome. The Social Stories™ and Peer Video Modelling reviews each involved at least one child with Asperger Syndrome. The studies also included 8 children with a diagnosis of PDD-NOS. There is no evidence review that a certain intervention worked best with participants with a certain diagnosis. With the publication of the DSM-5 as of May 2013 these diagnostic categories have changed, and future research is likely to be based on these new guidelines.

The communication abilities of the participants ranged from non-verbal to highly verbal. However, a majority of studies used observational data instead of standardised assessments to describe the communication abilities of the participants. This reduces their usefulness in relation to evaluating the outcomes described and generalising findings. In the SS™ review, the participants ranged in ability from using single words to being highly verbal, where as both PVM and SVM had participants who were non-verbal. It is unclear if certain interventions are more appropriate for children with a certain language level. Both SVM and PVM were shown to be successful in supporting participants who were non-verbal and also those who were highly verbal.

The cognitive abilities of the participants were only discussed in a few studies. Less than a third of the studies overall assessed the cognitive abilities of their participants using standarised measures. In the SS™ review, all of the participants were quite high functioning, whereas PVM and SVM participants also each included a child with a significant intellectual disability, albeit only one in each. Overall, it is difficult to come to any significant conclusion regarding the best fit of intervention to a certain child

based on their diagnosis, language level and cognitive level. The evidence is not available.

2. Research Design

Many of the studies were single case study designs or involved only one participant within the age range of interest. The others involved very low numbers of participants (n= 2-4). Single participant designs or those with very low numbers of participants have a number of benefits such as their capacity to be flexible and to highlight individual differences in response to an intervention. They can be cost effective and can be carried out more easily in a clinical setting. However, they have low external validity and the interpretation of results can be misleading and unreliable. The potential for drawing wider conclusions from such studies is based on the possibility of replicating results. However, replication needs to be precise and the characteristics of participants and interventions need to be assessed and described in sufficient detail in order to build an evidence base. This review has highlighted a number of inconsistencies and limitations in how the studies have been carried out, including lack of information regarding participants, differences in intervention delivery, lack of reliability data, lack of maintenance and generalisation data and lack of social validity data. No study could be classified as an exact replication of another. Differences in target skills, settings and other relevant variables between studies added to their heterogeneity. As the evidence stands, it is not possible to conclude that one intervention is more effective than any of the others in supporting the development of social behaviour skills in preschool children with ASD.

3. Reliability

All 22 reviewed studies provided data on interobserver reliability, which ranged from 73-100%. Procedural reliability was discussed in 19 of the 22 studies and ranged from 96-100%. Procedural reliability measures are particularly important considering the relative newness of the interventions discussed, the perceived simplicity of the interventions and the lack of established, internationally agreed guidelines for SVM and PVM as interventions.

4. Target Behaviours and settings

A range of social behaviours was targeted in the reviewed studies, including the teaching of positive social behaviour skills, such as play skills, conversation skills and imitation, and the reduction of behaviours that limited social interaction, such as pushing or having tantrums. However, no two studies taught the same sequence of actions as a desired behaviour, and target skills differed widely. This again emphasises the need for studies with group designs, that teach the same target skill to a group of participants, to allow for more meaningful extrapolation of results to the ASD population in general. Overall, there is no clear evidence that certain behaviours are supported more successfully by a certain intervention.

The majority of studies on SS™ and SVM took place in the preschool setting, whereas those on PVM were spread more evenly across home, preschool and clinic. It is not possible to draw conclusions from this literature review regarding the best setting for a certain intervention. For children with ASD, a key factor is the ability to support the generalisation of skills outside of the teaching setting. Therefore, the ease in which interventions can be used in different settings is an important aspect that merits further exploration.

5. Results and Effect Size

The majority of studies for each intervention reported positive results in relation to the development of social behaviour skills for preschool children. The PND was not calculated for many studies due to the baseline data containing a zero. However, the mean PND where calculation was possible was highest for SVM (83.3%: highly effective range) and PVM (77.2%- moderately effective range). SS™ achieved a mean PND of 52.2% with a large range of 0-100%. Both the selective nature of the analysis, and the number of outliers that affected the PND results, mean that it is difficult to be confident about the effectiveness of the interventions based solely on PND. None of the studies calculated effect sizes. In the absence of SMD or exact data being given, effect sizes could not be calculated in any consistent way and the relative impact of interventions across studies could not be compared.

Moreover, results were sometimes confounded by the use of additional intervention. Studies of PVM were confounded by the use of prompting and reinforcement to support

the production of unmodelled behaviours, to support imitation of an activity and to support initiation of the target behaviour. In the SS™ review, teacher modelling and prompting were found to be used in two studies. Interestingly, however, no additional strategies were used in SVM.

There was some limited evidence that PVM resulted in more rapid acquisition of skills than SVM. However, the procedures were directly compared by only one study (Sherer et al., 2001) and, therefore, the basis for this conclusion is weak.

6. Maintenance and generalisation

Both maintenance and generalisation data were either insufficient or entirely lacking in the reviews. It is essential that data on maintenance and generalisation of the target skills is included in a study to ensure that the intervention can provide real functional change in the social behaviours of children with ASD. Where maintenance data were available, the majority of participants were found to maintain the behaviours at or above the mastery level. One of the studies using PVM discussed how the target behaviour was not maintained in a participant with moderate intellectual disability. One of the studies using SS™ indicated that the skills taught to overcome problem eating behaviours dropped below mastery level but remained above baseline. Generalisation data were generally anecdotal. The lack of social validity data also impacts on the generalisability of interventions to other settings, communication partners and other behaviours. It is unclear if certain interventions are more successful in supporting the generalisation and maintenance of skills in children with significant intellectual disability.

7. Social Validity

Only seven of the 22 studies in reviewed literature measured the social validity of the intervention. This is a low proportion considering the importance of social validity in ensuring that an intervention is relevant, acceptable and ethical. Future studies should do more to assess social validity to ensure that all parties involved, namely parents, preschool therapists, teachers, clinicians and relevant others, agree that the intervention is reasonable for the clinic, home or school setting and relevant to the needs of the child. Ensuring that an intervention is viewed as socially valid promotes the likelihood that it

can be implemented across settings and delivered by various parties and will adhere to the protocols laid out by the therapist. The three studies using PVM which measured social validity looked at parental and sibling opinions, while the studies for SVM and SS™ focused on teacher opinions. Most of the studies used Likert type questionnaires and one study also used an interview. All of the studies reported that the interventions were viewed in a positive light. However, the relative lack of different perspectives for each intervention and the limited number of studies providing social validity data restrict the conclusions which can be drawn regarding the social validity of any of these interventions.

8. Limitations of the review and suggestions for future research

The reviewed literature had a number of limitations that adversely affected the possibility of making reliable and accurate conclusions.

The number of studies which met the inclusion criteria for each intervention was small. This meant that a thorough evaluation of covariation between participant characteristics (i.e. specific diagnosis, cognitive level, language level), setting characteristics (home, clinic, preschool), intervention features (number of stories/videos, length, number of targets etc.) and the outcomes of intervention was not possible.

In this analysis, PND values were used to compare results across studies. However, PND figures need to be interpreted with caution due to outliers and the occurrence of zero within baseline data, which limited the number of studies for which it could be considered a suitable measure.

Few studies documented social validity data. These data are vital to ensure that the intervention and the results are socially acceptable, relevant and applicable to the general population. This is essential for the interventions reviewed in this study, as parents, teachers and clinicians will be required to implement them.

Information on generalisation data was lacking for all of the interventions. For an intervention to be considered successful, particularly for a child with ASD, it is essential that gains will generalise to other settings, people and behaviours.

Overall, the review has left many questions unanswered. A number of questions of critical importance remain: Which interventions support the development of social

behaviours more effectively? Who benefits most from which intervention? How should the interventions be presented? What other strategies should be combined with these interventions for maximum effect? Research focusing on finding reliable answers to these and other questions raised in this review will enhance our knowledge of interventions that support social learning and thus quality of life for children with ASD.

Chapter 8: Study 1 - Development

This chapter details how a prospective cohort study (Study 1) was designed to compare the effectiveness of Social Stories™, Self Video Modelling and Peer Video Modelling as teaching procedures for children aged 36-72 months with ASD.

The chapter includes descriptions of:

(a) the aim of the study and the research questions addressed,
(b) the target behaviours consistent with such aims,
(c) the construction of a task analysis based upon the target behaviours, along with the process of selecting stimuli in the form of toys used in teaching the skills,
(d) the development of the three intervention approaches, based on SS™, SVM and PVM.

Aim, Research Questions and Hypotheses

The aim of this study was to determine the effectiveness of SS™, SVM and PVM as teaching procedures for children aged 36-72 months with ASD. A number of specific research questions were set out:

1. How effective are Social Stories™, Peer Video Modelling and Self Video Modelling as interventions for the teaching of defined social behaviour skills for children with ASD in the 36-72 month age range?
2. Which intervention is superior in terms of gains in social skills and social functioning in this age group? Are these gains maintained over time and to what extent are they generalised to different activity partners and tasks? What are the comparative strengths and weaknesses of the various methods?
3. Is a child's learning with these methods significantly affected by individual attributes including demographic characteristics, cognitive ability, linguistic ability and behaviour?

Null Hypotheses (*H0*):

1. Social Stories™, Peer Video Modelling and Self Video Modelling as interventions do not influence the development of defined social behaviour skills in children aged 36-72 months on the autism spectrum.
2. There is no significant difference between these three interventions in terms of efficacy in teaching social behaviour skills as above.
3. Demographic characteristics, cognitive and linguistic ability, and behaviour have no significant effect on a child's learning with these methods.

Target Behaviours

Target social behavioural skills in the context of ASD

As mentioned in the literature review section, a lack of meaningful social interaction is one of the core deficits in ASD. Perry et al. (2003) emphasise the need for strategies to enhance social understanding, social relating and play skills. The importance of play in the social and overall development of children was highlighted by Bergen (2009). Social learning from peers at a preschool and primary school age occurs largely in the context of play. Studies show that play and friendship are vital for emotional, cognitive, linguistic and cultural development as well as physical and mental wellbeing (Howlin et al., 2000; Lord, 1995). Therefore, developing social skills around play is essential for children with ASD to allow them to integrate with their peers and also for optimal general development.

Typically developing children by the age of two years become interested in their peers and make efforts to engage peers and adults in play, both through shared attention, including pointing, and through sharing of toys. A child aged three years will also imitate peers and parents. Co-operative play has typically also developed at this age, including turn taking. Children aged three years normally can finish a game co-operatively with a peer or adult and can understand concepts such as putting away a toy (Mayo Clinic developmental milestone data 2013).

Children with ASD often have difficulty developing the skills required for spontaneous/reciprocal game play, including turn taking and imaginative play. These difficulties may highlight the children's difference from their peers, and should this create a barrier to forming friendships, it may affect both a child's emotional wellbeing and their ability to learn from peers. They may become absorbed in one small component of the game or one element of a toy, to the extent that the overall purpose of the game is lost. They may have difficulties in planning, organising and integrating play scripts.

The National Autism Plan for Children in 2003 recommended a focus on several core skills for children with ASD: development of social skills and communication skills, fostering peer integration, and generalisation of skills to new situations and people.

With this in mind, social behaviour skills were chosen as the focus for this study. Several core skills needed for social interaction were then targeted in the setting of game play. The context of play was selected as it was appropriate for the age group of interest, and involved an important setting for social learning at this and later ages. The social skills targeted were those deemed most important for satisfactory game play and included:

- Eye contact
- Initiating play
- Requesting
- Getting the other person's attention
- Turn taking and waiting
- Sharing
- Ending play
- Reduction of prompt dependence

Eye contact, although an important social skill, has been shown in studies to induce anxiety among those with ASD. Dalton et al. (2005) demonstrated an increase in activity in the amygdala (an anxiety centre within the brain) on Magnetic Resonance Imaging (MRI) diffusion scanning in conjunction with analysis of eye movements. The same authors showed that the fusiform region (involved in facial recognition) is less active than it would be during a typically developing child's gaze, because children with ASD avert eye contact. Therefore, in order to avoid inducing excessive anxiety among the participants during the current study, eye contact was sought to a reasonable degree rather than forced. Such an approach was also extrapolated to the other skills. If a participant became excessively anxious while performing a task or was unable to perform it after a number of attempts, the researcher did not press the child further.

Stimuli were then chosen which would lend themselves to teaching the above skills. A crucial element of teaching skills to children with ASD is their generalisation to different settings to that in which the teaching took place, and to interactions with other people. For the skills learned to be useful, the child needs to be able to apply them in everyday situations and with people other than the therapist, for example peers and parents.

Another consideration was how to discourage/diminish inappropriate behaviours in the context of play. In children with ASD these can include crying, stereotypical repetitive behaviours which may distract the child from the task, and other challenging behaviours. Some of these behaviours are incompatible with successful game play if the participant is to achieve the social skills listed above. Through encouragement of appropriate play behaviour by engaging the child and teaching the target social skills, undesirable behaviours are often diminished.

The above list comprises those skills which were felt to be requisite for all participants of the study. The specific difficulties of each child as derived from the baseline assessments were used to develop a tailored schedule of the skill set required to be taught within their intervention. The SS™ and peer and self videos were then tailored accordingly. This allowed for a child centered and targeted approach, in accordance with the guidelines for these interventions.

Three core play skills were selected to be taught and measured using these interventions:

- Initiating play
- Turn taking
- Finishing Play

The Stimuli

Definitions of Operational Terms

An operational definition defines a task or set of tasks in terms of the specific process or set of validation tests used to measure it in a systematic way. The following definitions were created by the primary researcher in order to standardise the task analysis and target skill set in a format which would lend itself to consistent data collection. Please see Appendix 6 for a table of operational definitions related to the target skills of interest in the context of game play**.**

Included Stimuli (toys)

The toys selected for inclusion in the study were as follows:

1. Shape Sorter Activity Bucket. A seven piece Activity Bucket comprising different shapes. Age certificate 18 months +.

Figure 4: Multicoloured Shape Activity Bucket

2. Large Lego. A seven piece set of large Lego suitable for stacking and other constructional tasks. Age certificate 12 months +.

Figure 5: Large Lego

3. Multicoloured Shape Wooden Puzzle. A seven piece puzzle comprising different shapes. Age certificate 18 months +.

Figure 6: Multicoloured Shape Wooden Puzzle

4. Wooden Stacking Rings. A seven piece set of rings with central stacking column. Age certificate 12 months +.

Figure 7: Stacking Rings

5. Wooden Animal Puzzle. A seven piece puzzle comprising different animals. Age certificate 18 months +.

Figure 8: Wooden Animal Puzzle

All of these toys were found to be age appropriate and similar in difficulty in terms of the skills required (visuospatial processing, hand-eye co-ordination etc.) to complete the game play. This was concluded after a group of three therapists/preschool tutors for ASD had examined the toys and trialled them with two typically developing children as above. There were seven pieces for each toy, allowing for a similar seven-step game play for each.

These toys were chosen for a number of reasons. Firstly, they were suitable for the ages of the participants used in this study. The toys were all given an age safety certificate of between 12 months + and 24 months + by their manufacturers. The gross and fine motor skills, visuospatial and constructive skills and hand-eye co-ordination required for game play for each toy were also deemed by the researcher to be appropriate to the age range of participants.

Secondly, the toys were shown to be of interest and within the scope of the prospective study participants. This was carried out by trialling a number of toys in the behavioural clinic. Two typically developing children (both male) aged 48 and 60 months played with the toys for 5 minutes each, in interaction with each other and with the researchers (Please see Appendix 7 for consent form pertaining to this). 10 of the toys were deemed to be of interest by the tutors/therapists observing the children. Five were then selected as being the most relevant to the social skills and target behaviours that are the focus of this study. (For a description of and rationale for the exclusion of the remaining toys, please refer to Appendix 8.) No one toy of the five included toys stood out as being of

more interest over another. The children were seen to be able to play with all the toys appropriately and were able to complete each toy's game play directive. However, it was acknowledged at this stage that those with a developmental age lagging behind their chronological age in one or more areas e.g. those with fine motor, speech or cognitive delay, adjustments might need to be made in order to interpret the data obtained on video.

The toys were also selected because they did not have any built in electronic sounds or lights that could be distracting or over-stimulating to children with ASD. The toys were all made to a high quality and were readily available to be purchased online and in a shop near to the catchment area that was used to source the participants for the study. This was important so that spare toys could be bought if parts were lost or broken during the study. Also each toy could be purchased by teachers and parents after the study, if they felt that the toy was important to the ongoing development of the child.

A task analysis was conducted on each toy by two therapists separately. The method used to determine and validate the sequence of behaviours in the task analysis, was by the therapists performing the behaviours themselves, a technique discussed by Snell et al. (2006). The therapists thus noted the discrete, observable steps necessary to achieve this task, thereby refining the analysis to make the procedure as efficient as possible.

Upon completion of the task analysis it was deemed by both observers that the target behaviours required for each activity were the same, e.g., eye contact to 'let's play!'(game), waiting; 'your turn'; 'my turn'; and 'finished, put away'. Each toy lent itself to the teaching of the target social play behaviours. The time taken for completion of the game play of each toy was similar.

A script template was then generated incorporating the target behaviours in sequence. This was based on observing typically developing children playing with the toys in interaction with their parents. The words "Let's play", "My turn, your turn" and "Finished, put away" were deemed to be normal words used in everyday language by typically developing children in the context of game play.

Table 6: Instructive Steps for Game Play

The game begins with the toy on the table with all the pieces in a set formation in a smaller box, with the larger Finished Box beside it. The Adult is sitting side on to the game, approximately 1 metre away from it. The child is also sitting on a chair, side on to the game but facing the therapist.

Instructive Play Sequence

1. Child: While looking for eye contact from adult, stands up and approaches the game. Child then gestures (by hand towards adult's hand or towards game) and/or saying "let's play" or approximation of "let's play"
2. Adult: "OK", kneels down next to the game.
3. Child: gesture (hand toward own chest) and/or "my turn" or approximation of this; child picks up a piece and puts it into correct place.
4. Adult: "my turn" and gesture (hand toward own chest); child hands a game piece to the adult and waits while adult picks it up & puts it into correct place.
5. Child: gesture (hand toward own chest) and/or "my turn" or approximation of this; child picks up a piece and puts it into correct place.
6. Adult: "my turn" and gesture (hand toward own chest); child hands a game piece to the adult and waits while adult picks it up & puts it into correct place.
7. Child: gesture (hand toward own chest) and/or "my turn" or approximation of this; child picks up a piece and puts it into correct place.
8. Adult: "my turn" and gesture (hand toward own chest); child hands a game piece to the adult and waits while adult picks it up & puts it into correct place.
9. Child: gesture (hand toward own chest) and/or "my turn" or approximation of this; child picks up a piece and puts it into correct place.
10. Child: "finished, put away" and/or gesture (hand toward Finished Box).
11. Adult: "OK".
12. Child: puts the game into the Finished Box or approximation of this.

After consent had been obtained, a baseline assessment was carried out using two assessment scales to evaluate cognitive and language ability and behavioural difficulties respectively. A parental questionnaire was also used to gather further information in relation to the individual preferences, needs and difficulties of each participant. The participant was then observed playing with the stimuli at baseline. This baseline assessment was then reviewed in the context of the target behaviours being taught in the interventions, and a functional analysis carried out as to how best to address any challenging behaviours which might impede a given participant's learning process. This included identification of appropriate replacement behaviors. The data obtained through these assessments were then used to guide the development of specific Peer/Self Videos and Social Stories™ for each participant.

Development of the Intervention Approaches: Social Stories™

Creating and implementing the Social Stories™ for the intervention.

All SS™ in this intervention were created by the researcher and were reviewed by a validating panel including a preschool teacher and another therapist, according to a Social Stories™ validity checklist (see Appendix 9).

These criteria have developed by degrees with accepted guidelines being altered over a number of stages (see Social Stories™ section of the literature review). The SS™ for this study were created according to the updated guidelines developed by Gray (2010), using her revised and expanded edition of *The New Social Story™ Book* as a manual. The new Social Story™ criteria below are derived from the tutorial element of this book. The examples, which form a large part of the later material of this book, were also reviewed as a source of ideas for formats, sentence construction, contextualisation *et cetera.*

The researcher attended a Social Stories™ Immersion Workshop run over two days by Carol Gray herself to acquire improved SS™ writing skills. The course provided insight into how best to develop a SS™ individualised to each participant and situation, with content that was both relevant and physically, socially and emotionally safe for each participant (the Audience of the story).

The new guidelines have simplified the number of different types of sentences to be used within a given SS™ and have renamed some types of sentences to render them more Audience-friendly. Overall, these new criteria allow for a more Audience-centred approach.

The SS™ were constructed following a task analysis of the stimuli to be used, incorporating the target social/behaviour skills. They were to be relevant to all game play rather than the specific toys used in this study, so that the skills learned could be generalised to game play in other situations and with other people.

Criteria in the Development of Social Stories™ (Gray, 2010) for this study

Criterion 1: The goal in creating these SS™ was to share information regarding the target skills with the Audience in an Audience-centred, constructive, patient and supportive manner. The physical, social and emotional wellbeing of the Audience was of primary concern when writing the SS™ and self-deprecating or critical sentences were avoided.

Criterion 2: Two-Step Discovery. Descriptive information pertaining to the context and setting of the target behaviours were gathered for each individual Audience. Examples of situations in which difficulties often arose in an everyday setting were gathered from parents. Additional information was obtained through structured assessments outlining each child's linguistic and cognitive ability. These were then collated to produce an appropriate intervention within the context of the target situation, in a format suitable to the language and comprehensive ability of the Audience in question. At least two statements were included for the process of "two-step discovery": one in the third person describing a situation from a "fly on the wall" viewpoint, and one in the first person relating that situation/course of action to the Audience him/herself.

Criterion 3: Each SS™ had a title and introduction clearly identifying the topic, a body adding detail, and a conclusion to reinforce and summarise the information. Therefore each SS™ had at least three sentences.

Criterion 4: The format of each SS™ including the construction and arrangement of text and illustrations, was tailored towards the individual needs of the Audience. For those with language and cognitive difficulties and for younger participants, a shorter SS™ was written, with the aim of sharing maximal information with minimal, simple, clear text and appropriate illustrations.

Criterion 5: Statements within each SS™ were written from a first-person or third-person perspective (as per criterion 2 above) and care was taken to ensure that the tone was consistently patient and positive, keeping the self esteem of the Audience intact. Every effort was made to ensure that the most accurate and comfortable vocabulary for

the Audience was used to convey meaning. Positive rather than negative verbs were used.

Criterion 6: The SS™ were constructed such that they answered "wh" questions (who/what/where/when/how), with the aim of helping the Audience to better understand their surroundings and what is asked of them in game play/social situations.

Criterion 7: Seven types of SS™ sentences are described. The sentence types used included descriptive, perspective, coaching, affirmative and co-operative sentences (see Appendix 10 for a description of all sentence types). Partial and control sentences are other optional sentence formats that were not used for this study.

Criterion 8: In creating the SS™ the researcher adhered to the Social Story™ Formula, which refers to the relationship between the different types of sentences in a Social Story™. The formula limits the number of Coaching sentences while allowing for an unlimited number of sentences of other types (i.e. sentences that describe). Thus

$$\frac{\text{\# of sentences that describe}}{\text{\# of sentences that coach}} \geq 2$$

Criterion 9: Each SS™ was tailored as much as possible to the individual preferences, talents, and interests of the Audience.

Criterion 10: Implementation. Following its creation, each SS™ was then edited and reviewed to ensure that it had maximal potential for meaning and interest. The SS™ and its illustrations were reviewed with comprehension in mind. The "voice" of the SS™ was reviewed to ensure that it had a consistently patient, positive and supportive tone. Praise was also incorporated into the implementation. A positive introduction of the story was planned to ensure maximal interest, e.g. "This is a story that I wrote for you!" Monitoring of Audience comprehension once the SS™ had been read was planned.

Constructing the Social Stories™

Information on each individual participant was gathered through observation at the Day 1 session, discussion with the parents as to specific interests, aversions and behavioural difficulties, and also through PLS-3 and Vineland 2 assessments (see measurement section in the methodology chapter). Further information was gathered on observing the child during the baseline session on Day 2 (see Appendix 11 for baseline data form for SS™). Between the Day 2 and Day 3 sessions, this information was reviewed and an individualised Social Story™ written in the most meaningful format for the participant's literacy level, using vocabulary that he/she would be comfortable with and in a patient, reassuring tone that would protect his/her emotional health.

Pictorial content was included as appropriate according to each participant's characteristics. A greater pictorial content was included for children who were not yet reading, but pictures were also included for literate children as a visual aid when needed. Gray (1998) cautioned that using pictures which are very specific (e.g. photos of a specific toy, activity partner and setting) may impede generalisation of the skills learned to other situations. Line drawings displaying a more general idea of stimulus, person and setting were therefore favoured.

Development of the Intervention Approaches: Self Video Modelling

Creating the Videos for Self Modelling

All Self Videos in this intervention were created by the researcher with reference to selected guidelines. Unlike Social Stories™ which is trademarked and has set guidelines, as yet a set of internationally agreed guidelines for SVM remains to be developed. However, some useful guidelines and checklists do exist. Following a review of these, those suggested in the book *Video Modeling and Behaviour Analysis* (Nikopoulos et al., 2006) were selected, along with recommendations by the National Professional Development Center on Autism Spectrum Disorders (2010), Buggey et al. (2007) and Graetz et al. (2010). The Self Videos created for this study were reviewed by the validating panel according to a validity checklist based on the guidelines chosen (see Appendix 12).

The first step was to identify the target social situation which the Self Video had as its focus. The skills targeted here were specific social skills related to game play, involving social interaction behaviours such as initiating play, co-operative play, turn taking and sharing, eye contact and finishing a game. The second step was, as for SS™, to gather information on each participant. This included PLS and Vineland assessments of their language and cognitive abilities and behaviour, and information gleaned from discussion with the parents during the Day 1 session. The third step was to assess the baseline abilities and difficulties of each individual child during each game play situation on Day 2 (see Appendix 13 for the baseline data form). Collection of these data allowed a baseline assessment to be formulated, against which further assessments post-intervention could be compared. A Self Video was then created which was tailored to the specific needs and abilities of the child in question.

Attending to the Video

In order for modelling to be effective, the participant must be able to attend to the modelled behaviour in the format in which it is presented (Cooper 1987). For video modelling, this involves measuring each participant's ability to attend to television. A television attention span of one minute (as used by Nikopoulos et al. in their SVM study in the book *Video Modelling and Behaviour Analysis*, 2006) was deemed adequate for use of video modelling with a given participant. The ability to attend to the video was necessary if video modelling was to be successful (McCoy et al. 2007, Kleeberger et al. 2010). All participants in this study were able to attend to television for at least one minute, as assessed through the parent questionnaire (see Appendix 14).

The steps outlined in these guidelines are included in Appendix 15. Below is a description of the creation of the Self Videos for this study in accordance with these guidelines.

Creating the Self Video

The best practice guidelines for creation of SVM (see Appendix 15) were followed in creating these videos.

1. A task analysis of the stimuli and game play involving the target social behaviour skills of interest was conducted.
2. The target behaviours were defined so as to be observable and measurable.
3. The researcher conducted a baseline assessment on Day 2 to identify which elements of the task analysis the participant could perform without assistance.
4. Correct equipment: the researcher recorded these videos using a video recorder mounted on a tripod with appropriate zoom and editing functions, with which the researcher was familiar. Following the editing process, the videos were shown to the participant on a 24 inch monitor.
5. The Self Videos were created with the camera at a more zoomed in vantage point than the observation videos, in order to render the Self Video as engaging and clear as possible, and so that background objects did not cause distraction.
6. An individualised script incorporating the task analysis was written, including what would be said on the video (see Appendix 16).
7. The Self Videos required three people for successful completion: the target participant, the therapist, and another trained person for prompting. Only skills that were within the participant's repertoire were taught using SVM.

8. Following this, each step in the completion of a specific task was videotaped, ensuring that the camera was held steady, with adequate picture and sound quality. Prompting was used where necessary to achieve the target skills/behaviours.
9. The videotape was then edited to include only the target behaviours and actions. Prompts, multiple attempts and inappropriate/off task behaviours were edited out.
10. Each behaviour taught took approx. 30-40 seconds as a maximum on the resultant videotape.
11. The setting used for the video was the same as that in which the child would be encountering the stimuli, i.e. the behavioural clinic office.

12. The desired actions, and the objects and people involved in the task, were emphasised using close-up and zoom techniques when possible. This was to allow the child to imitate the actions the researcher wished to teach and to filter out distractions.
13. The video was then further edited by the researcher, and any errors/extraneous events or noises removed.
14. Another baseline evaluation was carried out following the completion of the video to assess for acquisition of skills during the making of the video.

Development of the Intervention Approaches: Peer Video Modelling

Creating the Videos for Peer Modelling

All Peer Videos in this intervention were created by the researcher with reference to selected guidelines. As for SVM, as yet a set of internationally agreed guidelines remains to be developed. However some useful guidelines and checklists do exist, and recommendations by the National Professional Development Center on Autism Spectrum Disorders were selected along with recommendations from the book *Video Modelling and Behaviour Analysis* (Nikopoulos et al., 2006). The Peer Videos were reviewed by the validating panel according to a validity checklist (see Appendix 17).

Attending to the Video

Again, a television attention span of one minute was deemed to be adequate for use of PVM with a given participant, and, as mentioned above for SVM, all participants fulfilled this criterion.

Creating the Personalised Peer Video

The steps followed for creation of the Peer Videos were very similar to those for SVM. First, the researcher identified the target social situation which the Peer Video had as its focus. The target skills were the same as for SVM i.e. initiating play, co-operative play, sharing, eye contact and finishing a game. Baseline data on the participants were used to create a Peer Video tailored to the specific needs and abilities of the child in question.

The actors in the Peer Videos were two typically developing children, one male aged 6 years 2 months and one female aged 6 years 1 month, who were members of the Cork School of Acting and volunteered to be the models. These actors were chosen based on the characteristics suggested in relevant studies (Grant et al., 1994, Martin et al., 2002). Both were Caucasian, with dark brown hair. Both male and female models were used so that in individual videos the models were gender matched to the child in question. A slightly older age was used following trials with younger child actors, as the older children were felt to be better able to fulfil the acting ability required to demonstrate the tasks in an engaging and expressive but not exaggerated manner (as recommended by Biedermann, 1999). However, they were still close to the age range of the participants and thus were suitable as peer models. A peer rating form for the actors involved in the PVM was used to validate the actors. A panel of 3 comprising of the main researcher, the research assistant and a teacher who works with children with ASD in this age group rated the actors using this form (Appendix 18). Both actors were deemed to be appropriate for the PVM videos for this study.

The literature review found no discernible difference in outcome, whether adults or peers were used as models. However, due to the nature of this study in comparing self with peer modeling, it was felt that the peer should approximate the age of the participant to decrease possible confounding between these two interventions.

The main researcher featured in all videos in the role of therapist, thus minimising confounding between therapists and maximising consistency of the videos created. The main researcher was also the only therapist during the teaching sessions for all three interventions.

The videos were created following the guidelines published by the National Professional Development Center on Autism Spectrum Disorder in 2010, with reference also to the book *Video Modelling and Behaviour Analysis* (Nikopoulos & Keenan, 2006). For a list of these guidelines, please see Appendix 19.

The steps followed for creation and implementation of the Peer Videos were as follows:

Creating the Peer Video

1. A task analysis of the stimuli and game play involving the target skills was conducted.

1. Target behaviours were defined so as to be observable and measurable.
2. The therapist conducted a baseline assessment to identify which elements of the task analysis the participant could perform without assistance. See Appendix 20 for baseline data form.
3. One model was used for the creation of each video. The model was of a similar age and gender to the participant. Please see Appendix 21 for consent form for the actors involved. These actors were chosen based on the characteristics suggested in relevant studies (Grant et al., 1994, Martin et al., 2002). It was ensured that the actors behaved in a natural manner, avoiding exaggerated tone and gesture (Biedermann 1999). A peer rating form for the actors involved in the PVM was used to validate the actors. A panel of 3 comprising of the main researcher, the research assistant and a teacher who works with children with ASD in this age group rated the actors using this form (Appendix 18). Both actors were deemed to be appropriate for the PVM videos for this study. Their demographic information is also contained within Appendix 18.
4. As for SVM, correct equipment was used.
5. A script (see Appendix 16) based on the task analysis was written.
6. Each step in the completion of a specific task was videotaped, ensuring that the camera was held steady, with adequate picture and sound quality.
7. Each behaviour as demonstrated by the model took 30-40 seconds as a maximum.
8. The setting of the video was the same as that in which the participant would be encountering the stimuli.
9. Close-up and zoom techniques were used as appropriate.
10. The video was then edited by the therapist.

Chapter 9: Study 1 - Methodology

This chapter details the methods by which Study 1, the prospective cohort study, was conducted to compare the effectiveness of Social Stories™, Self Video Modelling and Peer Video Modelling as teaching procedures for children aged 36-72 months with ASD.

The chapter includes descriptions of:

(a) ethical approval for the study,
(b) recruitment of participants, their demographic data, their randomisation to different intervention-task-stimulus combinations and the subsequent sessions of the study,
(c) arrangements for implementing the interventions and details of the setting, that is, the physical environment in which the study was conducted, including provisions within the setting for the comfort and emotional wellbeing of participants, along with a description of all equipment used,
(d) the experimental design, including the reasons for using such a design,
(e) measurement methods and data collection procedures, and
(f) data coding and subsequent analysis, including statistical tests used.

Ethical Approval

A research proposal with details of the teaching procedures being used, target skills, settings and all other relevant details was submitted to the Social Research Ethics Committee of University College Cork (see Appendix 22). Following review, the committee granted the researcher ethical approval to proceed with the study (see Appendix 23 for the committee ethical approval letter). An exchange of emails with Dr Andrew Freedman, Chair, Cardiff University School of Medicine Research Ethics Committee (see Appendix 24) confirmed that he considered this ethical approval to be sufficient. The original application for ethical approval contained provision for further teaching being given to participants who did not learn the skills being taught to the criterion level (see Appendix 22, section 18 part 4). Hence, both Study 1 and Study 2 were covered in the original application for approval. This has been confirmed by a letter from Mr. Sean Hammond (see Appendix 25).

Participants

Inclusion Criteria

The inclusion criteria for the selection of participants for this study were as follows:

- A diagnosis of Autism, Asperger's syndrome or PDD-NOS according to the DSM-IV criteria 1994 (see Appendix 2).
- Within an age range of 36-72 months. The reason for selecting this target age range was that it defined the early intervention/preschool years. This is the optimal time for intervention in terms of the child achieving his/her potential (National Autism Plan for Children, 2003) and, therefore, was felt to be the optimal age group for the development of social/play skills.
- Available to attend for the full set of intervention sessions accompanied by a caregiver.
- Attention capacity for television and for following a story > 1 minute.

Recruitment

20 participants were recruited for this study. The aim at this stage was to recruit as many participants as possible within the catchment area who fulfilled the inclusion criteria. Recruitment was carried out through advertising on social media websites including online autism forums. The recruitment advertisement was nationwide. Those responding to the advertisement were all from the province of Munster, which is likely to be because of the logistical difficulties of travelling to sessions from further afield. The initial advertisement comprised a brief paragraph describing the objectives of the study, expected duration and inclusion criteria. An email address was provided for those interested to contact the researcher. On expression of interest, if the proposed participant fitted the inclusion criteria, an email with more detailed information along with the consent form was sent to the interested parent (The consent form and information leaflet are available in Appendix 26). These more detailed emails were sent to 31 parents, of whom 18 parents replied expressing interest in participating in the study. Two of the families who replied had two siblings each who fitted the study criteria: one pair of brothers and one pair of twin brothers. This came to 20 participants.

Excluded Participants

Two of the participants recruited were unable to attend to the game at baseline due to behavioural and emotional difficulties on the day. These participants were aged 39 months and 50 months respectively. Both were male and had a diagnosis of ASD. It was also not possible to conduct the PLS-3 baseline assessment with either of these children as they were not able to focus on or answer the questions contained within it. As it did not prove possible to engage the child with the stimuli, these children were excluded from the study. It was deemed ethically inappropriate to continue with further sessions, as this might prove distressing. Both of these children had siblings who were included in the study. Although the two children did not participate in the study, advice on behaviours and teaching techniques appropriate to the characteristics of the child were offered by the researcher. Following the exclusion of these children, this yielded a total number of 18 participants.

Included Participants

Sixteen of the 18 participants included in this study were male and two participants, participant (pt.) 9 and pt. 13, were female. Two of the participants, pt. 14 and pt. 16, both of whom were male, were of African origin. 15 participants had a diagnosis of Autism, two (pt. 17 and pt. 18) a diagnosis of Asperger's Syndrome and one (pt. 14) a diagnosis of PDD-NOS. All diagnoses had been formally made by qualified multi-disciplinary teams. Four participants were in the age range 36-48 months, seven were in the range 48-60 months, and seven in the 60-72 month range. Eight participants could read, and ten were as yet unable to read. Fourteen participants attended a school or preschool. Pts. 1,3,6,8, and 12 were either attending a school specialising in ASD, or a specialist unit attached to a mainstream school. Pts. 2, 5, 7, 9, 10, 11, 15, 17 and 18 were in mainstream school with the help of a Special Needs Assistant in the classroom. Four participants (pts. 4, 13, 14 and 16) were awaiting school placement but three were receiving home tuition from a Special Needs Tutor. Participant 14 had only recently been diagnosed and had not as yet received any specialised care.

Table 7 overleaf provides information on the 18 participants included in Study 1 in terms of the measured intake variables, which are as follows: age, gender, reading ability, ethnicity, Vineland and PLS scores.

Table 7: Participant information

Participant Number & Diagnosis (as per DSM-IV)	Age in months	Gender, Ethnicity	Reading ability	Vineland Composite	Vineland Commun-ication	Vineland Daily living	Vineland Social-ization	Vineland Motor Skills	Vineland Maladaptive Behaviour Index	PLS-3 Auditory	PLS-3 Expressive	PLS-3 Composite
1. Autism	70	Male, Caucasian	Yes	94	100	107	79	97	21	117	93	106
2. Autism	62	Male, Caucasian	No	66	59	75	70	75	20	52	50	50
3. Autism	63	Male, Caucasian	No	74	81	79	68	81	24	54	50	50
4. Autism	50	Male, Caucasian	No	67	60	74	72	77	19	68	67	64
5. Autism	62	Male, Caucasian	Yes	78	93	69	74	88	20	117	104	112
6. Autism	39	Male, Caucasian	No	74	83	91	72	63	21	77	81	77
7. Autism	51	Male, Caucasian	Yes	83	81	93	72	97	19	90	95	92
8. Autism	51	Male, Caucasian	No	72	91	81	70	61	19	90	90	89
9. Autism	56	Female, Caucasian	No	66	69	71	72	67	17	92	100	96
10. Autism	64	Male, Caucasian	Yes	80	79	83	81	88	21	98	93	95
11. Autism	69	Male, Caucasian	Yes	75	85	78	74	78	18	117	98	108
12. Autism	50	Male, Caucasian	No	61	59	71	66	59	22	64	65	61
13. Autism	39	Female, Caucasian	No	64	69	69	68	64	16	79	76	75
14. PDD-NOS	40	Male, African	No	59	43	65	75	65	24	50	50	50
15. Autism	58	Male, Caucasian	Yes	69	76	79	79	56	19	79	93	83
16. Autism	40	Male , African	No	50	29	58	66	56	20	64	64	60
17. Asperger	51	Male, Caucasian	Yes	86	100	89	88	78	18	103	93	98
18. Asperger	70	Male, Caucasian	Yes	83	91	85	70	96	24	109	93	101

Table 8 below provides further information regarding these intake variables in the Study 1 population, including a count and calculation of percentages of participants falling into different categories, and for continuous variables, a calculation of mean, standard deviation, minimum and maximum values.

Table 8: Included Participants – Demographic Characteristics

Gender	**Count**		**Percentage**	
Male	16		88.9%	
Female	2		11.1%	
Ethnicity				
Caucasian	16		88.9%	
African	2		11.1%	
Ability to read				
Yes	8		44.4%	
No	10		55.6%	
	Minimum	**Maximum**	**Mean**	**Std. Deviation**
Age (months)	39.0	70.0	54.7	10.73
Vineland Composite	50.0	94.0	72.3	10.80
Vineland Communication	29.0	100.0	74.9	19.23
Vineland Daily Living	58.0	107.0	78.7	11.60
Vineland Socialization	66.0	88.0	73.1	5.67
Vineland Motor Skills	56.0	97.0	74.8	14.16
Maladaptive Behaviour Index	16.0	24.0	20.1	2.32
PLS-3 Auditory Score	50.0	117.0	84.4	22.77
PLS-3 Expressive Score	50.0	104.0	80.8	18.51
PLS-3 Composite	50.0	112.0	81.5	21.24

Note: All Vineland and PLS composite and subdomain scores above are standardised scores.

Intervention

Implementation of the Social Stories™

A checklist was used to ensure that all of the criteria for a safe and successful Social Story™ had been fulfilled according to the guidelines above. Care was taken in the presentation and implementation of each SS™ to ensure its effectiveness and that it was communicated in a way appropriate for its Audience. If the participant was unable him/herself to read the SS™, the researcher read it to him/her. The participant was observed throughout the reading process to assess attention and behaviours indicating either that they enjoyed reading the story or that they were bored by it/disliked it. The participant's understanding of the story was checked after a number of readings, by asking the participant questions about the story. For examples of the SS™ used for different participants and the SS™ checklists, see Appendices 27 & 9.

Implementation of the Self Video Model

The technique used in the Self Video was that of positive self-review, i.e. the participant was videoed performing the target skills, and any extraneous or undesirable action edited out of the video prior to its being viewed. The technique of positive self review was recommended by Dowrick (1999) particularly for those children with adaptive behaviour intermixed with non-desired behaviours, while incorporating an improved self image, which was felt to be appropriate to the participants of this study. Dowrick (1990, 1999) suggests that positive self-review may alter the memory of the participant to an extent where the adaptive behaviours are remembered to a greater degree than the maladaptive or extraneous ones, and are therefore more likely to be reproduced on subsequent occasions.

As per the guidelines below, the length of the Self Video was kept to within 30-40 seconds as a maximum. Videos were recorded and edited to focus on the task in hand, minimising distractions and thereby enhancing learning.

The steps outlined in these guidelines are included in Appendix 15. Below is a description of the implementation of the Self Videos for this study in accordance with these guidelines.

1. The video was shown in the same setting as that in which it was recorded.
2. The participant was allowed to watch the video clip at least three times. Many participants requested to see the videos multiple times.
3. If required, the participant was prompted to attend to the video.
4. When appropriate, the video was stopped after each step and the participant encouraged to display the desired behaviour.
5. The participant was allowed 30 - 90 seconds to demonstrate each step of the modelled behaviour.
6. The participant was shown the video clip again if he/she failed to imitate the desired behaviours.
7. Encouragement, in the form of verbal praise, was offered when the participant successfully displayed the desired behaviour. Also, whether or not the participant had successfully imitated the behaviour in question, encouragement in the form of verbal praise was offered if the participant was behaving well and not exhibiting disruptive behaviours.
8. Sessions to assess maintenance and generalisation of the desired behaviours across different stimuli and people were an integral part of the study.
9. Assessment of the effectiveness of the video modelling process for each individual participant was quantified through a scoring process discussed later in this chapter. Ongoing progress data including that from maintenance and generalisation probes were then examined to determine whether changes to the video modelling strategy and techniques were needed to improve the progress of an individual participant (as recommended by Sigafoos et al., 2007), and advice given to parents accordingly.
10. Fading of prompting and of the use of video were used where appropriate as the participant performed the desired behaviours more and more independently. This also promoted maintenance of the skills gained.

11. Troubleshooting: The researcher adjusted the video strategy on identification of problems using questions such as:

- Has the participant watched the video enough times?
- Is the participant watching the video, but not focusing on the tasks in hand?
- Does the participant require prompting to pay and keep attention, and to perform the desired behaviours?
- Is the appropriate amount and type of reinforcement being given for performance of the desired behaviours?
- Is the video too complex?

Each participant was observed to assess attention and enjoyment of the video. Each participant was also asked who the child on the video was, to assess whether they could identify themselves on camera. Many participants appeared to enjoy seeing themselves on video and requested more than three viewings. One participant however disliked viewing the video and appeared self conscious in reaction to seeing himself on camera.

Implementation of the Peer Video Model

The main researcher featured in all videos in the role of therapist, thus minimising confounding between therapists and maximising consistency of the videos created. The main researcher was also the only therapist during the teaching sessions for all three interventions.

The videos were created following the guidelines published by the National Professional Development Center on Autism Spectrum Disorder in 2010, with reference also to the book *Video Modelling and Behaviour Analysis* (Nikopoulos et al., 2006). For a list of these guidelines, see Appendix 19. For the implementation of the Peer Video, adherence to the guidelines was identical to that for SVM.

Setting

The study took place in a behavioural clinic, in which the author works as a behavioural specialist. During the hours in which the participants attended the clinic, it was used exclusively for the purposes of the study with no other client sessions being conducted at that time. The rooms consisted of a consultation room, a tutoring room and a relaxing room with soft lighting, a multicoloured bubble tube, soft play equipment and some sensory toys. A small kitchenette was at hand should refreshments be required and a toilet with disabled access was also available.

Three different rooms were used for the study. The teaching interventions were conducted in the tutoring room. The furniture was set up as follows: two tables were placed parallel to each other with a chair facing sideways behind the table on the right hand side. The stimuli were set out on the table on the right with a large plastic box, the "finished box" on the table on the left. This box had a "finished" chequered symbol on it. A camera was placed 6 metres from the tables, directly facing them, so that the performance of the participant could be captured on video. For the creation of SVM, the camera was placed 2 metres in front of the table to allow a better close-up picture. A "dark den" (which consisted of a soft play dark tent as a place of low sensory input) stood out of range of the camera, to the left of the tables. This was placed so as to allow participants who became anxious or wanted time alone to have a safe and calming place where they could choose to go. No other furniture was placed in the office during the interventions, so that distractions from the tasks being taught could be minimised. The layout of the furniture remained constant throughout all days of intervention.

The relaxing room was used as a calm, restful place, for scheduled breaks between videos and after the videos had been completed on each day of intervention. This relaxing atmosphere had been created by the primary researcher during his own tuition hours in the clinic with similarly aged clients with ASD. It was noted that a darkened relaxing room with the use of a bubble tube and sensory toys was restful enough for the child to take a break, but not so reinforcing that they would not want to return to the tuition room.

The consultation room as above, which contained armchairs and a couch, was used for parents. Here, introductory sessions were carried out for getting to know the child and family, completion of assessments requiring the parent's input and discussion of a participant's performance in the interventions, including any behavioural issues that arose. Parents often waited in this office while the interventions were being carried out next door. The room also contained some simple sensory toys for children to play with, both for observational purposes and for their entertainment while discussions were being held with parents.

Experimental Design

This was a prospective cohort study, the objective of which was to ascertain the relative effectiveness of three types of intervention among the specified research population. A counterbalancing design was chosen, matching each target task being taught with an intervention and a stimulus in a balanced pattern (see counterbalancing grid below). Thus each stimulus was allocated to an intervention and social skill for each participant according to a counterbalancing design.

Counterbalancing Grid

This pattern was such that each triad (combination of intervention, task and stimulus) occurred only twice during the study. Participants were allocated this series of combinations in the order in which they were recruited. Although not strictly random allocation, this procedure controlled for selection bias on the part of the investigator and minimised allocation bias so that those participants with, for example, a higher cognitive ability would not be allocated to a certain combination more frequently than would occur by the chance inherent in their order of recruitment. This design also incorporates a cross-over design, that is, all participants were exposed to all interventions, allowing for within-subject as well as between-subject analysis and comparison.

Table 9 :Counterbalancing Grid

Condition Counterbalancing by Pairing of Independent Variables and Order of Condition Presentation (randomisation to different intervention-task-stimulus combinations)

Key:

A= Social Stories™

B= Self Video Modelling

C= Peer Video Modelling

1 = Stimulus 1: Activity Bucket

2 = Stimulus 2: Large Lego

3 = Stimulus 3: Wooden Puzzle

X= Target Skill 1: Finishing a game

Y= Target Skill 2: Turn taking

Z= Target Skill 3: Starting a game

Participant #	Condition 1	Condition 2	Condition 3
1	A1X	B2Y	C3Z
2	A2X	B3Y	C1Z
3	A3X	B1Y	C2Z
4	B1X	C2Y	A3Z
5	B2X	C3Y	A1Z
6	B3X	C1Y	A2Z
7	C1X	A2Y	B3Z
8	C2X	A3Y	B1Z
9	C3X	A1Y	B2Z
10	A1X	B2Y	C3Z
11	A2X	B3Y	C1Z
12	A3X	B1Y	C2Z
13	B1X	C2Y	A3Z
14	B2X	C3Y	A1Z
15	B3X	C1Y	A2Z
16	C1X	A2Y	B3Z
17	C2X	A3Y	B1Z
18	C3X	A1Y	B2Z

(Generalisation stimuli used- Stimulus 4: Rings and Stimulus 5: New Wooden Puzzle.)

A counterbalancing design was preferred to a simpler design (e.g. allocation of one intervention to each child for all tasks) again to reduce bias. If, for example, a larger proportion of those with higher cognitive ability were by chance allocated to a certain intervention, then the data would be skewed as this intervention might appear more effective than it would in a representative sample. A stratification of abilities/characteristics and allocation of a certain number of those with different abilities/characteristics to each group, was also rejected as a study design as it was considered that a lack of randomisation and the introduction of a possible subjective element to the allocation of interventions would almost inevitably lead to bias. Although all tasks were selected so as to be equivalent in difficulty, they were by their nature different. The counterbalancing of tasks and interventions in a randomised way was felt to be a design which minimised bias. It also reduced the possibility of false-positive and false-negative findings, thus reducing the potential for both Type 1 and Type 2 errors respectively.

Intervention Session Design

The intervention sessions for the first three days were performed between 5-7 days of each other. The interval between the third and fourth (maintenance and generalisation respectively) days of the intervention was kept to a period of approximately one week.

Intervention Structure

Checklists were created detailing each step of the procedure for each session, to ensure that nothing was omitted, in order to ensure procedural reliability (see checklists in Appendices 28, 29, 30.) The researcher and the research assistant were present throughout each day of the intervention, including all video sessions.

Intervention Structure: Day One

On day one of the intervention, time was set aside for an introduction to the parents and the participant, and to get to know each family. Specific problems and preferences of each participant were discussed at this time in order to enable the researcher to work more effectively with him/her, allowing for his/her individuality. The language (PLS-3)

and Vineland assessments were completed with the parents at this stage. This was instrumental in building up a profile on each participant including preferred means of communication, reinforcing objects and activities, and aversions. For example, some participants had an aversion to being touched or being led with their hand held. Knowledge of this maximised the effectiveness of the communication and teaching techniques used while minimising distress. During this stage, parents often spoke about specific behavioural problems which their child was experiencing, and advice was offered in dealing with specific issues during this conversation. The researcher felt that it was essential from an ethical point of view that expert advice be offered during discussions with parents in order to maximise the benefit to each participant, while keeping the main focus on the intervention at hand. The structure of the three further days of sessions was explained in detail with the parents also.

During this discussion with the parents, the participant was given a session in the relaxing room which would be used for breaks during the study, supervised by the research assistant. The participant was also brought in to the room which would be used for the interventions, to become acquainted with the environment in which he/she would be participating in the interventions.

Where possible, a script was used to ascertain whether the participant him/herself wished to be part of the study. This was done on each day of the study. Please see Appendix 31 for example of script used.

Intervention Structure: Day Two

During the second session, baseline videos were carried out for each of the stimuli, for a full play through of each toy. As explained elsewhere, a different task of comparable difficulty was assigned for each stimulus.

This session involved three baseline videos using each of the three stimuli, conducted in the behavioural office. The participant was guided towards a set of parallel tables on which the toy and all its pieces were laid out, ready to be played. The researcher was sitting on a chair facing the participant as he/she approached the toy. The behaviour of the participant was then observed, to assess if at baseline he/she already possessed any

of the skills being taught. All baselines were recorded using a concealed camera. A five minute break for relaxation was built in between each video session. This was to reduce any anxiety related to the activity and to encountering new people.

The baseline video session took on average 45 minutes, following which a 30 minute relaxing room session was offered for relaxation. If the participant decided to take this break, he/she was accompanied by the research assistant. Feedback was given to the parents following the session involving a brief explanation of the findings and their implications for the ensuing sessions.

Following day 2, a tailored Social Story™, as well as Self and Peer Videos, were created for each participant based on the functional analysis and their performance at baseline.

For SVM, the participant was then guided through the skill in hand through *in vivo* teaching, according to the individualised video script prepared. The desirable behaviours and tasks were included, and extraneous or undesirable actions and behaviours edited out. Following this, another baseline video was shot to assess whether the *in vivo* teaching involved in creating the Self Video had taught part or all of the skill which was intended to be taught by SVM. This potential for confounding by *in vivo* teaching is integral to SVM, as the self must of course be the subject of the video. The Self Video could be then tailored again to adapt for any skills learned through *in vivo* teaching, if this were possible.

Intervention Structure: Day 3

Day 3 involved the intervention probes. The counterbalancing design involved assigning 3 triads to each participant, each comprising of a task, an intervention and a stimulus (see Table 9 above). The task of finishing the game was taught first, then turn taking and lastly starting the game. The sequence of tasks was the only sequence which remained constant for each participant, that is, it was not counterbalanced. The rationale for this sequence was so that the new task being taught in each intervention would always be the first one chronologically that the participant had to perform. If, for example, initiating the game were taught first, then for turn taking the participant would

need to remember and perform the task of initiation before getting an opportunity to perform the task just taught- that of turn taking. It was felt that this would create a disparity in the latent period between the time an activity was taught and the point in time where the participant would be required to perform this intervention, which would introduce bias. Also, the performing of a recently taught skill just before the participant attempted to perform the new skill was a possible distraction which might affect performance.

For the tasks being taught by PVM, the individualised Peer Video was shown at least three times to each participant. Again each participant was observed to assess attention and enjoyment of the video. Each participant was also asked who the child on the video was, to ascertain if they could tell themselves from a peer on the video. Some answered that it was him/herself on the video. Many participants appeared to enjoy seeing a peer in video and requested more than 3 viewings.

Three observation (post-intervention probe) videos were then recorded, each assessing a task taught immediately after the relevant intervention. Each task involved a different toy, and although only one skill was being taught in each video, the participant was allowed to complete the game play each time. It was felt that this was essential to contextualise each skill such that its meaning within the global experience of game play was understood. For these videos, a further away vantage point was used, to allow concealment of the camera which could otherwise have been a distracter and/or could have induced anxiety or self-consciousness among participants. The camera was, however, placed close enough to enable observation of eye contact, facial expression and subtle motor gestures. During these videos, the researcher sat facing sideways towards the participant while they were entering the camera range. If the participant did not engage the researcher and turned immediately towards the toy, the researcher would kneel down beside the participant as soon as they had picked up a piece and commenced game play, to allow an opportunity for the participant to complete turn taking and finishing of the game.

A ten minute break for relaxation in the relaxing room was scheduled in between each of the videos. A thirty minute session in the relaxing room was again offered following the completion of all videos, and individualised feedback provided to parents.

Intervention Structure: Day Four

Session Four involved an assessment of maintenance and generalisation of the skills learned through the teaching of Day Three. It was felt that the interval between the post-intervention probe and the maintenance and generalisation probes should be as similar as possible for each participant, to avoid confounding by disparity in latent periods. The average for this interval was a period of one week.

Maintenance of the skills learned was assessed with the researcher and the same stimuli involved in the teaching probe. Generalisation of the skills learned to both different toys (novel stimuli) and a different adult (the research assistant- novel person) was measured. This was an important measure of the usefulness of the skills taught in the probe for each participant, as generalisation of the social skills learned to other play and social situations allow their integration into everyday life, providing maximal benefit to the participant and their families (Kazdin 1982). The participant was first videoed with the researcher playing with another shape-based ring toy, and then a different puzzle of equivalent difficulty. For each of these generalisation stimuli, there were seven steps involved in completion of basic game play as per the stimuli for the teaching probe. The steps involved placement of pieces and thereby offered a clear opportunity for turn taking.

The participant was then videoed with the research assistant taking the place of the researcher, that is, sitting on a chair side-on to the camera facing the participant as he/she approached the stimulus. Game play was videoed with all three stimuli used in the teaching probe (day 3- maintenance), as well as the two generalisation stimuli as above. The researcher was also present throughout these sessions in an observatory capacity.

A five minute break for relaxation in the relaxing room was scheduled in between each video. A thirty minute relaxing room session was again offered at the end of the videos. Also on completion of the videos, discussion with the parents included advice on behaviours observed throughout the intervention days. A further follow up session of behavioural work was also offered to the participant and his/her family, to ensure maximal benefit for each child from his/her participation. Any criterion of the target skills not met fully during the study could be discussed and a plan made to teach/consolidate this skill.

Stimuli 1-3 above were used in the probe, maintenance and Novel Person, Known Stimulus generalisation sessions. Stimuli 4 and 5 were used for the Novel Stimulus generalisation sessions.

Dependent Variables, Measurement and Data Collection

Dependent Variables

The dependent variables incorporated:

- Initiating play
- Turn Taking
- Finishing play
- Disruptive behaviours
- Eye contact: level of appropriateness

Measurement

Instruments used for Baseline Assessment

The following standardised assessments were selected for the evaluation of participants at baseline in terms of cognitive ability, linguistic function and behavioural difficulties.

- **Vineland Adaptive Behavior Scales: Second edition – Vineland II** (Sparrow, et al., 2005) was used to assess levels of adaptive functioning. This instrument is used to support the diagnosis and classification of intellectual and developmental disabilities, ASD and Attention Deficit Hyperactivity Disorder (ADHD). It measures personal and social skills required in everyday living. It addresses principally three domains of function: communication, socialisation and daily living. It includes:

  - Communication- in terms of receptive, expressive and reading ability
  - Socialisation- including interpersonal relationships, play and leisure time and coping skills
  - Gross and fine motor skills
  - Daily Living Skills (personal/domestic/community)
  - Maladaptive Behaviour Index: internalising/externalising/other

  The Second Edition includes an expanded age range (up to age 90 years), an updated schedule of daily living skills which are in concordance with current societal norms, a semi-structured interview format and a new caregiver rating form, allowing for easier administration.

- **Preschool Language Scales 3 UK (PLS-3UK**) (Zimmerman et al., 1997) was used to assess the receptive and expressive language skills of the participants. This scale assesses both auditory comprehension and expressive communication, and is tailored specifically towards the preschool age group. It involves age appropriate language tasks, for example matching pictures and words, constructing basic sentences, describing how to do everyday tasks, repeating

sentences etc. The age range catered for is the 0-83 month range, thereby encompassing the target age range for this study.

For further information on individual scores in these assessments for each participant included in the study, please refer to Table 7 above.

Following a discussion with the parents during the Day one session, and having read the parent questionnaire on individual preferences and reinforcements (see Appendix 14) and scored their assessments as above, the researcher compiled information on the participant's individual characteristics and difficulties. Further information was gathered on observing the child during the baseline sessions, and this was combined with the information above to gain a clearer picture of each participant. The resultant functional analysis was then considered in the context of target skills and other factors in the creation of the interventions for that individual participant.

Recording of Videos

Sarafino et al. (2001) proposed that videotaping behaviours and then evaluating the child thereafter augments and improves accuracy in recording the effectiveness of interventions. Therefore in this study, all sessions pre and post-intervention were recorded using a tripod-mounted camcorder with a wide-angle lens. The camcorder was placed out of reach of the child and was hidden to avoid it becoming a distracting object.

The videos were recorded with a high definition digital camcorder, and were later digitally transferred to an external secure hard drive archive. For the recording of each probe, maintenance, generalisation and longitudinal study video, the camcorder was mounted on a tripod 6 metres from the participant, discreetly set beside a stand at the back wall of the room where it could be concealed with a cloth. It was set to an appropriate degree of zoom so as to be equivalent to filming from 3 metres. To place the camera at 3 metres would, it was felt, render it more difficult to conceal and thus a potential distracter to the participant.

The Self Videos were filmed from a closer vantage point, with the tripod positioned 2 metres from and slightly to the side of the participant, with further zoom where needed for clarity. The tripod was not concealed in the creation of the Self Video. Likewise, a similar vantage point was used for the creation of the individualised Peer Videos. After editing, the Self and Peer Videos were shown to each participant on a 24 inch, high definition monitor. For each Self and Peer Video created, the best practice guidelines checklist was completed and changes in editing or reshooting of the video conducted accordingly where necessary.

Social Validity

Social Validity refers to the acceptability, appropriateness and reasonableness of a given intervention or treatment. For an intervention to be considered best practice, Emerson (2001, p.66) stated that:

"..Interventions, whether behavioural, psychopharmacological or based on alternative approaches, should be constructional, functionally based, socially valid..."

The Constructional approach was first described by Goldiamond (1974, quoted in Emerson, 2001). He described two conflicting approaches to intervention: constructional and pathological. He defined as pathological an approach which focuses on *"the elimination of behaviours, (e.g. self- injury) or states (e.g. anxiety, distress)"* (Emerson, 2001). This contrasted with the constructional approach which focused on the *"learning of new behaviours or development of behaviours already in the client's repertoire"* (Hastings et al., 2005). Therefore for this study, the learning of positive social skills was targeted rather than an approach directed at eliminating, for example, disruptive behaviours. It was hoped that by redirection in the form of engagement with the stimuli and with the therapist, such behaviours might possibly be reduced as a secondary outcome.

For this study, it was therefore vital that a measure of the social validity of the interventions was carried out. This was done through the use of a Likert scale (a technique for measuring attitudes, first proposed by Renesis Likert in 1932), assessing the social acceptability and appropriateness of the interventions chosen, following a

description and explanation of these by the researcher. Built into the scale was an assessment of the social relevance of the target skills chosen.

Table 10 : Five-Point Likert Scale

1. **The following interventions are appropriate for my child/the participants.**
2. **The Target Skills being taught are relevant to the learning needs of my child/the participants.**

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1.(a) Social Stories™					
1.(b) Self Video Modelling					
1.(c) Peer Video Modelling					
2.Target Skills being taught					

An explanation of the meaning of social validity, the target skills and a description of the interventions as per the headings above was given to both therapists and parent groups prior to their completion of forms.

Data Collection

306 sessions were recorded on video for the main study, and a further 26 were recorded for the longitudinal study. Each of these was analysed with a three-page data recording form and two-page scoring form.

Data Recording Form

The data recording form (see Appendix 32) was designed by the researcher. It consisted of three pages: one for each target skill, to ensure that data were collected in a uniform, structured format, in order to maximise consistency of results. It was based on the task analysis as outlined earlier in this section. The primary purpose of this form was to record in an objective format the level of achievement of behaviours along with a child's demographic information. For the main study, a total of 17 forms were completed for each participant, one for each video recorded.

The data recording form was used to closely analyse each event in the video, including the degree of achievement of skills. Observations were made on every aspect of skill performance such as seconds taken to initiate each skill as measured in intervals of 5 seconds (Alberto et al., 1995), level of eye contact and verbalisations (scripted or unscripted), and level of anxiety or distress present or any reason for discontinuing the video. These observations were made in a scoring format, but a section for free text was also included. The scripted and unscripted verbalisations uttered by each participant were written in the 5 second box in which they were uttered. An adult checklist was also included to assess whether the adult in the video had successfully completed their part of the script and tasks which made up the task analysis, and was completed by the use of a check mark for each task achieved.

A section for free text was then provided for further information to be recorded, should this be considered relevant. This included specific difficulties which a given participant may have had, or any deviation in performance of tasks which still approximated the desired skills but was not covered by the options present in the table. Although the data furnished by this free text was qualitative rather than quantitative, it was felt that this type of data was of sufficient interest in terms of each individual participant to be included as providing further information on how individuals respond to these interventions, which would otherwise have been missed.

Scoring Questionnaire, Scoring Form and Form for Composite Formula

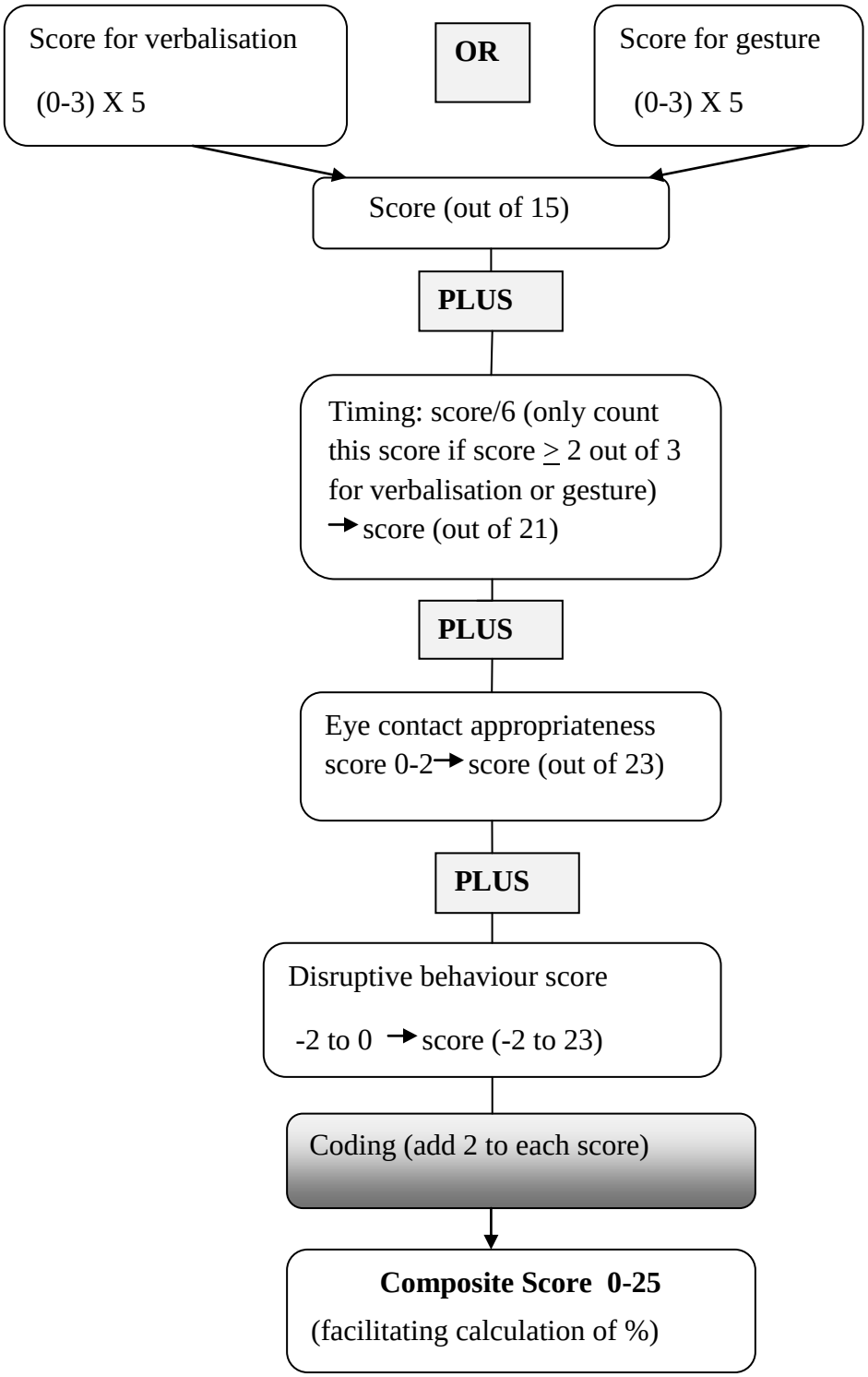
The scoring questionnaire (see Appendix 33) allowed the observations to be reliably converted into numerical data. This included scoring of variables separately, from which a composite score would be calculated assessing overall performance for each skill. The variables assessed included scores of the level of task completion, time taken to achieve each task, eye contact in seconds, eye contact appropriateness, inappropriate turns taken, level of disruptive behaviour and other actions. The purpose of the scoring questionnaire was to render the data obtained through video analysis as objective as possible, allowing for statistical analysis. These data were then transferred to a scoring form (see Appendix 34, and for Longitudinal scoring form see Appendix 35) and the numbers were entered in a tabular format. The composite score was a 1-25 scale of level of global skill achievement for each target skill. For each of the target skills, a time limit was agreed within which the task had to be initiated, for it to be considered as being achieved. This time limit was set at 30 seconds for initiation of play and finishing play, and at 90 seconds for the taking of all turns.

Scoring Formula

The composite formula, and its resultant 0-25 scale, were devised by the researcher in collaboration with the research assistant and in consultation with a statistician (please see Appendix 36 for the Form for Composite Formula). Scores were assigned as to whether the task had been completed, or if incomplete, to what level it was approximated. If tasks were performed in a non-verbal way, i.e. by use of gesture, the gesture was scored in terms of its quality and clarity of meaning. This was as an alternative to scoring of the verbal script associated with the skills, i.e., no marks were deducted for using non-verbal gesture only, and a score of 100% could still be achieved by a non-verbal participant. This is also in line with natural game play, where typically developing children often use either verbal cues or gesture to communicate, or a combination of the two. The time taken to commence performance of the task was also factored into the score and weighted the composite score to a degree, with higher scores being allocated for a more timely performance. For turn taking, time to take all turns was scored and an adjustment made to allow for this more time consuming skill.

Below is a flow diagram summarising the scoring of performance, which is then further explained. Note: this flow chart describes the exact scoring system for initiating and finishing play; for turn taking minor adjustments were necessary to incorporate all turns to arrive at the same composite score 0-25. The scoring is further described in the text overleaf.

Figure 9: Calculation of Scores: Flow chart



For initiating play, a score of 0-3 was given for verbalisation of "let's play", and/or appropriate gesture (hand pull). The same score of 0-3 was used for finishing play (see scoring questionnaire, Appendix 33). A score of 0-3 was assigned to each task according to the degree to which the participant achieved each verbalisation and/or gesture. This was scored according to how well the participant performed with a score of 1= some attempt at verbalisation, 2 = verbalisation approximates script but still incomplete, 3 = full verbalisation. Scores for both the verbalisation and the gesture were scored for each participant for each skill, and the higher score used to calculate the composite. This 0-3 score was then multiplied by 5, as the performance of the skill was felt to be the most important outcome being measured, therefore giving it a maximum score of 15. For turn taking, several factors were taken into account for performance of the task. The appropriate verbalisation "my turn" or gesture by the participant was scored 0-4 (1 for each turn in which it is said/gestured) and the resultant score multiplied by 2. The participant's actions in handing a piece to the therapist appropriately and waiting for him/her to take a turn were scored 0-3, and the resultant score multiplied by 2. The actual taking of appropriate turns by the participant was then scored 0-4.

The timing of the skill was scored next, and was inversely scored in 5 second intervals. 30 seconds was decided upon as an appropriate time within which a participant would be hoped to have commenced initiating play, and this time period was also used for finishing play. Therefore those taking greater than 30 seconds received a score of zero for this timing section, those taking 26-30 seconds a score of 1, those taking 20-25 seconds a score of 2, and so on. Because the timing of performance of skills was not considered as important as its performance per se, the scoring of timing of skills was limited to a maximum of 6. For finishing play, the gesture involved was putting the toy into the "finished" box. If a child scored 1 on this gesture (i.e. simply picked up the toy), they scored zero automatically for the timing section, but if they achieved a score of 2 or greater, the score for timing was included. This was judged to be the fairest solution as children who merely picked up the toy might well do so more quickly than the children who picked it up and put it in the box, therefore resulting in those children scoring higher on timing, with points being awarded inappropriately.

To ensure consistency across the target skills, it was necessary to adjust for the larger allowed time period for turn taking (90 seconds to take all turns). This was scored in 15 second intervals, so that those taking > 90 seconds to take all turns had a score of zero, those taking 76-90 seconds scored 1, those taking 61-75 seconds scored 2, and so on. This again yielded an initial maximum score of 6 for timing of turn taking. However, turn taking was felt to be a more time consuming task, and the exact timing of the participant in taking all turns was felt to be less important than the other factors determining performance score. The score for timing was therefore then divided by 2 for turn taking. The participant had to take at least three turns for the timing score to be calculated for turn taking. If less than three turns were taken, the participant scored zero for the timing section, although they retained their points for actual skill performance. This was judged to be the fairest way to control for number of turns taken, as otherwise it would have conferred an advantage on those who took less turns, as this would take less time and so these participants would be inappropriately awarded points.

The duration of eye contact in seconds was not used as a raw number for the composite; instead a 0-2 measure of appropriateness of eye contact was used. This was because a number of participants demonstrated an excess of eye contact which was inappropriate and distracted focus from the task, or was felt to reflect that the participant was looking for prompting. On the other hand, some participants, including some higher functioning children, had only a few seconds of eye contact, but this was felt to be appropriate, for example in turn taking, where the task involved looking at the toy and its pieces a considerable amount. Therefore a score of zero denoted no eye contact, a score of 1 inappropriate eye contact (inadequate or excessive), and a maximum score of 2 denoted appropriate eye contact. Disruptive behaviour was quantified as a negative score with -2, -1 and zero denoting significant, a degree of, and no disruptive behaviour respectively. The scoring methods for eye contact and disruptive behaviour were identical for all tasks scored.

The composite score was then calculated using the formula as explained above, using a dedicated formula form to ensure consistency (see Appendix 36). This score, using the formula as above was calculated by the therapist and the research assistant separately for each participant, to minimise mathematical errors.

The preliminary composite score yielded from this formula ranged between a possible -2 and 23. For the purposes of avoiding negative numbers in the analysis, and to facilitate expression of scores as percentages, a coding addendum was added to the formula form (see Appendix 36) where 2 is added to each score, yielding a final range of scores from 0-25. The score, as per the formula, is then multiplied by 4 to achieve a percentage, which is taken as the final composite mark.

Certain variables, such as the number of inappropriate turns taken, eye contact in seconds and other actions during the video, were omitted from the composite score but were retained as separate scores in themselves. All separate variable scores were also retained following calculation of the composite score.

The data obtained from the video analyses were entered into a Statistical Package for the Social Sciences (SPSS) along with the counterbalancing design combination corresponding to each video. The demographic details of each participant (gender, age, ethnicity) were entered as well as their language developmental age in months according to the PLS-3, their Vineland scores (including adaptive and maladaptive scores), again in a numerical format. In this way, participants' performance, as well as being analysed as per each intervention, could be analysed in subgroups. It could thus be ascertained which intervention was best for those with lower or higher cognitive ability, language ability and age, and which was most suitable for those with a greater level of behavioural difficulty. The composite scores as per the formula for each session were also entered for each participant.

Data Collection – Social Validity

A group of three therapists/preschool tutors for ASD were consulted to determine the social validity of the interventions and target skills chosen for use in the study prior to its commencement. Upon completion of the study, a focus group comprising four parents of children with ASD, rated the interventions and target skills. A Likert scale as above was used for both groups for data collection.

Interobserver reliability

Inter Observer Agreement (IOA)/ Inter Observer Reliability (IOR) is defined as a measure of the degree to which two or more observers record the same measurements after observing the same events (Cooper et al. 2007). To ensure consistency and accuracy of recording of events, it was essential that another observer assessed a sample of the data independently, and that a high degree of reliability between the two scores for each parameter was achieved.

For the study, two observers (the researcher and the research assistant) were involved with data collection. This research assistant had prior experience of more than 5 years with data collection for research studies. The assistant was trained first in the operational definitions of the target skills and task analysis, and then in using the tools devised by the researcher (the data collection form, scoring form questionnaire, and the scoring formula) for recording data, scoring and then calculating the composite score for each task. One participant was then scored by the assistant concurrently with the researcher present to ensure that this training had been effective.

Once the researcher had scored all participants, 4 participants were randomly selected by an independent third party as a sample to be scored again independently by the trained assistant. The composite scores for initiating play, turn taking and finishing play were then compared and the number of agreements (where the scores were identical to those of the researcher) and the number of disagreements (where they differed) were counted. The formula then used to calculate the Inter-Observer Reliability was as follows:

$$\frac{\textbf{Agreements}}{\textbf{Agreements + Disagreements}} \textbf{ X 100}$$

A requirement for an IOR level of $\geq$ 85% was agreed to be deemed as signifying an adequate level of accuracy (see table of individual results of IOR below). The researcher and the trained assistant reached an overall IOR of 97.2%, thus meeting the criteria originally agreed upon. The separate measures of IOR for initiating play, turn taking and finishing play were 97.9%, 95.8% and 97.9% respectively. See overleaf for individual values of IOR.

Table 11- Interobserver Reliability: Results Table (R1 = Main Researcher, R2 = Interrater)

Participant number & raters	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person
Initiating play												
# 1; R1	8	96	100	100	100	100	100	100	100	100	100	100
# 1; R2	8	96	100	100	100	100	100	100	100	100	100	100
# 4; R1	8	100	100	16	100	8	8	8	8	8	8	100
# 4; R2	8	100	100	16	100	8	8	8	8	8	8	100
# 9; R1	8	100	100	100	100	100	100	100	100	100	100	100
# 9; R2	8	100	100	100	100	100	100	100	100	100	100	100
# 12; R1	8	100	84	80	96	100	100	96	92	100	100	100
# 12; R2	8	100	84	80	96	100	100	76	92	100	100	100
Turn Taking												
# 1; R1	8	98	98	96	96	98	96	96	96	96	96	96
# 1; R2	8	98	98	96	96	98	96	96	98	96	96	96
# 4; R1	8	78	86	8	82	90	8	90	0	90	90	90
# 4; R2	8	64	86	8	82	90	8	90	0	90	90	90
# 9; R1	12	82	90	98	90	90	90	70	98	84	78	98
# 9; R2	12	82	90	98	90	90	90	70	98	84	78	98
# 12; R1	8	94	94	92	94	94	88	80	90	96	86	20
# 12; R2	8	94	94	92	94	94	88	80	90	96	86	20
Finishing play												
# 1; R1	72	100	92	92	92	92	92	92	92	92	92	92
# 1; R2	72	100	92	92	92	92	92	92	92	92	92	92
# 4; R1	72	88	84	68	88	72	88	92	4	8	64	72
# 4; R2	72	88	84	68	88	72	88	92	4	8	64	72
# 9; R1	16	100	92	100	100	100	92	100	100	92	92	92
# 9; R2	16	100	92	100	100	100	92	100	100	92	92	92
# 12; R1	16	92	56	72	16	12	52	72	64	36	4	72
# 12; R2	16	92	56	72	16	16	52	72	64	36	4	72

Procedural Reliability

This study provided measures of procedural reliability, which serves to increase the validity of findings. A failure to conduct procedural reliability measures would raise concerns about whether all procedures were carried out in a uniform manner, with an ethical and safe approach, adhering strictly to guidelines. In this study, procedural checklists and guideline checks (see Appendices 9, 12, 17, 28, 29 & 30) were used to ensure procedural reliability. For example the presentation of information to/teaching of any participant should, although individualised, be of maximum clarity and of an equal quality for all participants. Guideline checks and video checklists (including checking of zoom, level of acting for Peer Video et cetera) were all used consistently throughout the study.

Analysis

The data were analysed using the SPSS software program (Predictive Analytics Software - PASW) Statistics 18 version 2009.

The study used a within-subjects design with counterbalancing of exposure to the various interventions across skills to be taught and stimuli. Maintenance and generalisation to new stimuli and activity partners were also assessed. As measurement was repeated for each participant and data were non-parametric, the Wilcoxon signed-rank test was used to explore the impact of the three educational procedures. Rather than comparing means, the Wilcoxon converts scores to ranks. It is the non-parametric equivalent to the repeated measures t-test.

The research questions to be addressed were:

- What was the impact of each of the three educational procedures as indicated by the significance of the change in participants' scores between the baseline and post-intervention probe sessions for each intervention, and its associated effect size?
- Did any educational gain maintain and generalise, as indicated by the significance of the changes in participants' scores between baseline and the maintenance and generalisation sessions for each intervention, and their associated effect sizes?

The effect size for each intervention quantifies the increase in score between one session and another. Quantifying effect sizes between sessions of a particular intervention successively over time provide a continuous guide as to how effective this intervention is, which may be used in practice to guide the degree to which this intervention might be used with a particular child. Effect sizes are not affected by sample size, so that even within a small set of data, a strong effect may be calculated.

The effect size is derived by dividing the Wilcoxon Z score (ignoring the negative sign in front of the Z score if it is negative) by the square root of n. Each test compared 2 sessions for each of 18 participants, thereby yielding an n of 36. Cohen (1969) sets out guidance for judging the size of effect. Values of 0.1-0.29 are regarded as small effects, 0.3-0.49 as medium effects and 0.5 or greater as large effects.

When exploring generalisation, the scores for all 'original person, known stimulus' sessions were averaged, as were those for all 'original person, new stimulus' sessions, those for all 'new person, known stimulus' sessions and those for all 'new person, new stimulus' sessions.

The effectiveness of the three educational procedures in relation to each other was assessed by comparing the average post-intervention, maintenance and generalisation scores for each procedure using a Friedman one-way repeated measures analysis of variance (ANOVA) for non-parametric data.

The research question to be addressed was:

- Was one educational procedure superior to another across post-intervention, maintenance and generalisation conditions (i.e., did the distributions of average scores differ between the interventions)?

If a significant difference between teaching procedures was found, post hoc pairwise Wilcoxon signed-rank tests were conducted to establish the nature of difference.

The Friedman analysis was first conducted on total scores (i.e., those for all target skills combined). The analysis was repeated for each target skill separately i.e. initiating play, turn taking and finishing play. Post-hoc Wilcoxon signed-rank tests were then conducted as appropriate.

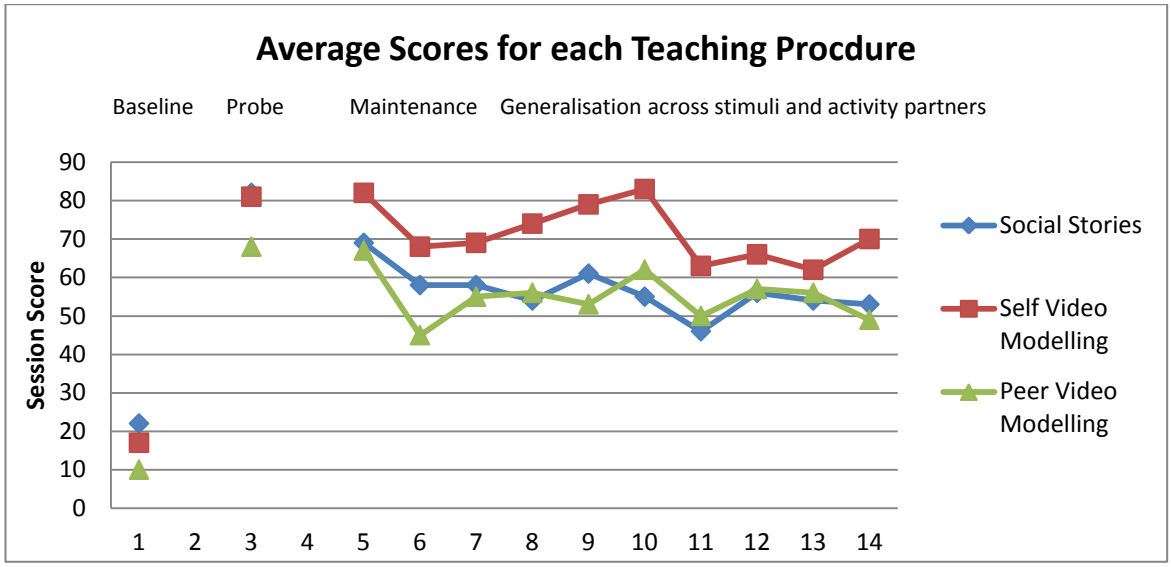
In order to assess the possible effect of participant characteristics on learning, the association between a number of intake variables (age, Vineland adaptive and maladaptive behaviour scores and PLS-3 scores) and the difference between post-intervention probe and baseline scores, was calculated using Spearman non-parametric correlation coefficients. Similar correlational analyses were undertaken to explore the association between intake variables and the post-intervention probe scores.

Chapter 10: Study 1 – Results

Performance Scores

Figure 10 shows average scores for each teaching procedure for the three skill elements combined (initiating play, turn taking, finishing play) across participants (please see Appendix 37 for raw scores obtained and averages).

Figure 10



The change in scores between baseline and the post-teaching probe was statistically significant for each of the three teaching procedures. Table 12 provides the average scores for each of the 18 participants in Study 1 for baseline and post-intervention probe conditions with associated change statistics. All effect sizes would be regarded as large according to the Cohen criteria.

Table 12

Procedure	Baseline	Post-intervention	z	p	Effect size
Social Stories™	22	82	-3.473	.001	0.579
Self Video Modelling	17	81	-3.446	.001	0.574
Peer Video Modelling	10	68	-3.412	.001	0.569

Table 13 shows average scores for the 18 participants in Study 1 for maintenance and generalisation conditions and change from baseline statistics (Z, p, effect size). All maintenance and generalisation performance was significantly above baseline for all teaching procedures. The majority of effect sizes would be regarded as large, the remainder being medium.

Table 13

Condition	Social Stories™	Self Video Modelling	Peer Video Modelling
Maintenance, original person & stimulus	69 (-3.442, .001, 0.574)	82 (-3.624, .001, 0.604)	67 (-3.308, .001, 0.551)
Original person, known stimulus	58 (-3.040, .002,.507)	69 (-3.530, .001, 0.588)	50 (-2.972, .003, 0.495)
Original person, novel stimulus	57 (-3.203, .001, .534)	76 (-3.627, .001, 0.605)	55 (-3.239, .001, 0.540)
Novel person, original stimulus	56 (-2.973, .003, 0.496)	83 (-3.730, .001, 0.622	62 (-3.219, .001, 0.537)
Novel person, known stimulus	50 (-2.944, .003,.491)	64 (-2.976, .003, 0.496)	54 (-3.111, .002, 0.519)
Novel person, novel stimulus	53 (-.3.109, .002, 0.518)	66 (-3.358, .001, 0.560)	53 (-2.922, .003, 0.487)

Note: The first number reported in each box above refers to the average score of all participants for the given intervention, in the given session. The numbers in brackets below this refer to the Z score, p value and effect size respectively, in terms of the change from baseline performance.

Non-parametric repeated measures analysis of variance (ANOVA) showed that there was a significant difference between the teaching procedures from post-intervention through maintenance and generalisation in relation to total scores (chi square = 14.364, p = .001). Post-hoc Wilcoxon signed-rank tests showed that Self Video Modelling was superior to both Social Stories™ (Z = -2.845, p= .004) and Peer Video Modelling (Z = -2.934, p= .003). Social Stories™ and Peer Video Modelling were not significantly different.

Figures 11-13 show average scores across participants for each teaching procedure for the three skill elements separately (initiating play, turn taking, finishing play) (please see Appendices 38, 39, 40 for raw scores and averages). There were significant differences between teaching procedures for initiating play (chi square = 16.791, p = .000) and turn taking (chi square = 11.636, p = .003) (Figures 11 and 12). However, scores for finishing play were not significantly different (Figure 13). Self Video Modelling was superior to both Social Stories™ (z = -2.937, p= .003) and Peer Video Modelling (z = -2.805, p= .005) for initiating play. Peer Video Modelling was also superior to Social Stories™ (z = -2.402, p= .016). For turn taking, Self Video Modelling was superior to both Social Stories™ (z = -2.225, p= .026) and Peer Video Modelling (z = -2.848, p= .004) and Social Stories™ was superior to Peer Video Modelling (z = -2.669, p= .008).

Figure 11

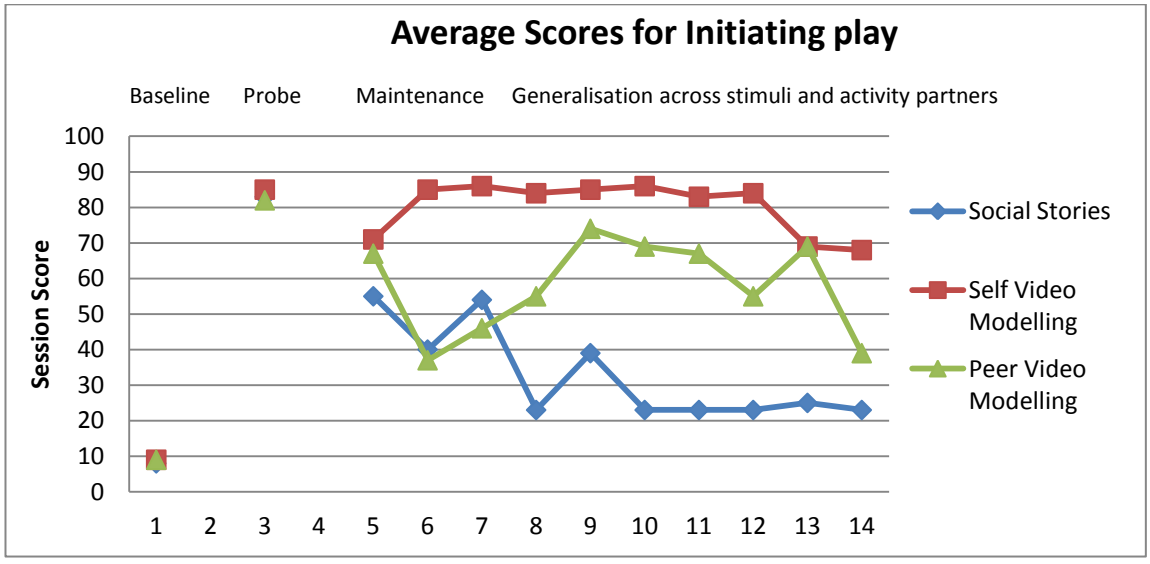


Figure 12

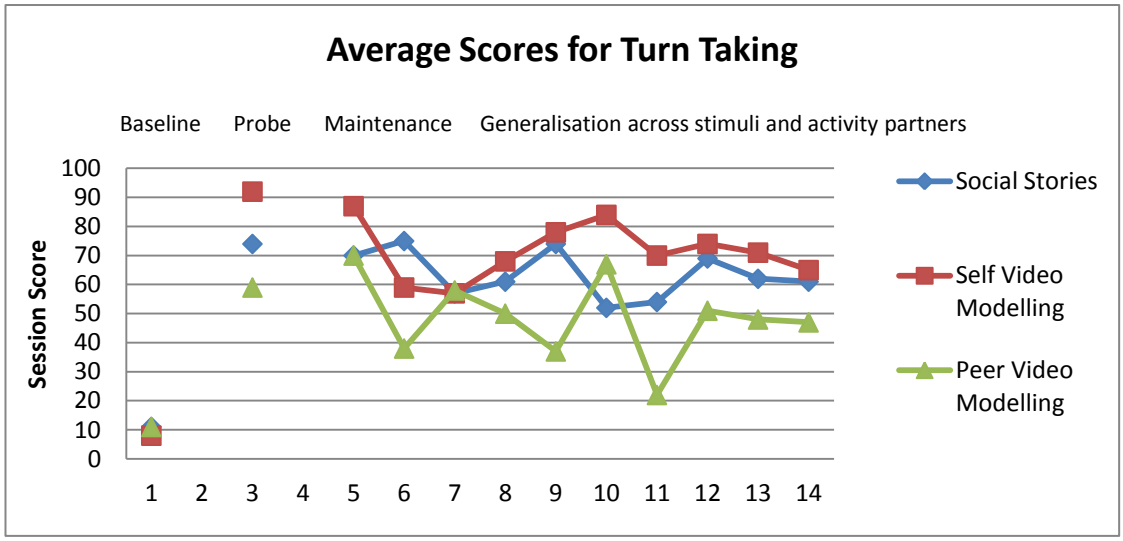


Figure 13

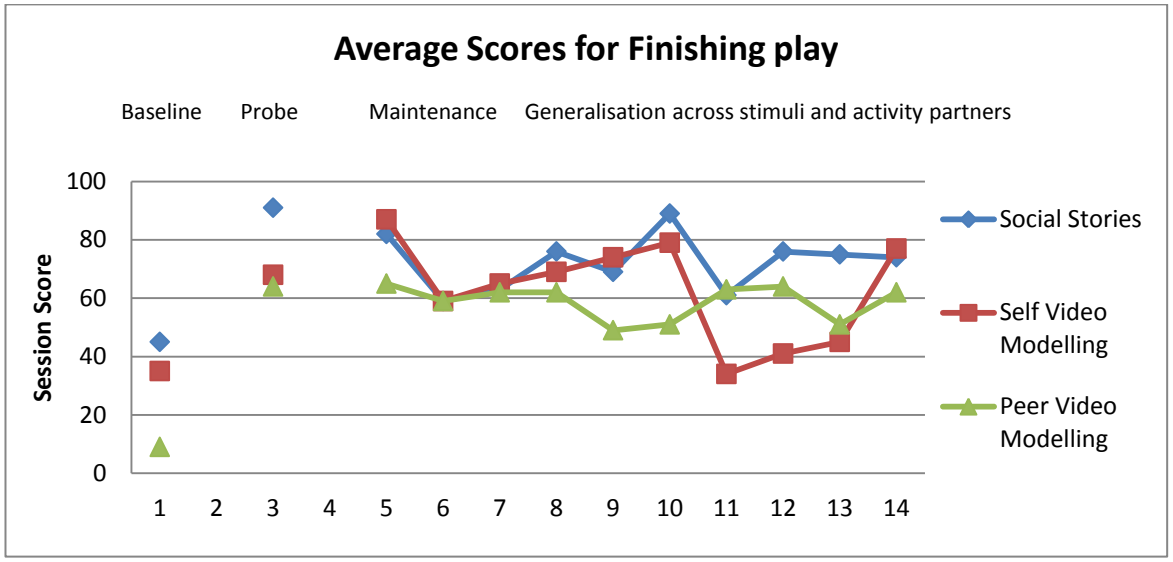


Table 14 shows the associations between participant intake variables and the degree of change between baseline and post-intervention for each of the teaching procedures. There were no significant associations between the intake variables and either the degree of change between baseline and post-intervention or the post-intervention scores themselves for Social Stories™. Degree of change for Self Video Modelling was positively related to the Vineland composite score and its motor skills domain score. The post-intervention scores for Self Video Modelling were positively related to the Vineland composite scores and its communication, daily living and motor skills domain scores as well as all three PLS-3 scores. Degree of change for Peer Video Modelling was related to the Vineland Maladaptive Behaviour Index. A positive correlation between performance and maladaptive behaviour would seem to be counter-intuitive. This will be explored in the discussion section.

Table 14: Correlation coefficients

Intervention	Social Stories™		Self Video Modelling		Peer Video Modelling	
Scores	Probe-Baseline†	Probe	Probe-Baseline	Probe	Probe-Baseline	Probe
Age	-.212	.154	.454	.411	.431	.354
Vineland Composite	.112	.320	.482*	.544*	.211	.165
Vine-Communication	.208	.334	.334	.496*	.204	.179
Vineland Daily Living	.129	.314	.429	.472*	.136	.028
Vineland Socialization	-.077	.076	.148	.159	-.118	.005
Vineland Motor Skills	-.104	.175	.564*	.531*	.369	.291
Vineland Maladaptive	-.176	.167	-.109	-.184	.471*	.290
PLS-3 Composite	.164	.169	.416	.535*	.062	.106
PLS-3 Auditory	.126	.183	.435	.540*	.090	.125
PLS-3 Expressive	.257	.118	.383	.494*	-.060	.033

† Probe-Baseline = Score for post-intervention probe session minus score for baseline session

* $p<0.05$ (statistically significant)

Social Validity

All of the therapists/tutors agreed or strongly agreed that the chosen interventions were appropriate for children with ASD within this age range, and also that the target skills were relevant to these children's learning needs.

It was felt that seven pieces were optimal for game play, as it allowed a reasonable number of turns to allow analysis and to give the participant an opportunity to perform turn taking several times, so that they could understand the process of turn taking, without the game being so lengthy as to place an excessive demand on attention span. The game sequence was constructed such that the participant took the first and last turns, which it was felt would increase their interest and participation in the game. This number of turns also allowed for learning and assessment of the skill of waiting while the adult took a turn.

Chapter 11: Study 2 – Longitudinal Study

Longitudinal Study (Study 2) - Methodology

Following completion and scoring of the original study (Study 1), some participants were found to have done less well for all or most of the sessions. The researcher selected those with an average score of 50% or below across all sessions for further attention. A further research question was yielded following completion of study 1:

- Would further teaching sessions using these procedures improve the learning and performance of those who did less well after just one teaching session?

A prospective longitudinal study (Study 2) was then designed by the researcher with the aim of answering this question.

Null Hypothesis

- For those who do less well initially with these teaching procedures, further sessions over a longer period of time do not significantly increase learning of social behaviour skills.

Participants

Inclusion Criteria

Any participant who achieved a 50% or less average score was invited to participate in the longitudinal study. This comprised 4 participants, 2 of whom were able to participate. The study did require a considerably greater time commitment from participants and parents, and the remaining 2 participants were unable to participate due to preschool commitments.

Recruited Participants

The recruited participants included one female participant (pt. 13, aged 39 months, Caucasian) and one male participant (pt. 16, aged 40 months, African), both with a diagnosis of ASD.

Target Behaviours, Stimuli and Interventions

The target behaviours, stimuli and interventions for this study were as for Study 1 above.

Experimental Design

Five further teaching sessions were conducted over the course of five successive days, with a further probe on the fifth day. The counterbalancing conditions (i.e. intervention/stimulus/skill combinations as designated by the counterbalancing grid) were kept identical to those used for the same participant in the original study. This meant that the same toys, setting, people and interventions were used. Each teaching session was identical in nature and duration to that for the relevant intervention for the same participant in the original study. The longitudinal study commenced within one week of the last session of the main study for each participant. The design was a prospective single subject study reversal design for each participant: A^1BA^2C where A^1= Baseline 2 (scores for Study 1), B= post-intervention probe (following five further teaching sessions as above), A^2=maintenance session with original stimulus and C= generalisation session.

As in the original study, a further maintenance and generalisation probe was conducted one week after the longitudinal probe session.

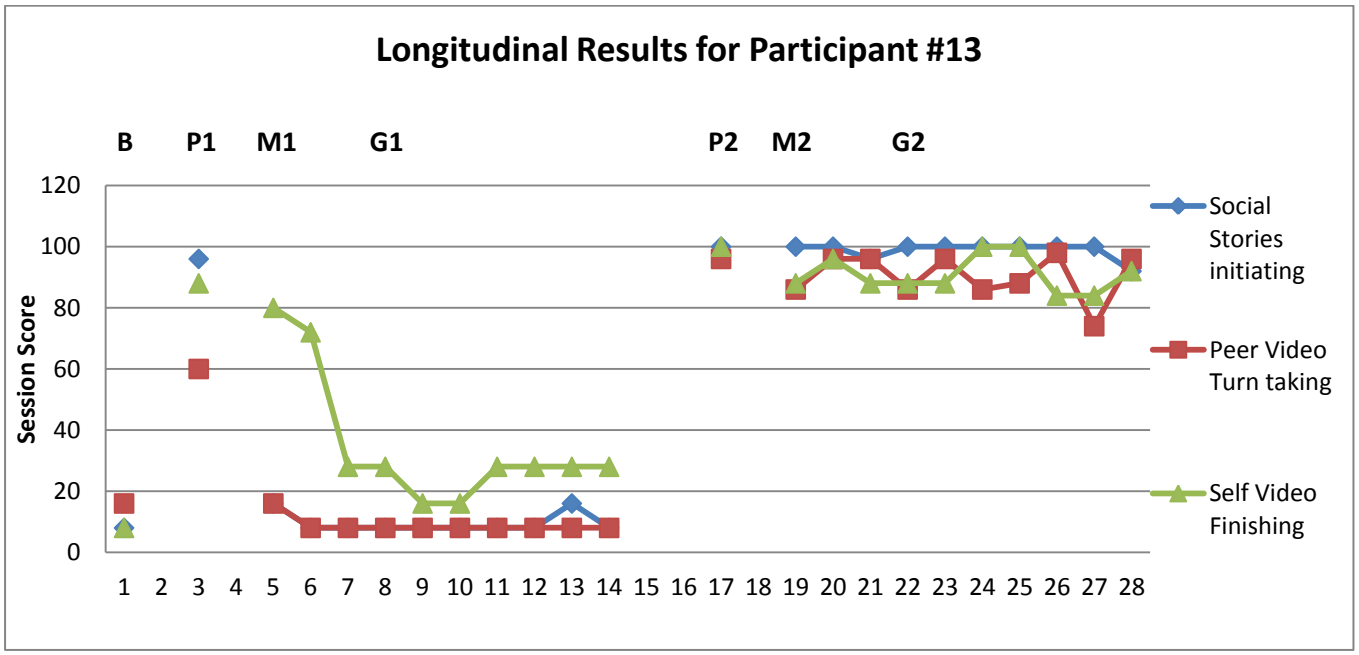
Data Collection, Scoring and Analysis

Data collection and scoring were done as they had been for the original study, using the same forms and scoring scale. Raw percentage score comparisons were used to assess the efficacy of the interventions for each participant separately, and results represented in graphical format. The trending of results was extrapolated following examination of these graphs.

Study 2- Results

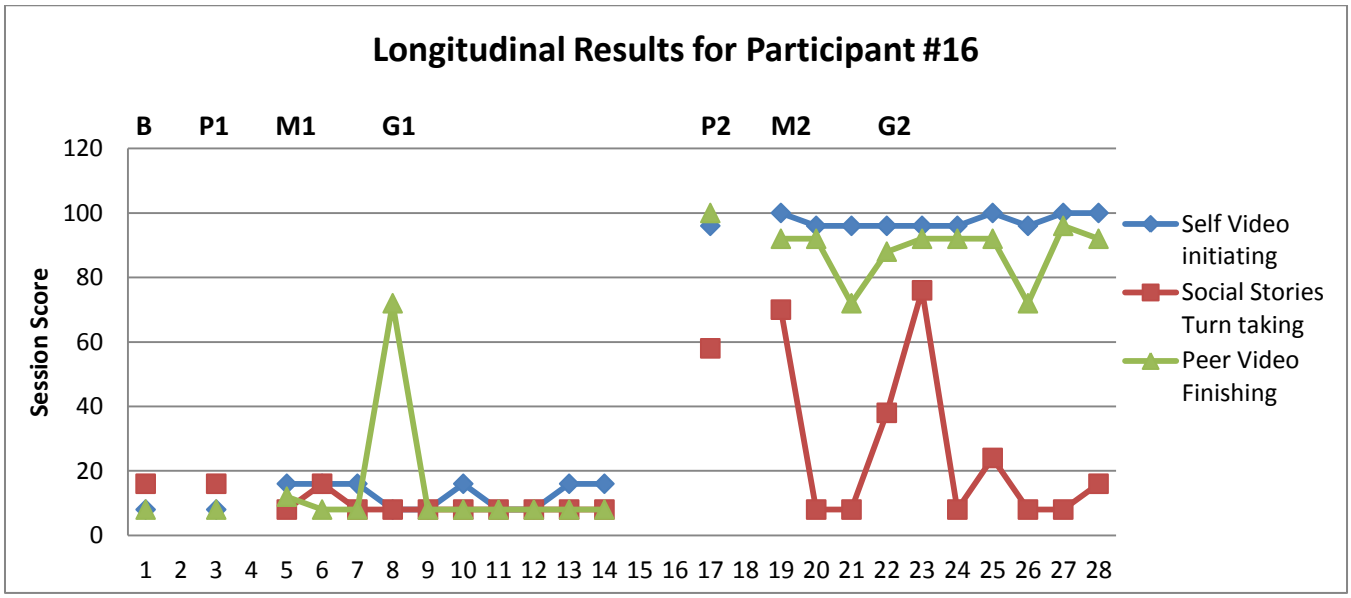
Figures 14-15 show scores for the original and the longitudinal study for both participants for each teaching procedure, for the target skill taught by that teaching procedure (please see Appendices 41 & 42 for raw scores). The additional teaching occurred between the end of the generalisation probes in the original study (G1) and the post-intervention probe in the longitudinal study (P2). In general, considerable gain was observed between the original and longitudinal scores for each procedure. However, turn taking for participant 16 (taught using Social Stories™), showed no consistent improvement.

Figure 14



B= baseline, **P**=post-intervention probe, **M**= maintenance, **G**= generalisation. Numbers 1 and 2 denote original study sessions and longitudinal study sessions respectively.

Figure 15



B= baseline, **P**= post-intervention probe, **M**= maintenance, **G**= generalisation. Numbers 1 and 2 denote original study sessions and longitudinal study sessions respectively.

Chapter 12: Discussion

Introduction

This study set out to address the relative effectiveness of three interventions in teaching social behaviour skills to young children with ASD and whether change was related to individual demographic and language and cognitive abilities. This chapter includes discussion of:

(a) the strengths of the study, and also of its limitations,
(b) an assessment of the findings of the study in terms of what conclusions can be firmly drawn,
(c) what the study adds to existing literature, and further research questions raised,
(d) implementation of these interventions in practice, and
(e) clinical implications.

Study Strengths and Limitations

Strengths

Experimental Design

This study has involved more participants within the target age group than any prior study concerned with these approaches to teaching. It has also contrasted more intervention methods. Very few studies have compared the relative effectiveness of these kinds of intervention and none has compared more than two. The studies available to date have largely involved low numbers of participants within single subject designs. The group design and size of the current study give it greater external validity. Conducting a group study yields a higher level of evidence. However, it was a more challenging study to conduct.

The challenges faced in conducting group research for this population are outlined in Sansosti's PhD dissertation *Using video modelled Social Stories™ to increase the social communication skills of children with high functioning autism/Asperger's syndrome* (online publication, University of South Florida 2005).

In this publication, the author states:

"In considering avenues for future research, it is important not to rule out potentially beneficial methodologies. In the past, single-subject studies have been a mainstay of Social Story™ research (Sansosti, Powell-Smith, & Kincaid, 2004). As an alternative to single-subject research, group designs might offer a way to easily manipulate variables for each experimental group". This potential for manipulation of variables in a group study would also apply to video modelling techniques.

Sansosti goes on to state that accessing a population of children with ASD in sufficient numbers is difficult. Creating homogeneity within study design for such a heterogeneous population also proves a challenge.

"However, the highly individualized nature of ASD makes creating large groups with homogeneity of variance challenging. For group research, larger populations are necessary for increasing the power of findings. Gaining access to a large population of children with HFA/AS may prove difficult."

Here, the author was referring to those with High Functioning Autism/Asperger syndrome. Clearly it is equally difficult to access other subgroups e.g. those with ASD who also have cognitive difficulties.

For this study, creating a group design so as to ensure consistency across target skills, conditions of teaching, personnel involved and measurement of performance proved a challenge among a population which is so heterogeneous. This was addressed in a number of ways. A carefully considered group of target skills was selected which would be likely to be common to children with ASD within this age group, while also using the interventions to work on any individual difficulties which a participant might have within the study. The context of game play was again chosen as one common to all participants as a challenging context in terms of social interaction. Any participant not

demonstrating difficulties with the target skills on baseline assessment could not have been included in a comparative group analysis. However, on baseline assessment following recruitment, all of the participants had difficulty with the target skills. Variability between participant sessions was further minimised by providing all sessions in the same setting, with the researcher and the same research assistant present at all sessions. The same scoring procedure was used for each participant, and flexibility was ensured within the scoring in order to cater for the differing language abilities of participants, as is explained in the methodology section. The only variables that were manipulated so as to be different among participants were the intervention and stimulus allocated to each task taught, thus providing as homogenous an experience as possible for each participant and avoiding extraneous environmental variability. The same setting and personnel were used for all participants, thereby maximising consistency of results.

Counterbalancing Design

The nature of the counterbalancing study design meant that each participant received all three interventions, thus allowing for within-subject observations to be made. It could be argued that the task matched with a specific intervention might, through its intrinsic difficulty, affect a participant's performance for that intervention. It is acknowledged that although the tasks were chosen so as to be equivalent in difficulty, there are inevitable intrinsic differences between them. However with a counterbalancing design, every task was matched with any given intervention a set number of times, i.e. for example Social Stories™ was matched with turn taking an equal number of times to SVM and PVM, thus minimising possible bias. To do a within-subject comparison in any other way would have introduced a much more tangible bias, i.e. if a participant was taught a skill through SVM, then the same through SS™, the results of the SS™ would of course be confounded by prior learning of the skill.

Recording and Correlation of Intake Variables

Sansosti further goes on to state:

"Social Story™ research should examine the interaction of participants' characteristics and intervention success, such that the characteristics of individuals that contribute to the success of a Social Story™ intervention are identified."

This would also apply to video modelling techniques. In this study, standardised assessments (Vineland and PLS-3) were used to ascertain the individual characteristics of participants, such that these characteristics could be correlated with end point achievement for each intervention.

The author then makes the point that:

"In addition, the individualized nature of Social Stories™ and video modeling would pose a challenge for group design research. Typically, Social Stories™ and video modeling interventions are designed specifically for individual cases. With larger samples, greater efforts to adhere to the specific requirements of Social Story™ and video modeling procedures would be necessary to ensure reliable treatment implementation."

The specialised assessments, interviews with parents and baseline assessments in this study were all conducted with a view to creating individualised interventions for each participant according to his/her specific attributes, difficulties and needs. Individual differences between interventions for different participants are inherent to these interventions. In this study, a tailored set of interventions were created and implemented as per the gold standard for each participant.

Adherence to Guidelines

Strict adherence to established gold standard guidelines becomes even more relevant when conducting group research. As interventions must be standardised across participants, and for generalisability to the wider ASD population, the exact mechanism of creation of these interventions must be clear. All aspects of the gold standard guidelines were constantly referred to in creating the interventions. Following creation of any given intervention, it was systematically checked independently by both the

researcher and the research assistant using the relevant list from a series of validity, procedural and scoring checklists created for this purpose (see Appendices 9, 12, 17, 28, 29, & 30 for checklists).

Challenges of Group Design

Sansosti (2005) then emphasises the labour intensive nature of group design studies, but recommends that efforts to overcome possible obstacles and conduct these studies would yield more robust data on these interventions.

"Therefore, a substantial amount of financial and personnel resources would likely be necessary to meet these empirical demands. Despite these considerable obstacles, group research offers a mechanism for manipulating and delineating the specific components of Social Stories™ and video modeling that render them effective. If these methodological challenges could be overcome, this type of research could add considerably to the existing literature base on video modeling and Social Story™ interventions"

As mentioned by Sansosti, a substantial amount of financial and personnel resources are required to create and implement individualised interventions for each of a larger group of participants. However, the same author emphasises the benefits of conducting group research as a beneficial methodology both in terms of power (and thus greater potential to demonstrate efficacy of interventions), and the potential for manipulation in the design. Group design also allows for analysis of a range of variables in terms of these interventions. These challenges show why this type of design has not been used in the past. However, it is possible, although demanding, to negotiate such challenges and conduct group research in this population, as was done in this study.

Sansosti also mentions the benefit of group designs for manipulating specific intervention components:

"group designs might offer a way to easily manipulate variables for each experimental group and draw conclusions about the efficacy of different intervention configurations (e.g., reinforcement, implementation modality, duration, frequency, etc.)"

To introduce variability in the sequence of intervention components was not the aim of this study and therefore was not done. Moreover, it would have allowed too many variables and thus potential for confounding. However, manipulating such components would be an interesting area for further research with these teaching interventions.

Mixed Gender

In the studies located through the literature search, all participants within the age range of interest for SS™ and SVM were male. This may partly be due to population prevalence of ASD among males and females. This study included two female participants, thus providing information on SS™ and SVM for females within this age range, which had not been formally studied in any available research.

Reliability Measures

This study provided measures of both interobserver (97.2%) and procedural (100%) reliability, which represent evidence that the interventions and the resultant scoring were carried out in an accurate manner. Checklists and continuous review of guidelines during creation of each intervention ensured a high level of treatment fidelity, in terms of both construction and implementation of each intervention.

Social Validity

Use of a Likert Scale by the researcher to assess social validity for all interventions and all target skills increases the generalisability of the results of this study. It provided an objective measure with which to assess whether the target skills were relevant to the general population of children with ASD, which is very important to ascertain (Wolf, 1978). This ensured that, prior to the commencement of this study, no assumptions were made in relation to the relevance, suitability and physical and emotional safety of the interventions and target skills chosen.

Maintenance and generalisation data

In order for a teaching technique to be effective, the skills must be learned such that a child can remember and consolidate the skill. In this way the aim is that a child will be able to retain and adapt knowledge of the skill sufficiently to perform it in the everyday settings where these skills are needed.

This study recorded maintenance and generalisation data for all participants in a uniformly scored format which rendered it amenable to statistical analysis. There was also a zero drop-out rate to follow-up/completion of all maintenance and generalisation sessions. This study therefore provides robust quantitative data in this regard for all interventions. Qualitative data were also obtained though observation of the participants in the free text section of the video observation forms.

Appropriate Reinforcement

Reinforcement is a technique that can be built into many interventions as a means of both learning new behaviours and changing existing ones. In the use of positive reinforcement in this study, the researcher was aware of a judicious balance between: 1) no positive reinforcement (i.e. no action from the researcher in response to the participant performing the desired behaviours, which could be artificial and discouraging), and 2) inappropriate or unethical reinforcement, and/or reinforcement that could prove to be a source of confounding.

Common positive reinforcements used by parents are food, money and time allowed to pursue preferred activities e.g. playing computer games. All of these examples would, in the researcher's opinion, have been inappropriate for this study as they could have presented ethical difficulties and introduced potential for exacerbating individual problem behaviours. They could also have proven to be a source of bias where the reward chosen was more reinforcing for some participants than others.

Positive attention in the form of verbal praise was therefore chosen as an acceptable reinforcement for use in the study, both for correct on-task behaviours, and for good behaviour even if it was not on task (e.g. "good waiting!" while the child sat on the chair waiting for the session to commence.) Positive attention in general may also involve physical contact e.g. hugging from a parent, but ethically it was felt that verbal praise alone was most appropriate for this study.

Limitations

While the interventions used in study have all been shown to have a positive impact on performance of the defined target skills, there were some limitations to the study and therefore to the conclusions and extrapolations that can be derived from it.

Although larger than any other study investigating participants within this age group for the specified interventions, the power of a study will always be a function of sample size. A larger study would have greater power. Only a certain number of participants within the age range willing to participate will be available within a given catchment area. Therefore larger trials might need to involve multiple centres and multiple therapists. In a multicentre trial, it would be important to ensure that the teaching process was identical and the setting sufficiently similar in each centre, in order to avoid bias.

Although with proper diagnostic assessment, people categorised as having ASD will have certain traits in common, there can still be variation in skills, preferences and behaviour. Hence, although these interventions were shown to be effective for this group of children, it cannot be assumed that they will work for every child with ASD.

There was an unequal gender balance among the participants in this study, with only two female participants recruited. This does mean that it has provided less data relating to females. The proportion of males to females recruited for this study is likely to be a reflection of the gender ratio within the population of people with ASD, which worldwide approximates a male: female ratio of 4:1.

Only two participants could take part in the longitudinal study. This was due to the time commitment involved in committing to a longer series of sessions, which was difficult for many due to preschool commitments and logistical issues. Participation in the study was offered only to those who had achieved low scores (<50%) for most sessions. It was felt that further sessions dealing with the same tasks and the same toys would be tedious and somewhat redundant for the participants who had already mastered or largely mastered the skills in question. Therefore, although the results of the longitudinal study were encouraging, sample size was more limited.

As mentioned above, the *in vivo* teaching component of making the Self Video rendered the SVM technique susceptible to bias, as skills might be learned through the medium

of *in vivo* teaching independently of the technique of SVM. However, it is not possible to create a Self Video in a controlled setting without some *in vivo* guidance, and therefore this *in vivo* element and its potential for bias are felt by the researcher to be inherent to the SVM process. A separate probe video was recorded for each participant following the creation of the Self Video to assess to what degree skills had been learned through the *in vivo* teaching component alone. In this way this component was quantified in order to gain the fullest information as to how each element of the SVM process (the *in vivo* component or the viewings of the video) contributed to learning.

This study used a defined age group and also used only one physical setting (the behavioural office with adjoining sensory room) for the sessions. Also, the target skills studied and the toys used were consistent for all participants. While this has important advantages in terms of reliability within the study, the extent to which the results can be extrapolated to other age groups, other target skills, other settings and other toys is therefore unknown. While intuitively it would be felt that positive outcomes could be anticipated in using these interventions in different settings, for other age groups, teaching other skills and using different stimuli, these possibilities still require further formal investigation to provide concrete evidence supporting their use. Areas in which there is scope for further research are discussed below.

Control Group

The design of this study did not include a control group. Although use of a control group is generally agreed to yield a higher level of evidence, the use of a control group was not felt to be appropriate for the interventions of interest for this population. Although the studies examined during the literature review had certain flaws, the evidence obtained favoured all interventions as having a positive effect on social learning. It was not therefore felt to be ethical to have some participants in a "control group" where they had no intervention, at least for a period of time. It was felt that this would involve repeating activities which might disengage a child with the stimuli and with the therapist and prove a negative experience overall. The early intervention age at which interventions are maximally effective is a short one (lasting 36 months in total), and if a child is deprived of interventions at this age, difficulties and behaviours may have become so ingrained that they are no longer easily remediable. A period of time at this critical age spent attending a clinic where no intervention was offered to a given

participant was felt to be unjustifiable. In practical terms, it was unlikely that a parent would be willing to attend a clinic regularly with their child if no intervention was offered. In this study, the baseline sessions for each child were used as a control against which post-intervention and further sessions could be compared; thus each child acted as their own control.

Limitations of the Composite Scoring

There were certain limitations to the scoring system introduced (please refer to Figure 9). The scoring of performance 0-3 at the start had a subjective element, as it relied on the judgement of performance by the scorer. The task analysis for each target skill was used to minimise subjectivity in this, but the potential for differences in scoring due to subjective opinion still existed within this. This subjectivity also applied to measuring of eye contact (as appropriate or inappropriate) and of disruptive behaviour. Scoring of performance 0-15 from the start would have allowed for finer gradations of scoring rather than scoring out of three and then multiplying that score by five, although the potential for subjective bias in scoring would still have remained. The scoring of timing was more objective because it was scored in seconds.

Number of Interventions Given

A potential limitation of the findings for SVM and SS™ was that one participant for SVM, and two for SS™, did not complete the full third training session. Although the amount of the intervention missed was minimal, it could be argued that this may have impacted on their performance. All of these children had a high level of behavioural difficulties, which could also have affected performance. Apart from these participants, all other participants received the allocated intervention exactly three times before the post-intervention probe was conducted.

Order Effect

It is possible that the order in which participants received the interventions may have affected their performance. For example, those receiving Social Stories™ as an intervention following one or two video interventions might perform differently to those, for example, receiving Social Stories™ as the first intervention. As mentioned in the methodology section, the only thing that was fixed in its order in the

counterbalancing design was the order of the target skills. The sequence of tasks was the only sequence which remained constant for each participant, that is, it was not counterbalanced. The reason for this sequence, as discussed in the methodology section, was so that the new task being taught in each intervention would always be the first task the participant had to perform, thereby maximising consistency of the latent period, the time between when an activity was taught and the point in time where the participant would be required to perform it, as much as possible. If this were not done, the performing of a recently taught skill just before the participant attempted to perform the new skill might prove a distraction which in turn might affect performance.

For example, looking at the results in relation to Figures 11-13, it is evident that those who received the Social Story™ for finishing play (i.e. as the first intervention) did better than those who received the Social Story™ for initiating play (i.e. as the last intervention). However, it is not possible to determine whether differences in scores for differing orders of interventions occurred due to order effect, or because the given intervention, for another reason, lent itself less well to teaching the skill which was fixed to that place in the order of teaching. It is thus a limitation of the study that the order effect could not be studied independently of the order in which tasks were allocated.

Selection of intervention methods

The intervention methods selected were of interest to the researcher as interventions used and emerging within the catchment area for preschool children with ASD. With the widespread use of Social Stories for this group, it was felt that this intervention was worth studying formally. Although the mean PND of 52.2% following the review of literature on this intervention placed in the mildly effective range only, the raw scores showed a more positive trend. Because of the limitations of PND as an effect size measure, and the difficulty in calculating PND for many studies because of floor or ceiling effects in the baseline, the PND was felt to possibly be an inaccurate estimation. It was felt that studying the effectiveness of this intervention formally with a consistent group design and effect size measurement, would be a valuable addition to the literature for this frequently used intervention.

Both Self and Peer Video Modelling were selected as relatively new, emerging interventions, the use of which has increased in recent years. It was felt that these interventions were a positive use of technology and could be further developed in the future in line with the rapid development of video technology. Again, it was felt that a well designed group study with consistent effect size calculation would be a useful addition to the literature for both of these interventions.

It could be argued that Self and Peer Video Modelling are both similar multimedia interventions, whereas Social Stories differs more in its nature. However, given that in practice a therapist may often be choosing which of these interventions to use, it was felt that a comparative study would be interesting and provide an evidence base which might improve confidence in using a given intervention with a given child. The fact that the success of the interventions was analysed for each intervention separately means that the therapist can also have improved confidence that, when using any of these interventions for the skills specified, his/her practice is evidence based. Studies with single subject design, or even a meta-analysis of studies which are very different, teaching a wide variety of different skills, would not provide the same level of evidence.

Systematic Review – Discussion

Purpose of Systematic Review

The series of systematic reviews done prior to the study was essential to sum up all available evidence on the interventions for the age group of interest, and to inform the methodology of the study. Systematic reviews are a key element in establishing evidence-based practices. A systematic review attempts "*to identify, appraise and synthesize all the empirical evidence that meets pre-specified eligibility criteria to answer a given research question"* (Cochrane Handbook for Systematic Reviews of Interventions, updated 2011). A systematic review is a means of summarising and synthesizing data in a way that minimises bias and can collate a large amount of data into a more accessible format for professionals wishing to inform themselves about whether a certain practice or intervention has a sound evidence base. It can also inform and provide a background for further research, which was the purpose of the series of systematic reviews carried out by the researcher prior to this study.

A systematic review, in order to minimise bias, must have defined eligibility criteria for the studies to be included in the analysis. Thus the search criteria used by the researcher, as defined in Chapters 3, 5 and 6 for the three interventions respectively, were specific to the diagnoses, target skills and age group of interest. Certain quality criteria were also specified to be met for inclusion in the review. For SS™, only studies which adhered to Carol Gray's guidelines were included in the review. This was because the term Social Story™ is trademarked such that unless the guidelines by Carol Gray were used, an intervention of this nature cannot be officially considered a Social Story™.

Interventions: Hypothesised Mode of Action

A Social Story™ is designed to describe a particular situation or activity which a child may encounter, in this case the situation of play and/or other situations where social skills are required. The Social Story™ is intended to work through describing the situation such that the child knows what to expect in encountering that situation. Positive guidance is given on how what the child might best manage, cope with and enjoy the situation of play. Information is given on how others may act and feel, what they may say, and what others can do to help the individual. The objective of this guidance is to provide the child with the skills necessary to negotiate a situation which they may find difficult or stressful, with the aim of reducing anxiety and improving communication and self-efficacy with a positive approach.

A self video, for a child with ASD, is one in which the child views him/herself on video performing an adaptive behaviour. The video has been edited so as to focus only on the desired skill. Self Video Modelling is hypothesised to work as follows: through the child viewing him/herself being successful in performing the adaptive behaviour, performance of the adaptive skill is increased and improved. The technique of positive self review is hypothesised to increase self-efficacy in the target skills being taught (Dowrick, 1999).

A peer video, for a child with ASD, is one in which the child views a peer performing an adaptive behaviour. In observing a successful model similar to themselves with PVM, it is hypothesised that a child will believe that they can perform the adaptive behaviour in question and are more likely to perform that behaviour with improved self-efficacy.

Systematic Reviews - Limitations

This series of systematic reviews included both group and single subject studies, which varied in terms of the target skills taught, setting and various aspects of methodology. Thus the studies are a heterogeneous group which may limit the extent to which they are directly comparable with each other. There was a wide degree of variation in responses to intervention across participants and behaviours. Due to the lack of provision of exact data points in many studies, SMD could not be calculated as a unifying measure of effect size for this review. The use of PND as a measure of effect size has certain limitations, as for many studies it could not be calculated due to "floor" or "ceiling" effects with zero or 100% in the baseline. Thus the mean PND values calculated for each of the interventions may not comprehensively represent exact effect size for each of the interventions. The results of the systematic reviews in terms of their mean PND values should be interpreted with this in mind.

Summary of Findings

At its outset, the study sought to evaluate the effectiveness of SS™, SVM and PVM for teaching defined social skills, to investigate maintenance and generalisation and explore whether learning was related to participant characteristics at baseline. A subsequent aim was to evaluate whether more prolonged exposure to the interventions would prove effective among participants who did less well initially.

All three interventions were found to significantly improve the defined target skills for participants in the post-intervention, maintenance and generalisation sessions.

Effect sizes for the score improvement between the baseline and immediate post-intervention sessions for all three interventions were large according to the Cohen criteria (1969). Effect sizes for comparison between the interventions were similar.

SVM was significantly superior to both SS™ and PVM for initiating play and for turn taking. For finishing play, there was no significant difference between scores for the interventions. PVM was significantly superior to SS™ for initiating play, and SS™ was significantly superior to PVM for turn taking.

On average over the ten maintenance and generalisation sessions, SVM was significantly superior to both SS™ and to PVM. There was no significant difference between SS™ and PVM.

Discussion of Findings

Therefore, Social Stories™, SVM and PVM were effective techniques for the participants in teaching the skills of initiating play, turn taking and finishing play. The learning of skills was demonstrated by a significant increase in composite scores. This would indicate that using these techniques to teach social skills in other children with characteristics matching the researcher's selection criteria is likely to be effective.

Effect sizes for the score improvement between the baseline and immediate post-intervention sessions for all three interventions were large according to the Cohen criteria (1969). Effect sizes for this comparison for the interventions were similar.

Maintenance and generalisation data were obtained for all participants for all sessions, with a zero dropout rate to follow up. As mentioned above, all teaching procedures resulted in significantly higher scores than baseline in the maintenance and generalisation probes. The average for the immediate post-intervention probe was somewhat higher than the average for the maintenance and generalisation probes (Figure 10). This would be expected. For maintenance, knowledge of the skill must be maintained over a latent period (in the case of this study, an average of one week), and then put into practice without further instruction or prompting. For generalisation, an additional challenge was posed in encountering a novel stimulus or a novel person, or both together. The novel stimuli (toys), although similar to the original stimuli, meant that visual processing and motor requirements for game play were slightly different.

For a child with ASD, encountering a new person can be an intimidating experience and prove a source of anxiety. This is a reflection of what occurs in everyday life when a child encounters a new person or peer. Due to shyness and a lower level of socialisation skills, this encounter could impede performance of a given task. These difficulties can create barriers which make it harder for children with ASD to learn from their peers (Howlin et al., 2000). Thus assessing the effect of the interventions on the participants' maintenance and generalisation of skills with a novel person and/or with a novel stimulus was essential in order to assess the usefulness of these interventions in

everyday life and for teaching in the community. For SVM and PVM it was observed that there was no drop in the average scores for the first probe with the novel person (and original stimulus); in fact performance generally increased for this session. Generalisation to a novel stimulus proved more challenging for participants than generalisation to a novel person, as reflected by a decrease in scores with new stimuli, and also known stimuli for which the task in question was not originally taught. For SS™, there was a general, though small, decline in scores across sequential sessions. However, the average generalisation scores for all interventions, even for sessions with novel stimuli, were still significantly higher than baseline. It is hoped that the new skills learned with a different person or toy would translate to everyday life, when the child encounters new toys, peers or adults.

On Wilcoxon analysis, the effect sizes for all of the maintenance and generalisation sessions for each intervention (see table 13 of the results section) were averaged for the purposes of summarising these findings. SVM had a considerably higher effect size for maintenance and generalisation than either SS™ or PVM, which were both similar in average effect size for these sessions.

With Friedman analysis, rather than assessing the effectiveness of pairs of sessions for each intervention separately, the interventions were directly compared with each other. On average over the ten maintenance and generalisation sessions, SVM was significantly superior to both SS™ and to PVM. As maintenance and generalisation are essential in the subsequent implementation of the skills learned, these results suggest that SVM is a very promising intervention for this age group. It could be considered particularly appropriate for those with difficulties with maintenance or generalisation of skills learned such as between school and home. All interventions had a similar immediate effect, so it is their impact on maintenance and generalisation that separates them.

On further Friedman analysis assessing each target skill separately for the maintenance and generalisation sessions, significant differences were found between interventions. This would suggest a possibility that because the tasks differed in their nature (although they were equivalent in difficulty), different individual tasks might be more amenable to being taught through different interventions. For example, SVM was significantly superior to both SS™ and PVM for initiating play and for turn taking (see results,

figures 11-13). Thus it was observed that different tasks may by their nature lend themselves to a certain intervention over others, which could have implications for practice as discussed below.

The literature to date has provided little in terms of analysis of the effectiveness of these teaching interventions in terms of a child's age, literacy, linguistic ability, cognitive ability, adaptive skills and level of behavioural difficulty. Many of the studies reviewed provided no information on these factors, or provided subjective observational assessments of language and cognitive abilities rather than data from standardised assessments.

This study addressed this deficit by exploring how reponse to intervention was related to Vineland and PLS-3 intake assessment.

The significant positive correlation between SVM composite scores and Vineland motor skills subdomain might reflect the nature of SVM as a procedure requiring a certain degree of motor proficiency. Those with higher motor ability were observed by the researcher during the study to be able to create the Self Video more quickly and with a greater degree of proficiency. In general, it was felt that these participants enjoyed the task more and appeared more engaged with it. The nature of SVM in requiring the participant to create a Self Video, albeit with instruction, might explain the further finding that those with higher Vineland composite, communication and daily living subdomain scores again had significantly higher post-intervention scores for SVM.

The finding that there was no significant correlation between Vineland scores and performance with Social Stories is an encouraging one, suggesting that if pitched correctly in terms of language and pictorial content, this intervention is suitable for those of differing levels of cognitive ability and adaptive function.

Interestingly, there was no significant correlation between the Vineland socialisation score and either the degree of change or post-intervention score for any of the three interventions. Thus these interventions are equally effective for those with low socialisation scores. This is an encouraging finding in that it provides further evidence that these interventions are suitable for use with children with ASD, many of whom have low socialisation skills. SS™ and video modelling may require shorter, more

focused interpersonal interactions for learning than situations, for example, in the playground, which may induce anxiety to the extent that learning is not possible.

Participants with higher PLS-3 composite scores and higher auditory or expressive subdomain scores achieved significantly higher post-intervention scores with SVM. There was also a similar but non-significant association with degree of change. It was observed by the researcher that creating the Self Video was more difficult for non-verbal children. Although gestures were used, creation of the video was more time consuming. More prompting and, later, more editing was required. However, with PVM, the degree of change and post-intervention scores appeared independent of linguistic ability. This might at least partly be explained by the decreased language and attention demands of simply watching a Peer Video as compared with creating and watching a Self Video.

One might have expected the Maladaptive Behaviour Index scores to be inversely related to performance, but no consistent association was found. Older participants had more maladaptive behaviours, as certain behaviours were simply not within the scope of younger children. Older children also had higher language and cognitive abilities, which may have outweighed the impact of behavioural difficulties in some participants. Overall, all three interventions appear suitable for use with children who have behavioural difficulties. This was felt to be a particularly important finding, as using more traditional teaching methods for these children can be difficult and frustrating for child and teacher.

Findings at Baseline

Although target skills were evaluated individually for each participant, it was noted that interactive play was reported by parents as an area of difficulty for all in the baseline questionnaire. All participants had difficulty with initiating play, turn taking and finishing at baseline. Several participants did score some marks at baseline for eye contact and for absence of disruptive behaviours.

At baseline for finishing play, 8 participants either simply picked up the toy or put it in the small box, which do comprise components of this target skill. In putting the toy back into the small box, it was felt that participants may simply have been putting the toy back where they got the pieces from, as before each game the pieces were laid out in

the small box. The finished box had a "finished" chequered symbol on it. The meaning of this symbol was known to all participants at baseline. It was noted that even with this symbol in place, the participants did not notice it. This is possibly due to the over selectivity of children with ASD in noticing and becoming absorbed in certain (relevant or irrelevant) stimuli and ignoring others which may be relevant to the task in hand. A higher average baseline result was yielded for finishing than that for the other two target skills. However the use of the post-intervention score minus baseline score as a value for separate analysis, along with analysis as per the post-intervention score itself was a way of addressing any skewing of results as per a higher baseline. No participant fully completed the target skill of finishing at baseline as outlined in the task analysis.

The baseline results reflect that all participants had difficulties related to all of the target skills, which fit the categories of both social skills and peer interaction, categories which were highlighted by the National Autism Plan for Children in 2003 as important areas for intervention. The difficulties and individual behaviours observed during baseline and reported by parents were built into the interventions matching the tasks in which those behaviours had been noted.

Longitudinal Study:

The longitudinal study showed that further teaching sessions using these interventions can improve performance of skills in those who do less well after one teaching session. Comparison of the effectiveness of the interventions was not possible because of the low number of participants involved and because different interventions were assigned to teach different skills using different stimuli for each of the participants. However, as results were positive, the findings provide an encouraging basis for further research into the efficacy of longer courses of teaching sessions using these techniques. These multiple sessions could, for example, be arranged as a term of teaching in which each session builds upon those preceding it.

A notable observation for participant 16 was that meaningful language improved greatly with the interventions. Before the main study, this participant was echolalic, i.e. could repeat or form simple sounds and words but without meaning. This was only done to radio or television, and the participant never imitated any words uttered in real life by another person. In his videos for the main study he did not use any words or attempt any of the script. During the longitudinal teaching sessions a week later, however, he

increasingly used or approximated several words in the script of each intervention with meaning in conjunction with performance of all of the tasks. This was first noted after he watched the Peer and Self Videos. Although he had not been able to complete the script during the creation of the Self Video, it was edited so that a voiceover of the vocal script was added. He initially echoed the speech in Peer and Self Videos, but then appeared to become aware of its relationship with the objects and tasks in hand, and began to use it in a meaningful way. This then transferred to the "my turn" script of the Social Story™ where he began to attend to the therapist's speech and repeat it, and then use it meaningfully, albeit to a lesser extent than for the videos. The words uttered during the longitudinal study sessions were, on consultation with his parents and his functional analysis, to be his first meaningful words. It is possible therefore that these interventions may be instrumental in and/or accelerate, the development of meaningful speech. Further research into this aspect of the interventions could lead to interesting data in this regard.

Enjoyment and Accessibility of Interventions

Self Video Modelling

In the post-intervention, maintenance and generalisation sessions, all participants apart from pt. 3 and pt. 16 enjoyed both the creation and watching of the Self Video. As discussed above, pt. 16 had significant language and adaptive difficulties. He did not enjoy the creation of the Self Video, although he later enjoyed watching it and requested through gesture to see it again and again.

It was noted that pt. 3 did not like watching himself on the Self Video, although he did learn from it, and requested not to watch it during the third viewing. He appeared quite self conscious when watching himself on video, and so the third viewing was stopped. His maintenance and generalisation scores were also the lowest for those taught turn taking by SVM. Apart from this participant, who did not watch the end of the third viewing, all participants watched the Self Videos exactly three times before the post-intervention probe.

Two participants (pts. 14 & 16) showed excessive interest in the Self Video, frequently requesting more viewings, and initially showed some reluctance to perform the skill when the Self Video was not being shown. Both of these participants had very low

scores across all sessions. For such children, in practice the target behaviour can perhaps be performed several times while viewing the video concurrently, with fading of video viewings as the task is performed more and more independently of the video. Participant 10 was reported by his parents to repeatedly ask to watch his Self Video during the week between intervention and maintenance sessions. The nature of ASD is such that children may develop preoccupations with the interventions, tasks and stimuli used. This should be borne in mind in choosing interventions and materials for an individual child.

Peer Video Modelling

PVM also proved popular with participants in that during the session and at home, many requested to see it again. Only one participant did not enjoy the Peer Video. Another participant did quite well with SS™ and SVM, and enjoyed watching the Peer Video, but had difficulty in understanding his relationship with the actor on the video. He called him "Tom", and spoke about waiting for Tom to play with him. He did not perform the skill.

For each PVM intervention, the child was asked, while watching the video, who the boy on the video was. Certain participants (pts. 1, 5, & 17) identified the boy on the video as themselves. For the non-verbal participants, it was not fully possible to assess how many thought the same. All of these participants were of a similar height and hair colour to the actor, but not deemed to be similar enough in appearance that this misidentification would be expected. The researcher did then mention to each of these participants that it was a different boy in the video. Participant 1 rejected this explanation and said "No, no, that is me". To pt. 1, the video therefore may have appeared like a Self Video. All three of these participants in fact did very well with PVM. Interestingly, these participants also all had high Vineland and PLS-3 scores. The level to which they identified with the actor on the video may have been positive in each child's understanding of their role within the game play.

None of the participants actively disliked watching the Peer Videos. PVM might therefore be an option for those who feel frightened or self conscious on watching a Self Video. However, some of those who enjoyed watching the Peer and Self Videos

frequently requested more viewings. It was felt for these children that the video had become a preoccupation and the viewing of it a routine which the participant wanted to repeat, to the extent that the repetition of viewings distracted from the performance of the tasks in hand. Each participant was shown the Peer Video exactly three times before the post-intervention probe. Caution is therefore required in this regard in the creation of videos for those for whom watching Self and Peer Videos is particularly reinforcing.

Social Stories™

14 participants enjoyed the reading of the SS™. This was assessed through observation of a child's facial expression, smiling, interest in and engagement with the story. 4 participants (pts. 6, 12, 14, 16) appeared to dislike the reading of their SS™. Two participants (pts. 6&14) disliked the SS™ to the extent that during the third reading, they requested not to hear it. Thus for these participants the third reading of the SS™ was cut short. For all participants, the post-intervention probe was conducted after the third reading. Those who disliked SS™ tended to be the younger participants and those who had a high level of behavioural difficulty.

What this Study Adds

Experimental Design

18 participants and, in accordance with the counterbalancing design, 54 participant-stimulus-intervention interactions, were included in this study. Consequently this study has been the largest to date assessing these interventions within the target age range, allowing for a greater powered study than those conducted to date. Among the studies including children within the age range and fitting the other search criteria for the literature review, the number of participants in the studies reviewed all represented considerably smaller samples than that of this study, with the largest study reviewed having 5 participants.

The group design, including the use of counterbalancing, allowed for more detailed data analysis and correlation, such that the results of this study give greater confidence that

the interventions have a generalisable effectiveness than has been shown by the single subject research to date.

This study provides information on the largest group yet studied teaching the same target skill for all. This provides an increased level of uniformity which facilitates both comparison between participants and allows teaching of that specific task to be applied to the wider ASD population. This study provides a clear task analysis and methodology which is reproducible by therapists who wish to put the findings of this study into practice. This uniformity was not achievable through meta-analysis of the literature available to date, as the target skills taught in different studies varied widely, and differed in terms of level of difficulty and issues for implementation. These ranged from conversational skills (Charlop et al., 1989) to social initiation (Nikopoulos et al., 2003, 2004) to decreasing undesirable behaviour e.g. tantrums and pushing (Buggey et al., 2005).

As mentioned in the literature review, none of the included studies commented on or calculated effect size or Standard Mean Difference for their intervention. Only one study included a PND value calculated by the authors. As the studies all had low participant numbers, and did not provide exact data sets, it was not possible to calculate a unifying measure of effect size for any given intervention. The lack of provision of exact data points and standard deviation values meant that a formulaic calculation of effect size based on SMD was not possible on reading many of the studies. As PND could be calculated for so few of the studies available, the raw scores again may represent a truer reflection of the effectiveness of a given intervention. Raw scores, percentages and graphs mostly reported positive trends, but a more accurate measure of effect size could not be calculated in the existing literature.

The calculation of effect sizes and significance values for all interventions in this study thus adds a higher level of evidence, leading to a greater confidence in the effectiveness of these interventions for the age range of interest. Also, if further studies were to be conducted using a similar design, the provision of effect sizes would mean that this study could be reliably included in a meta-analysis.

No study was found in the literature comparing all three interventions directly with each other. The information yielded from the data analysis comparing the efficacy of the

three interventions in the same group of participants, with the same stimuli and teaching the same skills is therefore an addition to the literature.

Counterbalancing Design

One study available in the literature for the relevant age range compared the interventions of interest directly with each other: Sherer et al., 2001, who selected 8, 8 and 4 questions respectively at random from a question bank of 20 for intervention 1, intervention 2 and generalisation respectively. However this did not ensure that each question was asked an equal number of times. It did nevertheless allow within-subject comparison of performance for the two interventions. This study had a single subject multiple baseline design. 5 participants is a relatively low number, and the data were presented as raw percentage scores for each participant for each session, and a note of how many times the video was watched. Thus a more detailed analysis of effect size, significance or other statistical measure was not provided.

No study available in the literature to date has used a consistent counterbalancing design. The use of a counterbalancing design in this study adds greater confidence in the findings, in that it allowed randomisation of skills, tasks and interventions. It also allowed a greater number of within-subject comparisons as to performance with the different interventions than any research available. The counterbalancing also increased the number of participants encountering each intervention. Each participant encountered all of the interventions. Therefore each of the three interventions was used with a group of 18 participants, albeit a group composed of three subgroups of six, one for each skill. In this way a data set of 54 participant-intervention encounters was obtained. If the study had been designed in a simple group design matching each participant to one intervention, this would yield only 18 participant-intervention encounters. Also this type of design, even if randomised, would have a potential for bias in that in assigning 6 participants to an intervention, those allocated to a particular intervention might by chance have higher cognitive ability, age or language skills. In groups of six, having such differences would significantly skew data to the extent that its analysis would be questionable. A stratification design, allocating participants to certain groups so that a similar number for participants with a given age, cognitive ability, language ability et cetera, was another option. It was felt however that this would inevitably lead to bias

due to lack of randomisation and lack of blinding. Thus counterbalancing was chosen as likely to yield the most powerful randomised data and allowed the statistical significance of changes in performance scores to be calculated (see Appendix 43 for the grid detailing the randomised matching of interventions to target skills for each participant allocated during counterbalancing).

Unfortunately, the design of the studies available in the literature (e.g. simple AB, ABAB) and low participant numbers meant that interpretation of results for most of the studies reviewed was difficult. None of the existing studies for this age group were systematically randomised. Many were single-subject studies (or included only 1 participant within the age range of interest) and therefore lacked external validity. Thus their generalisability beyond the immediate study was unclear. The prospective cohort design of this study, incorporating appropriate randomisation and blinding, places it in the Level A category of the NHS classification of levels of evidence. Both single subject studies and those with low participant numbers would be categorised as level C evidence (see Appendix 44).

Correlation with Linguistic and Cognitive Ability

This study provided more consistent information on linguistic ability than many of those located for the interventions. Many studies commented on the language ability of participants separately in a more anecdotal fashion (e.g. Bellini et al, 2007, Wert et al., 2003). Only a minority of existing studies used standardised language scales, and none correlated language scale scores with performance. This study calculated PLS-3 score in months for each participant, and subdomains of auditory and expressive language development were also calculated. The correlation of PLS composite and subdomain scores with aspects of performance allowed for a more robust assessment of which interventions were superior to others for children with a higher degree of language ability. This aspect of efficacy had not been previously formally studied.

This study also provided new information on how children with different levels of cognitive and adaptive ability perform with SS™, SVM and PVM. Less than half of the existing relevant studies found in the literature commented on the cognitive abilities of the participants, and fewer again used standardised assessments to evaluate this (e.g. in some studies the participants' cognitive ability was described simply as being high, average or low).

In this study, measuring cognitive ability using the subdomain scores of the Vineland-II scale, allowed for correlation with performance scores for each participant for each intervention. Thus each intervention could be studied as to how suitable it was for those with specific areas of difficulty including daily living, motor skills, socialisation, maladaptive behaviour *et cetera*. This had not been studied anywhere in the available literature for this age range as without a standardised scale, formal correlation yielding effect size values was not possible. This information may be considered in the choosing of a particular intervention for a given child in practice following a cognitive assessment.

This study also checked that the attention span of all participants when watching television was sufficient for each participant to be able to learn from the Peer/Self Video. This was not commented upon in any of the relevant studies found in the literature search for video modelling.

Use of Guidelines

Although all seven studies used Gray's guidelines to create the Social Stories™, there was no study available in the literature using the updated (2010) guidelines to create the SS™. This study therefore provides new information as to the efficacy of SS™ created according to the new guidelines in this age range. Also some non-conformity to the guidelines was noted in certain studies (e.g. Lorimer et al, 2002- see SS™ section of literature review).

Unlike for the creation of SS™, there is no internationally agreed, set gold standard guideline which must be used in the creation of video modelling interventions. For the Peer and Self Videos included in the literature review, the length of each video ranged between 20 seconds and 5 minutes. For this study, the videos created were all less than 40 seconds in duration. In their 2010 guidelines, the National Professional Development Center on ASD recommend that each behaviour taught should take 30-40 seconds as a maximum on the videotape (see Appendix 15). Some of the studies available in the literature were conducted before these guidelines emerged, but performance of skills taught through video modelling using longer videos (as was done in some studies) may have been limited by concentration span, as it may involve extraneous information or a more complex level of sequencing, with which many children with ASD have difficulty.

Reliability Measures

This study provided measures of both interobserver (97.2%) and procedural (100%) reliability, which represent evidence that the interventions and the resultant scoring were carried out in an accurate manner. Many studies in the literature did not report procedural reliability in particular. For this study, checklists and continuous review of guidelines during creation of each intervention ensured a high level of treatment fidelity, in terms of both construction and implementation of each intervention. This study could be seen as adding new information in comparison with studies which did not report procedural reliability measures, as failure to do so would raise concerns about the consistency of methods for these studies and thus the quality of data obtained.

Social Validity

Without social validity measures, it would not have been possible to accurately determine whether the tasks taught were relevant to the general population of children with ASD. Very few of the studies available in the literature within this age range commented on the social validity of their intervention. To teach a child with ASD an abstruse skill, however objective it may be as a measure, would lack meaning in terms of the needs of the child and in terms of application to the general population of children with ASD. This could also be ethically questionable (the child's time would be better spent learning relevant skills). In all research for children with ASD, a participant-centred approach should be maintained. The core aim of any teaching intervention is to address the needs of the learner. In children with ASD, attention to the core deficit of meaningful social interaction should be taken into account when considering the needs of a given child. At the preschool age in particular, skills should be chosen that foster development in key areas. These include (among others): social skills, daily living skills, coping skills, language skills and motor skills (the subdomains of the Vineland adaptive scale). An objective measurement in the form of a Likert or other appropriate scale is vital in ensuring that the researcher does not make assumptions in relation to the relevance, suitability and physical and emotional safety of the interventions and target skills he/she has chosen. Using this checking procedure to refine the interventions and skills chosen before commencing the study is vital, not only to ensure that relevant results are obtained, but for ethical reasons to ensure relevance

and safety for children participating in research, and to reassure parents in regard to the methods and content of the study.

The findings of this study and their applicability are therefore reinforced by the use of Likert scales (see Table 10) to objectively assess social validity. This was the first study to assess the social validity of not only interventions but also target skills within this age group. Formal measurement of the social validity of target skills is vital in conducting research with this population in order that, should any issue in terms of lack relevance, potential for causing distress or impracticability arise, the target skills can be modified at the development stage. Ethically, encouraging feedback from parents and participants is also desirable, as was done in the post-hoc Likert scale administered after the completion of the study to parents, and the more informal qualitative feedback in terms of enjoyment of sessions and generalisation of skills both demonstrated by participants in later sessions and reported by parents to be occurring outside the sessions.

Reinforcement

Food, tokens, money and time allowed to pursue preferred activities, each of which has been used in one or more of the studies available in the literature to date, were all rejected as possibilities for positive reinforcement for this study. The potential for both bias and ethical issues were of concern. Providing, for example, small cash or token/gift incentives on performance of desired behaviours would, it was felt, be inappropriate in several ways. Firstly, it is likely that some children would understand the significance of money/tokens and seek it out through increased performance of behaviours, while for others less aware of this, it would not be effective at all as reinforcement. This alone would skew data, being dependent as it is upon cognitive ability, upbringing, socioeconomic status and other factors. It was felt that this would be ethically problematic and, at worst, might induce selection bias among interested participants and parents, and/or a possible persistence of dependence on the reinforcement. Food incentives might be appropriate for certain children but in general run the risk of causing an unhelpful dynamic between parent and child surrounding food, and may compound problem eating behaviours when they do exist, which, in children with ASD, is quite commonly.

Time spent pursuing preferred activities is a reinforcement which certainly can have its place with an individual child. However, this can again be problematic especially when

excessive preference of a given activity is already a problem. For example, children with ASD commonly enjoy playing computer games and if this is preferred to the extent that it is affecting their willingness to engage in other more social, interactive activities, then using it as a positive reinforcement is undesirable at least in research. The parents of many of the participants of the study mentioned computer games as a preferred activity for their child in the baseline questionnaire and during the discussion on day 1, many stated that they would like to reduce this. This applied to other activities, as children may have had fascinations or rituals surrounding same (e.g. on the parent questionnaire, participant 10 was reported to have a preoccupation with cats, repeatedly drawing cats and asking to look at cats).Therefore using any preferred activity was avoided as a reinforcement.

The studies available in the literature have used various forms of reinforcement e.g. praise (Kleeberger et al., 2010), physical contact (Boudreau et al., 2010) and tangible rewards (Apple et al., 2005). Leaf et al. (2012) used a token system of reinforcement for desired behaviour where tokens could be exchanged for gifts or preferred activities. The use of many different reinforcers in different studies is another factor which renders meta-analysis difficult as of course it introduces bias.

Attention of any nature has been found to be reinforcing for behaviours. Therefore even negative attention in the form of "telling off" or punishment can prove to be a reinforcement, paradoxically increasing the behaviour which led to it. In the researcher's opinion, the most desirable and healthy positive reinforcement to be desired by participants was positive attention from the caregiver or parent.

Target Skills

In this age group, the setting of play is an important one where much of a child's social learning, relationships and language development take place. Initiating play, turn taking and finishing play are integral skills to interactive play. Without them, children may become alienated from their peers, depriving them of the very setting in which they can develop these and other skills further. This leads to further social anxiety and shyness, which will affect later stages of development, and very importantly, quality of life.

Many studies available in the literature using these interventions measured target undesirable behaviours (e.g. Lorimer et al., 2002), and used the interventions to effect a

decrease in these behaviours over time. In terms of addressing undesirable behaviour for future studies, more recent recommendations advocate an approach which encourages positive behaviours as a means of engaging the child while providing a constructive alternative to undesirable behaviour while fostering self esteem. This could be borne in mind for future studies. Carol Gray in her 2010 publication The New Social Story™ Book discusses this. When discussing sentence types, she specifically instructs the creator of the Story™ not to use sentences with "I must not...." or equivalent. She makes the point that the over-riding goal of any Social Story™ is that of information sharing, which must be carried out using sentences which have a patient, supportive tone and provide emotional safety for the Audience. Thus, rather than teaching a child directly what *not* to do, an approach which encourages appropriate behaviours is favoured. It is hoped that by redirection and increased ability in performing appropriate behaviours and through reinforcement of these (e.g. in the form of verbal praise), the child will gradually begin to preferentially perform these behaviours rather than resorting to undesirable behaviours out of habit or as a means of seeking negative reinforcement (negative attention) from these. This observation is likely to be translatable also to video modelling. Thus for this study, level of disruptive behaviour during the session was not defined as a target skill or measured as a primary outcome, but rather scored and factored into the composite session score as a negative scale, 0 to -2.

Although one study (Chan et al., 2008) did teach initiating peer contact and play, no other study available in the literature looked at these interventions as a means of teaching turn taking and finishing play in this age group. This study therefore adds new information in regard to the use of these procedures for teaching the important skills of turn taking and finishing play. One study did include sharing as one of its social skill set, but turn taking involves sharing in a specific, interactive, sequential way and is as such a specific form of sharing which required separate study. Lack of turn taking will of course alienate many peers, and lack of clarity about when and how to finish play may cause irritation and confusion in peer interactions, particularly where a child with ASD goes on to play repetitively with a toy at the end of a game. The new finding that all three teaching procedures can help to ameliorate these skills for the target population is therefore encouraging and has everyday applications.

Maintenance and generalisation

Generalisation of skills to new situations and people was cited by the National Autism Plan for Children, 2003 as a core focus for early intervention. Through use of interventions which have been well researched in terms of their effectiveness for generalisation, children can acquire knowledge which will better equip them for social interaction and relationships with others. Similarly, maintenance of skills learned in the same setting in which they have been taught is also essential for progress.

Without maintenance and generalisation data, the usefulness of the teaching procedure being studied is less clear. The aim in working with children with ASD is that they can learn skills which they take outside the classroom/behavioural clinic and use for problem solving and dealing with situations which they currently find challenging. Translation of skills to new people is also extremely important. It is acknowledged that, even if a teaching procedure has a general effectiveness, some children may need further sessions of tuition to enable them to perform, maintain and generalise a new skill (see discussion of longitudinal study below), or, even with further sessions, may not learn that skill with the intervention. Obtaining maintenance and generalisation data will identify those requiring further or alternative instruction in and experience of the skill. Thus each individual child's characteristics and needs are taken into account.

For some studies available in the literature, maintenance and/or generalisation data were not available. For others, exact scores were not always available, and/or there was loss to follow up. In some studies generalisation data were limited to comments that a target behaviour was demonstrated in a new setting or with new people, e.g. anecdotal reporting by family members as to their child performing these skills at home (Kuoch et al., 2003), which, although encouraging, unfortunately lacked detail with regard to how proficiently they were demonstrated.

This study therefore yielded a larger amount of quantitative maintenance and generalisation data than was previously available in the literature, which supports their usefulness in terms of applicability to everyday situations. The same novel person and the same novel stimuli were used for each participant, thereby avoiding possible bias.

Implementation in Practice

Each of the teaching procedures presented its own challenges, and participants varied in their reaction on encountering the procedures. In terms of labour intensity, the interventions were similar in the sense that an individualised intervention was needed following assessment of the child. It could be argued that SVM was possibly more time consuming for some participants as creation of the Self Video took longer where the participant had difficulty following instruction. However, in view of the superiority of SVM, especially in terms of maintenance and generalisation, it could be argued that the time spent in the creation of the intervention was worthwhile in terms of results gained. The longer time taken to create these videos was not significantly longer such that it became burdensome or distressing for the child.

As mentioned above, Self Video Modelling in this study appeared to be an enjoyable procedure for most participants, with 16 of the participants requesting to watch the Self Video multiple times. One participant showed little interest in any intervention. This child was very fixated on computer games. This relates to the visual aspect of these interventions, which may be less reinforcing for a child who is constantly over stimulated by the visually exciting material of computer games, where significant reinforcement is received for performing simple tasks such a pressing a button at the right time. Overexposure to such games may reduce the effectiveness of all three interventions, due to its effects on concentration span and a decreased sense of reinforcement in encountering a less stimulating medium. Another participant, pt. 18, did quite well in the study, but during certain maintenance sessions, particularly for PVM, appeared to lose interest and had very low scores, despite high Vineland and PLS-3 scores. His parents in the initial questionnaire had reported that he spent a lot of time playing computer games.

Another overstimulating activity which may decrease attention span for and interest in simple play is excessive exposure to television. On reflection, it would have been interesting to collect data on the average number of hours of television watched and of computer games played by each participant and correlate this with performance scores.

Following the creation of the Self Video, an "*in vivo*" session was conducted to assess whether any skills had been acquired from the *in vivo* demonstrations necessary to create the video. For seven of the eighteen participants (across all target skills), there

was no increase in score between baseline and the score post the *in vivo* demonstration. Three participants in fact had lower scores than baseline following the creation of the Self Video. This may be due to the nature of *in vivo* teaching in including a lot of prompting, such that immediately after the session children expected a prompt and were unsure of what to do. For 8 participants there was a rise in score from baseline to "*in vivo*". This is not surprising, as *in vivo* is a well researched teaching method in itself. However, the highest rise in score from baseline to *in vivo* was from 8% to 56% for two participants. With these observations it must be borne in mind that this *in vivo* component is necessary for creation of a Self Video and therefore is integral to the Self Video Modelling process. Therefore in assessing score between baseline and post-intervention probe for any SVM teaching, learning from *in vivo* itself is inevitably a possibility, and so there is no "cleaner" way of assessing SVM apart from its *in vivo* component, other than to record what portion of learning (if any) has resulted from the *in vivo* component alone. There is a recommendation in the guidelines that skills performed in the post-*in vivo* analysis could be edited out of the Self Video. However this was not always possible. It was felt by the researcher that editing out skills achieved, for example, in the middle of a sequence, would be confusing for the participant, who expects the sequence that has been taught. Although the skills were achieved in the post-*in vivo* session, to what degree they would be maintained and generalised in later sessions was uncertain. Also, no participant had a very high increase in any of the target skills following creation of the Self Video, and therefore all had further scope for learning and achievement of those skills to a higher level.

As mentioned above, one participant (who had significant language and adaptive difficulties on Vineland and PLS-3) had consistently low scores with SVM. He also did not enjoy the creation of the Self Video, although he later enjoyed watching it. With further sessions through the longitudinal study, his scores subsequently improved. Another participant did not like watching himself on the Self Video, and after two viewings requested not to watch it. His maintenance and generalisation scores were also the lowest for those taught turn taking by SVM. Flexibility is important in the implementation of this technique in that those who do less well initially may learn from an extended schedule of teaching. However, sensitivity and caution are needed if a child is distressed by the video.

Among certain participants, interestingly there was an increase in score between the post-intervention and maintenance sessions. It was noted by some of the parents that the child between post-intervention and maintenance sessions was acting out target skills on the toys they had at home or repeating the game play script to themselves. Some participants mentioned to their parents during this period that they wished to see their video again. This pattern was seen in the scores of three participants for SS™, 7 participants for SVM and 9 participants for PVM.

Clinical Implications

The findings of this study provide evidence which supports the effectiveness of the three interventions for teaching the defined social behaviour skills, in the context of play, for children aged 3-6 years. Although some interventions were superior to others in certain respects, all significantly improved performance for the target skills. Video modelling has also been used to teach other skills such as swimming (Scraba, 1989), life skills (Miklick et al., 1977) and decreasing aggressive behaviours (Creer et al., 1970) among many others. This would indicate that the technique can be used to teach a wider range of social and motor skills.

The finding that participants with low socialisation scores could still achieve high performance scores following the teaching procedures indicates that these procedures are suitable for children with ASD, who generally have a paucity of socialisation skills. The purpose of the teaching procedures in this context is to enhance a child's social understanding, social relating and play skills (Perry et al., 2003). Becoming more comfortable with play will improve learning opportunities within a medium that enhances social understanding and social communication (Singer & Singer, 2006). Maintenance and generalisation sessions are integral to each teaching procedure and these sessions must be built in to the teaching plan.

In addition to the teaching of social skills, some studies in the literature describe their use in other skill domains e.g. motor skills. Although the level of evidence for their use in terms of other skills is limited, by extrapolation a trial of use is reasonable for teaching skills in other areas. One intervention may be selected over another following an analysis of the child's individual characteristics, aversions and preferences. It may also depend on the situation and equipment available at the time.

The importance of adhering to appropriate guidelines in the creation of these interventions in practice must be emphasised. Any teacher or therapist creating such interventions has a responsibility to the learner to teach in such a way that the material is appropriately presented, in a patient, supportive and positive tone. All interventions must not only share information on the target skills in a meaningful way, but, more importantly, protect the self esteem and emotional safety of the learner. Therefore as in research, in practice the teacher must hold him/herself to a gold standard. Evidence based practice is a process of continual development and updating of skills. Each teacher/therapist must remain abreast of current guidelines and theories surrounding these interventions and their implementation.

The generalisation of behaviours to home is also important, but could not be standardised to an acceptable level for this study. Involvement of parents as much as possible by the teacher/therapist, as an integral part of longer term use of these methods throughout the preschool years, could facilitate this form of generalisation. Discussion with parents and providing training for them to support maintenance and generalisation in the longer term is inherent to the role of a teacher or therapist. The same would apply to skills taught through these teaching procedures, so that the approach taken by parents to certain skills is sufficiently similar to that of the teacher/therapist to allow the child an opportunity to perform the skills in the home and other settings. The parent must therefore know what skills are being addressed in any given week of teaching, so that they can provide a context as appropriate to enable the child to consolidate that skill. Thus a new skill is used and practised in a situation relevant to the child's life, allowing for richer understanding and contextualisation. The aim over time is for the child to develop an ever expanding repertoire of skills which can be used at different times, in different sequences, and adapted to different settings, as occurs in typically developing children. As children with ASD tend to demonstrate restricted, repetitive behaviours, including within the context of play (Wing et al., 1979), this development of flexibility is important. Older skills can be reviewed and revised continuously as new ones are learned.

Prompting in the intervention phase was not used in this study in order to avoid bias. However, in practice prompting may be a useful technique during an intervention to improve performance and thereby reduce the number of repetitions of a given task or game play. However, this prompting must be faded so that the child can gradually

perform more and more of the task independently of prompting. In this study, some parents mentioned that their child tended to be too prompt-dependent, and some children did appear to be looking for such cues at times in the baseline sessions. These children rarely looked for cues following the interventions however. With such children, prompting must be used judiciously and with the clear goal of independent achievement of task completion, maintenance and generalisation.

The researcher proposes some possible additions which could be considered for use in conjunction with the current guidelines. For instance, with PVM, the child could be asked, after watching the video, who the child (an unknown actor) on the video was. As in this study, some children may identify the actor as themselves or possibly as a friend they know. For SVM, a test video should be conducted before the procedural video, to test if this is a modality with which the child is comfortable, to assess how they respond to seeing themselves on video and who they think the child in the video is. A 30 second video of the child playing with a preferred toy and, if possible, with a group of other children could be used for example and the child asked on viewing the video: "Which one are you?" This also gives a child time to get used to seeing him/herself on video. Following this assessment, if the child is afraid of, or does not enjoy seeing the video, a decision to use graded exposure to SVM, or not use it at all, should be made. Although guidelines are available, the need for international agreement on a set of guidelines for video modelling (as is already in existence for SS™) is something which should be addressed in the future as a means of ensuring uniformity of creation and implementation of videos, in a manner which is appropriate, maximally effective and safe for children with ASD. Immersion workshops for training of therapists in video modelling techniques would be very useful in ensuring that these techniques are being used appropriately in a standardised manner, while allowing for maximal flexibility and adaptability within recommended guidelines.

One study in the literature (Kleeberger et al., 2010) examined interventions in combination. Interventions were not used in combination in this study, as this would confound the results, rendering a direct comparison impossible. However in practice, a use of these techniques in combination for teaching the same skill may be helpful, as the techniques may synergise each other and consolidate learning.

Social Stories™ may be a useful adjunct to PVM and SVM to refine problem areas, e.g. problem behaviours that arise during the intervention phase. It is felt that SS™ are very amenable to use in addressing specific problem behaviours. It is more difficult to construct a Peer or Self Video based on the problem behaviours. PVM, SVM and SS™ all work by showing the appropriate behaviour; however SS™ can also address feelings, emotions and a perspective on other people's thoughts and feelings, which can help a child to understand the problem behaviour better, while protecting his/her self esteem. The context of play is an appropriate one here in that play can help children understand and express their emotions (Haight et al., 2006), and aids development of emotional regulation (Barnett et al., 1981).

Perhaps a trial of all three interventions with the same child might be used in some situations, to see which engaged and suited the child best, and the preferred method then used as a first line. This does need further consideration and dedicated study however, as there are other possibilities e.g. the child might be distracted or confused by too many interventions teaching the same script and task. Again the individual characteristics of the child are likely to come into play.

In practice the researcher recommends that an assessment be carried out during sessions as to which of these three interventions an individual child finds more enjoyable and most reinforcing. The preferred intervention should perhaps be used as a first line for teaching appropriate tasks, with the other interventions used as second line or in combination with the preferred intervention. However, certain tasks may lend themselves more to being taught using a specific intervention, and this assessment should be subject to flexibility and constant review, as preferred/enjoyed activities may change concurrently with each child's development.

For all three interventions, it is reasonable to suggest that obtaining a measure of social validity should be formally included in the guidelines. This should include a measure of the social validity and relevance of both the intervention and the target skills.

For PVM, it was found that there was little correlation with PLS-3 score. Those with lower PLS-3 scores still did quite well in performing the target skills. Less verbal processing was required in PVM than SS™, which even with pictures involves at least auditory processing of words, and SVM, which involves the child understanding the

task and performing it before seeing it performed on video. Therefore PVM might be considered as a possible first line intervention for those with limited language ability.

All three interventions were effective for those with high Maladaptive Behaviour Index scores. The net correlation between performance and Maladaptive Behaviour Index scores was close to zero, apart from PVM which showed a positive correlation with Maladaptive Behaviour Index (MBI). His suggests that all of these interventions, especially PVM, are effective in those with a high degree of behavioural difficulty. Perhaps PVM might be considered as a first line for these children.

For those who have difficulty with maintenance and generalisation of skills, it is suggested that SVM be considered as an intervention with strong performance in this regard. While bearing these findings in mind, the individual preferences, abilities and talents of each child must of course be taken into consideration as of paramount importance.

Scope for further research

All three teaching interventions in this study have shown promising results, and offer exciting opportunities for development. These interventions have a vast scope for development and refining of techniques, and for use in teaching an extensive range of skills. Although all three teaching interventions have been studied to an extent in the past, many research questions remain to be answered in regard to their use. Further research using robust study design is needed to ensure that use of these procedures is evidence based, and is based upon evidence of the highest possible quality. High quality cohort studies for example would provide a higher level of evidence than the studies already available in yielding more generalisable data which could inform practice. There is a critical dearth of maintenance and generalisation data overall, and future research should have as an important focus the effectiveness of these techniques in maintenance and generalisation of skills learned.

Further study of use of these interventions with other age groups, although beyond the scope of this study, is needed. Although some data are available pertaining to this, again high quality studies are limited. Also, many different aspects of how these techniques might be used remains to be explored. For example, use of these techniques has largely

only been studied in relation to social and, to a lesser extent, motor skills. The techniques have great potential to be used for coping and everyday living skills, as well as a broader range of skills within the social and motor categories. It would not, of course, be possible to study every single skill within every situation that could possibly arise. It is reasonable therefore when designing a group study to look at skills which the group are likely to have in common as challenging areas. This, of course, will relate to the age group of participants as well as other variables.

Given the proven importance of early intervention as a means of maximising long term gains in social learning and adaptive function, further research focusing on this age group is merited. For many of the studies examined in the literature review, the age range was very broad (e.g. Sherer et al 2001: age range of participants 3-11 years), and thus data were difficult to interpret. Larger studies using a more focused age range, including further studies in the early intervention population, would yield stronger evidence for a given intervention or set of interventions for a certain age group.

Looking at the effectiveness of these interventions in a group of children with a common characteristic would also be helpful. For example, a study including only children with ASD who had associated moderate to severe learning difficulty, or including only non-verbal children within a certain age range, would provide more accurate information on which techniques might suit children with these special needs, and how teaching techniques can be modified to best cater for this group. Similarly, a study including only children with Asperger Syndrome, or only those with severe behavioural difficulties, would be extremely useful, both in terms of the quantitative and qualitative data such a study would yield. Of course, every child is individual, but such studies would provide useful guidance which could then be adjusted according to the needs and preferences of the individual learner. The challenges posed in conducting research of this type would be similar to those encountered by the researcher in this study: the cost in terms of financial and personnel resources in such a study, which is by nature labour intensive. Gold standard guidelines must be faithfully adhered to, while providing individualised interventions as the guidelines suggest, on order to allow accurate comparisons between participants. Also, a consistent and appropriate setting, such as the behavioural clinic used in this study, should ideally be available to control extraneous environmental factors. Accessing a large population of children with ASD may prove challenging, particularly if a study were to use narrow inclusion criteria.

Possibilities for studying the potential of these investigations for generalisation to other people and physical settings are considerable. Among the areas which require closer study are the effectiveness of SS™, SVM and PVM in teaching skills which are then generalised to peers, teachers or parents. The challenge posed here would be how to assess the participant's performance for these sessions: the researcher could provide a similar situation with a peer/parent present and score this him/herself. Another (more practical but perhaps less accurate) way of measuring this would be to provide training and a questionnaire for parents/teachers to report on how the child was doing on an ongoing basis. Although this latter method would possibly facilitate a longer period of assessment of generalisation of skills, consistency of stimuli and of course interobserver reliability would suffer.

Generalisation to other physical settings could involve assessment of behaviour either at home, at school, or in other settings e.g. a supermarket or restaurant. Again if the researcher is scoring these sessions, results are likely to be more reliable. Clearly, homes/schools/restaurants are different and provide different challenges, which would need to be taken into account when comparing participants.

This study also involved a defined set of stimuli only. The same generalisation toys were also used, to ensure maximum consistency across participants. The toys were also similar to each other, while differing sufficiently to maintain interest. Again, this was to allow comparison between toys. It would be interesting to assess the effectiveness of SS™, SVM and PVM as techniques in teaching skills around different types of toys and games, and around everyday objects. The interventions are very versatile and could potentially be used around a substantial number of stimuli, including common playground games and multisensory toys for example.

The use of ritualised scripts and the child's ability to repeat these in different situations is a feature that can be used to advantage in Social Stories™, Self and Peer Video Modelling in teaching a child a script which will enable them to cope better with certain situations.

However, there is a difficulty with a child sticking rigidly to an exact script for a given social skill, compared with a typically developing child who might incorporate more spontaneous actions and appropriate unscripted actions. Thus a typically developing

child might play creatively with puzzle pieces, and make more creative shapes e.g. an aeroplane with the Lego blocks instead of a simple stack.

In this study, many participants were observed to adhere rigidly to the script and perform the tasks in exactly the same way each time. This observation is in line with the tendency towards repetitive and stereotyped behaviour observed in general in children with ASD (APA, 2012). Many of these were high functioning participants who had high Vineland adaptive scores (apart from socialisation) and high PLS-3 scores. These participants achieved high scores throughout the probe, maintenance and generalisation sessions but a concern would be the processing of the script as a ritual or routine to remembered rather than something more flexible. For example, one of the participants repeated the same word at the end of each game: (participant 10 said "Yeah!" at the end of each game without variation for every session). This might affect social interaction with peers somewhat around the use of these scripts.

Another research question which remains to be answered is to what extent the intervention (SS™ or video) should be available outside of the intervention setting, e.g. parents having access to the SS™ or video. The availability of interventions outside of the intervention setting is commented on in few of the studies included in the literature review. The extent to which parents should know the script of and/or have access to the interventions themselves remains to be studied. Issues including adequate parent training in use of this material arise in this context, and are further discussed below.

Newer Technology

The use of newer technology in implementation of video modelling in particular is an exciting area with considerable potential. With the arrival of mainstream possession of smartphones and also many owning tablet devices with video recording functions, opportunities for creating and watching video models have vastly increased. As new technologies come on-stream, the potential for exploiting them for therapeutic purposes should be examined.

Tablets and phones may of course be used by therapists and teachers within sessions and classroom contexts for easier access to videos. Where the therapist conducts a session e.g. in the playground/restaurant/home setting a more portable device is advantageous. The facility with which these interventions can be conducted gives rise to

questions around who can administer these interventions. For safe and effective administration of these interventions, dedicated training and teaching surrounding the guidelines for use are necessary. Portable devices provide ample opportunity for use of these interventions by teachers, parents and carers in different everyday settings. For ease of use, there is potential for design of applications for devices which would facilitate the video creation, editing and playback process, or SS™ creation and presentations process, and details of guidelines. While this could prove very useful especially for maintenance and generalisation, issues around ensuring adequate training may arise. Also the confidentiality and security issue of having video footage available on a portable device is a significant one and would need to be addressed. Of course, also not every parent can afford to purchase this type of equipment and assumptions should not be made about its availability.

These interventions are by their nature individualised to the child for which they are intended. Providing master copies of interventions for common areas of difficulty, which can then be altered individually for the child in question, might be a useful resource for both teachers and parents, if parents were to be trained to tailor and administer these interventions. The extent to which flexibility can be allowed in this remains to be determined, but it is suggested that increasing flexibility of use would allow greater integration of these interventions into everyday life, and greater inclusion and empowerment of parents.

Use of advanced animation techniques may also play a role in future developments in video modelling. Technology already exists which allows us to create very realistic environments and characters similar to those in real life, in which the user can "inhabit" one of the characters and, at will, make that character act in a certain way. This technology has been used to create successful and enjoyable computer games. These animation techniques could very well lend themselves to creating a form of "self" and "peer" video modelling where the characters involved comprise a realistic three-dimensional figure very similar in appearance to the learner him/herself, or a typical peer and others involved. The environments for these animated videos could be constructed so as to closely approximate the learner's home, school, local playground or other situation where these skills are commonly called upon. Many children enjoy watching animated material and find it reinforcing. If it can be adapted for a teaching function, this modality may improve attention, enjoyability, accuracy and therefore

learning. A computer program which could use a photograph to create a 3 dimensional image incorporating the learner's face in a premade video would aid in allowing use of stock master "self" videos and adapting them for individual children. Research into this area could yield very interesting results.

For PVM, if master videos were available using a very generic background and materials then such circumstances could be easily recreated in the home by parents. This might include for example a white background, a peer actor with a plain white T-shirt and other people in the video wearing black T-shirts, using very common and readily available toys. Thus a plain wall, plain T shirts and the same readily available toys can be used by parents to recreate the teaching environment and work on the target skills with their child before translating these skills to more specific settings. The possible efficacy of this technique, along with the extent to which individual characteristics of each child could be catered for within it, remains to be studied.

Different skills by their nature lend themselves to use of different interventions. The relative efficacy of the different interventions for different tasks is an area of much scope for further research. This could yield information which would inform which intervention was preferentially used as first line to teach a given skill. Whichever intervention had been already proven to be most suited to the task in question could be used as first line, and if learning was suboptimal with this, second- and third-line interventions could then be used adjunctively.

Conclusion

This study has shown that Social Stories™, Self Video Modelling and Peer Video modelling all lead to significant improvements in performance of three social play skills for the early intervention age group. These findings support existing evidence for these three interventions, which has also shown encouraging findings for these techniques. Importantly, this study provides positive maintenance and generalisation data for all three teaching interventions, based upon a robust group study design. In particular, SVM showed very encouraging maintenance and generalisation data and was superior overall to the other two interventions. However, all three interventions were shown to be very effective and led to a statistically significant improvement in performance of skills, both post-intervention and in terms of maintenance and generalisation. The techniques are inclusive of and suitable for children with socialisation, behavioural,

cognitive and language difficulties. The researcher suggests that their use should be seen as evidence based practice for this population. For those who initially have lower results with these techniques, the longitudinal study has shown that further sessions over time lead to an improvement in, and often to optimal, performance of social skills. These interventions can be used to create tools in the form of a remembered sequence which a child with ASD can use in social play situations, in which they often feel challenged.

Video Modelling reflects a powerful means through which all children attain social learning, that is, through the process of modelling i.e. observing and imitating peers (Bandura et al., 1961). However it does so in a way which is more accessible and less threatening for children with ASD, breaking tasks down into a sequence of easier steps which can gradually be used in context. By creating such structured tools, coping and socialisation skills are improved, and the medium of interactive play may become accessible to these children for learning many other important social, language and motor skills. As coping skills increase, levels of frustration decrease, which is likely to lead to a decrease in problem behaviours in these situations.

The interventions also have vast potential to be applied to the teaching of skills other than those chosen as the focus of this study. This includes many different social skills, motor and language skills, and others. Many skills have not yet been formally studied in regard to these techniques. With further research and by refining techniques further for these interventions, they may be used with increasing efficacy as scaffolds to help individuals with ASD to relate to their peers and to adults from an early age. In this way, isolation from peers and stigmatisation can be greatly reduced or eliminated. Improved peer relationships may lead to improved opportunities for children with ASD to learn from their peers, and also improve cognitive, linguistic and emotional development (Howlin et al., 2000). Peer friendships in childhood lead to improved psychological wellbeing, academic achievement and coping skills in later childhood and adulthood (Parker, 2006). It is thus hoped that improving play, social skills and peer relationships using these interventions will translate into improved further social learning at later ages, fostering relationships with others and therefore enabling a child to reach their fullest potential, both throughout childhood development and, later, in their adult lives.

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Appendices

Appendix 1: List of Acronyms/Abbreviations

AAC	Augmentative and Alternative Communication
ADHD	Attention Deficit Hyperactivity Disorder
ADI-R	Autism Diagnostic Interview-Revised
AE	Age Equivalent
ANOVA	Analysis Of Variance
APA	American Psychiatric Association
APA*	American Psychological Association
AS	Asperger Syndrome
ASD	Autism Spectrum Disorder
CDD	Childhood Disintegrative Disorder
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders 4th Edition
DSM-5	Diagnostic and Statistical Manual of Mental Disorders 5th Edition
DVD	Digital Video Disc
ERIC	Educational Resources Information Centre
ES	Effect Size
HFA	High Functioning Autism
Ho	Null Hypothesis
IOR	Inter-Observer Reliability
IOA	Inter-Observer Agreement
IQ	Intelligence Quotient
KBIT	Kaufman Brief Intelligence Test
MBI	Maladaptive Behaviour Index
MRI	Magnetic Resonance Imaging
PAND	Percentage of All Non-Overlapping Data
PASW	Predictive Analytics Software
PDD	Pervasive Developmental Disorders
PDD-NOS	Pervasive Developmental Disorder-Not Otherwise Specified
PLS-3	Preschool Language Scales, 3th edition.
PPVT-R	Peabody Picture Vocabulary Test-Revised
PPVT-III	Peabody Picture Vocabulary Test-3rd edition
PND	Percentage of Non-Overlapping Data
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta- Analyses.
PVM	Peer Video Modelling

Appendix 1 continued: List of Acronyms/Abbreviations

R2 Index	Regression approach
RD	Rett Disorder
RIT	Reciprocal Imitation Training
SCD	Social Communication Disorder
SMD	Standard Mean Difference
SPSS	Statistical Package for the Social Sciences
SR	Spontaneous Requesting
SS™	Social Stories™
SVM	Self Video Modelling
TELD-3	Test of Early Language Development
ToM	Theory of Mind
TV	Television
VCR	Video Cassette Recorder
VM	Video Modelling
VPM	Video Peer Modelling
VSM	Video Self Modelling
WISC	Wechsler Intelligence Scale for Children
WPPSI	Wechsler Preschool Primary Scale of Intelligence

Appendix 2: DSM-IV-TR Criteria for Autistic Disorder*

A.) A total of at least six items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3).
(1) Qualitative impairment in social interaction, as manifested by at least two of the following:
a. Marked impairment in the use of multiple nonverbal behaviors, such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction.
b. Failure to develop peer relationships appropriate to developmental level.
c. A lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest).
d. Lack of social or emotional reciprocity.
(2) Qualitative impairments in communication, as manifested by at least one of the following:
a. Delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime).
b. In individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others.
c. Stereotyped and repetitive use of language or idiosyncratic language.
d. Lack of varied spontaneous make-believe play or social imitative play appropriate to developmental level.
(3) Restricted, repetitive, and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
a. Encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus.
b. Apparently inflexible adherence to specific, non-functional routines or rituals.
c. Stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting or complex whole body movements).
d. Persistent preoccupation with parts of objects.

B.) Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication,
and (3) symbolic or imaginative play.

C.) Not better accounted for by Rett's disorder or Childhood Disintegrative Disorder.

*American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition—Text Revision.*

Appendix 2 continued: DSM-IV-TR Criteria for Asperger Disorder*

A.) Qualitative impairment in social interaction, as manifested by at least two of the following:
1. Marked impairment in the use of multiple nonverbal behaviors, such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction.
2. Failure to develop peer relationships appropriate to developmental level.
3. A lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest).
4. Lack of social or emotional reciprocity.

B.) Restricted, repetitive, and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
1. Encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus.
2. Apparently inflexible adherence to specific, non-functional routines or rituals.
3. Stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting or complex whole body movements).
4. Persistent preoccupation with parts of objects.

C.) The disturbance causes clinically significant impairment in social, occupational, or other important areas of functioning.

D.) There is no clinically significant delay in language (e.g., single words used by age 2 years, communicative phrases used by age 3 years).

E.) There is no clinically significant delay in cognitive development or in the development of age-appropriate self- help skills, adaptive behavior (other than in social interaction), and curiosity about the environment in childhood.

F.) Criteria are not met for another pervasive development disorder or schizophrenia.

*American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition—Text Revision*.

Appendix 3:

Social Stories™: Summary of excluded research papers

Paper	Reason for exclusion
1. Social Stories™ to increase verbal initiation in children with Autism and Aspergers disorder. K. Hanley-Hochdorfer, M. Braz, T. Kehle, M. Elinoff (2010)	Participants were not within the age range of interest.
2. Analysis of a Social Story™ intervention to increase appropriate social interaction in children with autism. Bailey (2009)	Subjects aged in range from 10-21 years of age.
3. Utilizing Social Stories™ to reduce problem behaviour and increase pro-social behaviour in young children with Autism. Wright (2009)	Unable to access unpublished dissertation.
4. Differentiated effects of paper and computer-assisted Social Stories™ on inappropriate behaviour in children with Autism. Mancil, Haydon & Whitby. (2009).	Participant was not within the age range of interest.
5. The effectiveness of a Social Story™ intervention in decreasing disruptive behaviour in Autistic Children. Watts (2008)	Participants were not within the age range of interest.
6. The effectiveness of Social Stories™ on decreasing disruptive behaviours of children with autism: three case studies. Ozdemir (2008)	Participants were not within the age range of interest.
7. Enhancing the conversation skills of a boy with Aspergers Disorder through Social Stories™ and video modelling. Scattone (2008)	Participants were not within the age range of interest.
8. Social Story™ Efficacy with a child with Autism Spectrum Disorder and moderate intellectual disability. Reynhout & Carter (2007)	Participant was not within the age range of interest.
9. Increasing appropriate social interactions of children with Autism Spectrum Disorders using Social Stories™. Scattone, Tingstrom & Wilczynski (2006)	Participants were not within the age range of interest.
10. Teaching a young child to appropriately gain attention of peers using a Social Story™ intervention. Soenksen & Alper (2006)	Participant did not have a diagnosis of ASD.
11. Using Social Stories™ and comic strip conversations to promote socially valid outcomes for children with autism. Hutchins & Prelock (2006)	Study uses a blended combination of Social Stories™ and Comic Strip Conversations.
12. Using Social Stories™ to change problematic lunchtime behaviour in school. Toplis & Hadwin (2006)	Exact ages and diagnoses of the participants are not disclosed. Exact behaviours targeted were not described.
13. Using Social Stories™ to improve the social behaviour of children with Aspergers Syndrome. Sansosti & Powell-Smith (2006).	Participants were not within the age range of interest.
14. The effects of Social Stories™ on the social engagement of children with Autism. Delano & Snell (2006)	Participants were not within the age range of interest.
15. Using a modified Social Story™ to decrease disruptive behaviour of a child with autism. Crozier & Tincani (2005)	Participants were not within the age range of interest. Stories do not follow the recommended Social Story™ format.
16. Teaching social skills to children with autism using Social Stories™: An empirical study. Demiri (2004)	Unable to access unpublished dissertation.
17. Using Social Stories™ to teach choice and play skills to children with autism. Barry & Burlew (2004)	Participants were not within the age range of interest.
18. Use of a Social Story™ intervention to improve mealtime skills of an adolescent with Aspergers syndrome. Bledsoe, Smith Myles & Simpson (2003)	Participants were not within the age range of interest.

Appendix 3 continued:

Social Stories™: Summary of excluded research papers

19. Using Social Stories™ to teach specific social skills to individuals diagnosed with autism. Feinburg (2002)	Unable to access unpublished dissertation.
20. An investigation of social-story effectiveness using reversal and multiple baseline designs. Staley (2002)	Unable to access unpublished dissertation.
21. Decreasing disruptive behaviour of children with autism using Social Stories™. Scattone, Wilczynski, Edwards & Rabian (2002)	Participants were not within the age range of interest.
22. Are Social Stories™ effective in modifying behaviour in children with autism? Romano (2002)	Unable to access unpublished dissertation.
23. Using Social Stories™ and Comic Strip Conversations to interpret Social situations for an Adolescent with Asperger Syndrome. Rogers & Smith Myles (2001)	Participants were not within the age range of interest.
24. Using Social Stories™ to enhance behaviour in children with Autism Spectrum Difficulties. Smith (2001)	Study did not measure baseline or outcome measures. Results based on parents and professional observations and impressions and scored on a Likert-type scale.
25. Social Stories™, written text cues and video feedback: effects on social communication of children with Autism. Thiemann & Goldstein (2001)	Effects of Social Stories™, written text cues versus video feedback not studied independently of each other.
26. Evaluating effects of a Social Story™ intervention on a young girl with autism. Norris & Dattilo (1999)	Participant was not within the age range of interest.
27. The use of Social Stories™ to reduce precursors to tantrum behaviour in a student with autism. Kuttler, Myles & Carlson (1998)	Participant was not within the age range of interest. 1 story did not follow the recommended Social Story™ guidelines.
28. Using Social Stories™ to teach social and behavioral skills to children with autism. Swaggart, Gagnon, Bock, Earles, Quinn, Myles & Simpson (1995).	Participants were not within the age range of interest. 2 stories did not follow the Social Stories™ format. Social Stories™ paired with response cost system for one subject.

Appendix 4:

Self Video-Modeling: Summary of excluded research papers

Paper	Reason for exclusion
1. The effects of video modeling with voiceover instruction on accurate implementation of discrete-trial instruction. Vladescu et al (2012)	Teaching of staff members.
2. An evaluation of preference for video and in vivo modeling. Geiger, LeBlanc, Dillon & Bates (2010)	Participants were not within the age range of interest. (video modelling referred to Peer Video Modelling.)
3. Incorporating video feedback into self-management training to promote generalisation of social intuitions by children with autism. Deitchamn, Reeve, Reeve & Progar. (2010)	Study focused on video feedback, not Self Video Modelling.
4. Two variations of video modeling interventions for teaching play skills to children with autism. Sancho, Sidener, Reeve & Sidener (2010)	Study utilised Peer Video Modelling.
5. Teaching socially expressive behaviors to children with autism through video modeling. Charlop, Dennis, Carpenter & Greenberg (2010)	Study utilised Peer Video Modelling.
6. Video preference assessment of students with autism for watching self, adults, or peers. Mechling & Moser (2010)	Study did not focus on the effectiveness of Self Video Modelling as an intervention.
7. The effectiveness of video modelling versus direct instruction for teaching gestural communication to children with autism spectrum disorder. Graves (2010)	Study utilised Peer Video Modelling.
8. Teaching generalized imitation skills to a preschooler with autism using video modeling. Kleeberger & Mirenda (2010)	Study utilised Peer Video Modelling.
9. Generalised effects of video modeling on establishing instructional stimulus control in children with autism: results of a preliminary study, Nikopoloulous, Canavan & Nikopoulous-Symrni (2009)	Study utilised Peer Video Modelling.
10. A comparison of Peer Video Modelling and Self Video Modelling to teach textual responses in children with autism. Marcus & Wilder (2009)	Target behaviour was naming novel letters (Greek and Arabic) – not a social behavioural skill.
11. Video Self Modeling as an Intervention to increase the Verbal Initiations of children with Autism Spectrum disorders. Murdock (2008)	Participant was not within the age range of interest.
12. Video modeling to reduce challenging behavior in individuals with autistic disorder. Fischer (2007)	Study utilised Peer Video Modelling.
13. Using video modeling for generalising toy play in children with autism. Paterson & Arco (2007)	Study utilised Peer Video Modelling.
14. Effects of video modeling and video feedback on peer-directed social language skills of a child with autism. Maione & Mirenda (2006)	Study utilised Peer Video Modelling and video feedback.
15. Using video Self-modelling to decrease inappropriate behavior. Graetz, Mastropieri & Scruggs (2006)	Participant was not within the age range of interest.
16. Using video-modeling and reinforcement to teach perspective-taking skills to children with autism. LeBlanc, Coates, Daneshvar, Charlop-Christy, Morris, Lancaster & Blake (2003)	Study utilised Peer Video Modelling. Interventions were not examined for effectiveness individually.
17. Self-modeling as an intervention to reduce disruptive classroom behavior. Possell, Kehle, McLoughlin & Bray (1999)	Subjects do not have diagnoses of Autism Spectrum Disorder. Subjects have diagnoses of Conduct Disorder.
18. Training responding behaviors in Students with Autism: Using Videotaped Self-Modeling. Buggey, Toombs, Gardiner & Cervetti (1999)	Participants were not within the age range of interest.

Appendix 5:

Peer Video Modelling: Summary of excluded research papers

Paper	Reason for exclusion
1. Establishing Verbal repertoires in children with Autism using Function-based Video Modeling. Plavnik and Ferreri (2011)	Used iPhone instead of TV monitor to display Peer Video Modelling images
2. Teaching socially expressive behaviours to children with autism through video modeling. Charlop, Dennis, Carpenter & Greenberg (2010)	Participants were not within the age range of interest.
3. Video preference assessment of students with autism watching self, adults or peers. Mechling & Moser (2010)	Participants were not within the age range of interest.
4. An evaluation of preference of video and in vivo modeling. Geiger, LeBlanc, Dillon & Bates (2010)	Participants were not within the age range of interest.
5. A comparison of the acquisition of play skills using instructor-created models and commercially available videos. Palechka & MacDonald (2010)	Used point of view video modelling
6. Two variations of video modeling interventions for teaching play skills to children with autism. Sancho, Sidener, Reeve & Sidener. (2010).	Used point of view video modelling.
7. Strategies for teaching children with autism to imitate response chains using video modelling. Tereshko, MacDonald & Ahearn (2010)	Target behaviour was a construction task, not a social behaviour.
8. Video modelling intervention to teach spontaneous requesting using AAC devices to individuals with autism: A preliminary investigation. Banda, Copple, Koul, Sancibrian & Bogschutz (2010)	Participants were not within the age range of interest.
9. Video modelling to improve task completion in a child with autism. Rayner (2010)	Participant was not within the age range of interest.
10. Video modelling intervention to teach spontaneous requesting using AAC devices to individuals with autism: A preliminary investigation. Banda, Copple, Koul, Sancibrian & Bogschutz (2010)	Participants were not within the age range of interest.
11. A comparison of Peer Video Modelling and Self Video Modelling to teach textual responses in children with autism. Marcus & Wilder (2009)	Target behaviour was naming letters- not a social behaviour.
12. Video-based intervention for individuals with Autism: Key questions that remain unanswered. Rayner, Carey & Sigafoos. (2009).	Review of literature.
13. Generalized effects of video modelling on establishing instructional stimulus control in children with autism: results of a preliminary study. Nikopoulous, Canavan & Nikopoulous- Smyrni. (2009).	Participants were not within the age range of interest.
14. Enhancing the conversation skills of a boy with Asperger's disorder through Social Stories™ and video modeling. Scattone (2008)	Participants were not within the age range of interest. Video modelling not studied independently.
15. Toilet training for children with Autism: The effects of video modeling. Keen, Branningan & Cuskelly (2007)	Video modelling using animation, therefore not peer modelling.
16. Combining video modeling and least-to-most prompting for establishing response chains. Murzynski & Bourret (2007)	Video modelling was not studied independently.
17. Video modelling to reduce challenging behaviour in individuals with autistic disorder. Fischer (2007)	Video modelling not studied independently.
18. Using Video-Modeling for generalisation toy play in children with autism. Paterson & Arco (2007)	Participants were not within the age range of interest.

Appendix 5 continued:

Peer Video Modelling: Summary of excluded research papers

19. Using Video Modelling to teach complex social sequences to children with Autism. Nikopoulos & Keenan (2007)	Participants were not within the age range of interest.
20. Using video modelled Social Stories™ to increase the social communication skills of children with high functioning autism/Asperger's syndrome. Sansosti (2006)	Study did not assess the efficacy of Peer Video Modelling.
21. A Comparison of two Group Delivered Social Skills Programs for Young Children with Autism. Kroeger, Schultz & Newsom (2006)	This study incorporated participants aged 4-6 years. It was not possible to separate the 4- and 5- year olds' results from those of the 6-year- olds; therefore an analysis could not be made which was pertinent to the age group of interest.
22. Effects of Video Modeling on social initiations by children with Autism. Nikopoulos & Keenan (2004)	Participants were not within the age range of interest.
23. Embedded video and computer based instruction to improve social skills for students with autism. Simpson, Langone &Ayres (2004)	Used computers instead of TV monitor to display Peer Video Modelling images
24. Teaching expressive labelling to children with autism via videotape modelling. Stoelb (2004)	Target behaviour was labelling items- not a pro social behaviour.
25. Using video modeling and reinforcement to teach perspective-taking skills to children with Autism. LeBlanc & Coates (2003)	Video modelling was not studied independently.
26. Promoting social initiation in children with autism using video modeling. Nikopoulos & Keenan (2003)	Participants were not within the age range of interest.
27. Teaching daily living skills to children with autism through instructional video modelling. Shipley-Benamou, Lutxker & Taubman (2002)	Social behaviour skills were not targeted.
28. A comparison of video modeling with In Vivo modeling for teaching children with Autism. Charlop-Christy, Le & Freeman (2000)	Participants were not within the age range of interest.
29. Increasing Play-related statements in children with Autism towards their siblings: Effects of Video Modelling. Taylor, Levin & Jasper (1999)	Participants were not within the age range of interest.
30. Using video modelling to improve conversation skills with autistic children: a comparative of obsessions and non-obsessions as topics. Haymes (1995)	Unable to locate unpublished dissertation.
31. Effects of videotape instructional package on purchasing skills of children with autism. Alcantara (1994)	Study did not research video modelling independently.
32. Teaching Autistic Children conversational speech using video modelling. Charlop & Milstein (1989)	Participants were not within the age range of interest.

Appendix 6:

Target Skills: Definitions of Operational Terms

Term	Definition
Scripted play/imitation – actions	The participant successfully imitates the motor activities required for each step of the game play taught by the intervention (MacDonald et al., 2005)
Unscripted actions	The participant engages in an action(s) which, although not part of the script/prescribed game play, are still relevant to the general concept of the game play, e.g. using a component out of sequence, wheeling a part along the floor, imaginative play with components of a toy (MacDonald et al., 2005)
Scripted verbalisations/ imitation	The participant makes a vocal statement that matches that of the intervention script, or comprehensible approximation of same. Alternatively if similar statements were used with altered, added or omitted components such as conjunctions, pronouns, articles etc., this was also considered acceptable. (Stevenson, Krantz, & McClannahan, 2000)
Unscripted verbalisations	A verbalisation from the participant which is not a part of the script but nonetheless is relevant to the context of the toy/game play. (MacDonald et al., 2005)
Eye Contact	Eye contact for a minimum of one second was deemed adequate. A gesture approximating eye contact (e.g. the child looking towards any part of the therapist's face) was also considered acceptable for the purposes of this study, to allow for possible anxiety problems. (University of Wisconsin-Madison, 2005)
Game begins	When one piece of game is put in place or near it.
Game ends	When all pieces are put in place.
Initiating play verbally	"Let's play" or approximation of same that is comprehensible within 30 seconds.
Initiating play non-verbally	Purposeful gesture towards the therapist's hands or towards the toy of interest (pointing towards or touching toy and therapist's hand) within 30 seconds.
Waiting to commence play	Participant waits while therapist says "OK"
Turn Taking	A process by which interactants allocate the right or obligation to participate in an interactional activity (Sacks, Schegloff & Jefferson, 1974). The most common everyday application of this is taking successive turns in a uniform manner during conversation and game play, through which sharing and reciprocal socialisation is achieved. The most common and simplest form of turn taking occurs between responsive pairs, as in the game play and script for this study. Successful game play for this study was defined as the participant 1) taking his/her turn in the conversation/game play, and then 2)successfully waiting for the therapist to complete his turn in the game/part in the conversation/game play.

Appendix 6 continued:

Target Skills: Definitions of Operational Terms

Participant's turn taking request - verbally	"My turn" or approximation of same.
Participant's turn taking request - non-verbally	Participant taps hand towards own chest (gesture) or approximation of same.
Participant's turn – turn taking	Participant takes his/her turn involving one step of the game.
Waiting a turn	Participant waits while the therapist takes a turn.
Sharing	Handing a piece toward the therapist and waiting a turn after the therapist says "My turn".
Ending play verbally	"Finished, put away" or approximation of same, within 30 seconds when a game is finished.
Ending play non-verbally	Child puts the game away into the large "finished" box, or approximation of same, within 30 seconds when a game is finished.
Prompt dependence	Prompt dependence comes when students need a prompt from a teacher or classroom aide in order to perform an academic, functional or vocational task.
Prompt seeking eye contact etc	Looking worried, eye contact, slow unknowing movements towards adult

Appendix 7:

Consent form for typically developing children to trial stimuli

Dear Parent,

I am undertaking a research PhD at the Welsh Centre for learning Disabilities, School of Medicine, Cardiff University. The purpose of this research is to compare the effectiveness of 3 types of intervention for children who are on the Autism Spectrum. The purpose of this video today is to highlight how typically developing children play with toys and interact with each other and adults. It will also help grade the toys in order of preference and game play for a task analysis on the toys. This video will only be seen by the researchers. The dialogue may be transcribed and used as a basis for the new videos in which actors will reinact this dialogue. These new videos will be used to teach the children on the spectrum appropriate play and social skills. The video recording will be held on a memory stick in a locked safe box in a locked filing cabinet for the duration of the study. Following this, the videos will be deleted.

Please complete the slip below to confirm your consent to your child being videoed today. You can return the slip to me in the envelope provided. If you have any queries please contact me on ##########

Many thanks for your help.

Yours sincerely

_____
Jamie Szymanski

I _____ give permission for _____ to be videotaped by Jamie Szymanski, PhD research student, as part of his PhD. I understand that this video will only be viewed by the researchers.

Date: _____ Signed: _____

Relationship to child: _____

Appendix 8: Excluded Stimuli

1. **Mr Mover:** A learning aid that combines two toys into one. Can be taken apart and re-assembled into a car or a rocking boat. Familiarizes children with sizes, colours and counting. This toy has been given an age certificate of 2 years +.

Figure 1: Mr. Mover

Initial and Expanded Steps for Teaching Mr. Mover

1. Pick blue ring up and put on stick
2. Pick green ring up and put on stick
3. Pick yellow ring up and put on stick
4. Pick orange ring up and put on stick
5. Pick face up and put on stick
6. Pick red hat up and put on stick
7. Wheel the toy at least 10cm

This toy was excluded as the act of moving the toy back and forth at the end was deemed to result in a lack of clarity regarding when the game was finished. During the trial sessions, the children continued to wheel the toy around and seemed uncertain of when to finish the game.

2. **Baby's Cot play** (by the Voila brand)

This toy includes: A Baby's cot (by the Voila brand), and several familiar generic objects as well as a baby doll and two teddies. The toys have all been given an age certificate of 24 months +. These toys were felt to work as a good tool for teaching symbolic play.

Figure 2: Baby's Cot

1. Put mattress into cot
2. Put pillow into cot
3. Put baby into cot
4. Give baby cup
5. Give baby star
6. Put blanket over baby
7. Rock cot back and forth at least once.

This toy was excluded as the act of moving the toy back and forth at the end was deemed to result in a lack of clarity regarding when the game was finished. During the trial sessions, the children continued to rock the cot and seemed uncertain of when to finish the game. Also the nature of game play in involving symbolic play was felt to be too dissimilar to the other toys selected as stimuli for this study.

3. **Slot Mobile** (by the Voila brand)

A simple toy that helps to develop basic recognition and hand-eye coordination. Children will enjoy fitting the 10 pieces of different shapes and colours into the 5 geometrically shaped slots in the vehicle with a lion picture on the front. The sorting pieces can also be used for simple constructions. This toy has been given an age certificate of 1 year +.

Figure 3: Slot Mobile

1. Pick up yellow cuboid piece and put into corresponding slot
2. Pick up blue cylindrical piece and put into corresponding slot
3. Pick up red pyramid shaped piece and put into corresponding slot
4. Pick up orange semicircular piece and put into corresponding slot
5. Pick up blue cylindrical piece and put into corresponding slot
6. Pick up yellow cuboid piece and put into corresponding slot
7. Wheel toy for at least 10cm.

This toy was excluded as the act of moving the toy back and forth at the end was deemed to result in a lack of clarity regarding when the game was finished. During the trial sessions, the children continued to wheel the toy around and seemed uncertain of when to finish the game.

4. **Baby's Room** (by the Voila brand)

This toy includes: a baby, a crib with mattress and mobile, a stroller, and high chair, a baby gym. This toy has been given an age certificate of 3 years +. A small see through tub aware box was added to this toy for the intervention to hold the toy in.

Figure 4: Baby's Room

1. Take baby out of the small box and put on table
2. Take mattress out of small box and put on table
3. Take crib out of small box and put on table
4. Take high chair out of small box and put on table
5. Take baby gym out of small box and put on table
6. Take stroller out of small box and put on table
7. Pick up mattress and put in crib
8. Pick up baby and put baby in crib
9. Gesture sleeping and snore
10. Pick up baby and put baby in high chair
11. Gesture eating and say "yum yum"
12. Pick up baby and put in baby gym
13. Tap the coloured strip with a finger
14. Pick up baby and put in stroller
15. Walk baby in stroller at least 5 cm

This toy was excluded as there were too many pieces involved. Also, it was a toy which lent itself very much towards imaginative play and during the trials the children became distracted with imaginative play sequences of their own, thus interrupting the skill sequence and timings.

5. Car Slide

This car slide has 7 cars, one blue, one yellow, one red, one purple, one black, one orange and one green. The wooden car slide allows the cars to slide or tumble down four adjoining slides in an alternating direction. This toy has been given an age certificate of 24 months +. A small see through Tupperware box was added to this toy for the intervention to hold the toy in.

Figure 5: Car slide

1. Pick up the blue car and let it go on the top of the slide
2. Pick up the yellow car and let it go on the top of the slide
3. Pick up the red car and Leave the blue car go on the top of the slide.
4. Pick up the green car and let it go on the top of the slide
5. Pick up the orange car and let it go on the top of the slide
6. Pick up the black car and let it go on the top of the slide
7. Pick up the purple car and let it go on the top of the slide

This toy was excluded as each car reappeared at the bottom of the slide after it had been let go at the top by the child, thus creating confusion as to whether each car could be used more than once, and again uncertainty as to when the game was finished.

Appendix 9: Checklist for Social Stories™ Validity

Social Story™

Author(s):_____

Name of reviewer:

_____

Title of Social Story™:

_____

Participant for whom the Social Story™ is intended:

_____

Stimulus used:

_____

Social Story™

Sentence types used:

*Coaching:*_____ *Descriptive:* _____

*Perspective:*_____ *Affirmative:* _____

Control: _____ *Co-operative:* _____

Sentence Ratio: Number of coaching sentences/Total number of sentences:

Number of coaching sentences:_____

Total number of sentences:_____

Ratio: No. coaching sentences/total no. sentences:_____

Appendix 9 continued: Checklist for Social Stories™ Validity

Sentence ratio as per guidelines by Gray adhered to? Yes _____ No _____

Sentence Structure Validity

Do each of the coaching, descriptive, affirmative, perspective, co-operative and control sentences adhere to their function as per the guidelines described by Gray?

Yes_____ No _____

If no, state how

_____

_____

Did the Social Story™ incorporate the desired target behaviours? Yes ____No_____

If no, state why

_____

_____

Further Considerations

Did the Social Story™ include all relevant components?

_____

_____

Was anything relevant omitted from the Social Story™?

_____

Further Comments:

_____

Appendix 10:

Social Story™ Sentence Types and Their Identified Purpose

Summary of the possible sentences types contained in Social Stories™ based on Gray (2000, 2010).

Types of sentence	Description	Sentence ratio
Descriptive	Truthful, opinion and assumption free statement of fact. They contain answers to "why" questions. Used to describe the setting and situation at hand, and who is involved.	Unlimited
Perspective	Statements that refer to an individual's internal state-thoughts, feelings, beliefs or physical condition. Describes feelings of other people within the situation in question.	Unlimited
Coaching	Suggested appropriate responses to social situations.	Less than half the total sentence number
Affirmative	These express a commonly shared value or opinion within a given culture.	Unlimited
Control	Statements written by the individual to identify strategies that they could use to help them in a situation. Analogies sometimes used to help further understanding of the situation.	1 (additional to basic ratio)
Co-operative	Sentences that identify what others will do to assist the individual	1 (additional to basic ratio)
Partial	These sentences encourage the individual to make guesses regarding the next step in the situation-such as the possible responses of others, their own thoughts and feelings and possible responses.	1 (additional to basic ratio)

Appendix 11: Baseline Data Form for Social Stories™

General Information

Date: _____ Time: _____

Day of intervention: _____

Name of participant**:** _____ Age: _____

Stimulus used: _____

Literacy level: _____

Comprehension: _____

Concentration span of >1 min for attending to a story? Yes____ No ____

Other relevant information: _____

Baseline Observations

Target behaviours to be worked on:

- Eye contact ☐
- Initiating play ☐
- Requesting ☐
- Getting the other person's attention ☐
- Turn taking and waiting ☐
- Sharing ☐
- Ending Play ☐
- Other

_____

Appendix 12: Self Video Modelling Validity Checklist

Participant: _____

Video duration: _____

Did the video incorporate the desired target behaviours? Yes _____ No_____

If no, state why

_____

Adequate camerawork? (camera held steady without quick/excessive movements)?

Yes ____ No _____

Any distracting background noise?

Yes _____ No _____

Was there appropriate zooming in on objects/people of interest to avoid visual distractions?

Yes _____ No _____

Each step of the game play demonstrated clearly?

Yes _____ No _____

Further Considerations

Did the video include all relevant components?

_____

Was anything relevant omitted from the video?

_____

Further Comments:

Appendix 13: Baseline Data Form for Self Video

General Information

Date: _____ Time: _____

Day of intervention:_____

Name of participant**:** _____ Age:_____

Stimulus used:_____

Attention Span duration for T.V:_____

Comprehension:_____

Other relevant information:_____

_____

Baseline Observations

Target behaviours to be worked on:

- Eye contact ☐
- Initiating play ☐
- Requesting ☐
- Getting the other person's attention ☐
- Turn taking and waiting ☐
- Sharing ☐
- Ending Play ☐
- Other

  _____

Appendix 14: Parent Questionnaire

Individual preferences and reinforcements

1. Activities preferred

_____

2. Foods preferred

_____

3. Can he/she attend to a television for at least a minute?

_____

4. Favourite games/toys

_____

5. Preferred people

_____

6. Any other reinforcing objects/specific aversions?

_____

Areas for Improvement/Areas of Difficulty

_____

_____

Appendix 15: Creating and Implementing the Self Video

Creating the Self Video

1. A task analysis of the stimuli and game play involving the target social behaviour skills should be conducted.
2. The target behaviours should be defined so that they are observable and measurable.
3. The therapist conducts a baseline assessment to identify which elements of the task analysis the participant can perform without assistance.
4. Correct equipment: the therapist must have access to two basic pieces of equipment: (a) something to make the video and (b) something to show the video (Sigafoos et al., 2007) i.e. a video recording device (e.g., hand-held camera, computer technology for editing and DVD player/monitor). The therapist should be proficient in usage of this equipment.
5. An individualised script incorporating the task analysis should be written, including what will be said and done on the video. The tasks targeted in the video should only include those which the child had difficulty with at baseline. If a task or behaviour was achieved at baseline, it was then excluded from the Self Video.
6. The Self Videos require three people for successful completion: the target participant, the therapist, and another trained person for prompting. Only skills that are within the child's repertoire can be taught via Self Video Modelling.
7. Following this, each step in the completion of a specific task should be videotaped, ensuring that the camera is held steady, with adequate picture and sound quality. Prompting is used where necessary to achieve the target skills/behaviours.
8. The videotape is then edited to include only the target behaviours and actions. Prompts, multiple attempts and inappropriate/off task behaviours are edited out. At this point, a review of the child's ability and of the task at hand should be carried out to assess whether Self Video Modelling is a suitable medium in teaching the task to this participant.
9. Each behaviour should take approx. 30-40 seconds as a maximum on the resultant videotape.
10. Initially, the setting used for the video should be the same as that in which the child will be encountering the stimuli. Generalisation to other settings may be carried out at a later stage.
11. The desired actions, and the objects and people involved in the task, should be emphasised using close-up and zoom techniques when possible. This is to allow the child to imitate the actions the therapist wishes to teach and to filter out distractions.
12. The video should be further edited by the therapist, and any errors/extraneous events or noises removed.
13. Another baseline evaluation should be carried out following the completion of the video to assess for acquisition of skills during the making of the video.

Appendix 15 continued:

Implementation of the Self Video Model

1. The video should be shown in the same setting as that in which it was recorded at least initially.
2. The participant should be allowed to watch the video clip at least once.
3. The therapist allows the participant to watch the video. If required, the participant is prompted to in order to gain and/or keep his/her attention.
4. The video should be stopped after each step and the participant encouraged to display the desired behaviour.
5. The participant should be allowed at least 30 seconds to demonstrate the modelled behaviour.
6. The participant should be shown the video clip again if he/she fails to imitate the desired behaviours.
7. The number of viewings necessary for the participant to successfully display the desired behaviour should be noted.
8. Encouragement: It is important to offer encouragement, usually in the form of verbal praise, where the child successfully displays the desired behaviour. Also, whether or not the child has successfully imitated the behaviour in question, encouragement in the form of verbal praise should be offered if the child is behaving well and not exhibiting disruptive behaviours.
9. A programme for maintenance and generalisation of the desired behaviours across different settings, stimuli, people and time, should be put in place.
10. Assessment of the effectiveness of the Self Video Modelling process for an individual participant is quantified. Ongoing progress data including that from maintenance and generalisation probes is then examined to determine whether changes to the video modeling strategy and techniques are needed to improve the progress of an individual participant (Sigafoos et al., 2007).
11. Fading of prompting and of the use of video can be used as the participant performs the desired behaviours more and more independently. This also promotes maintenance of the skills gained.
12. Troubleshooting: The therapist adjusts the video strategy on identification of problems using questions such as:

    - Has the participant watched the video enough times?
    - Is the participant watching the video, but not focusing on the tasks in hand?
    - Does the participant require prompting to pay and keep attention, and to perform the desired behaviours?
    - Is the appropriate amount and type of reinforcement being given for performance of the desired behaviours?
    - Is the video too complex?

Appendix 16:

Example of Video Script for Self and Peer Video Modelling

Initiating Play

Participant: “Let’s play”
Adult: “OK”

Turn Taking

Participant: “My turn”
Adult: “My turn”
Participant: “My turn”
Adult: “My turn”
Participant: “My turn”
Adult: “My turn”
Participant: “My turn”

Finishing Play

Participant: “Finished, put away”
Adult: “OK”

Appendix 17: Peer Video Modelling Validity Checklist

Participant: _____

Video duration: _____

Did the video incorporate the desired target behaviours? Yes _____ No_____

If no, state why

_____

Adequate camerawork? (camera held steady without quick/excessive movements)?

Yes ____ No _____

Any distracting background noise?

Yes _____ No _____

Was there appropriate zooming in on objects/people of interest to avoid visual distractions?

Yes _____ No _____

Models used are engaging and lively?

Yes _____ No _____

Acting is suitably natural and not stilted?

Yes _____ No _____

Each step of the game play demonstrated clearly?

Yes _____ No _____

Further Considerations

Did the video include all relevant components?

_____

Was anything relevant omitted from the video?

_____

Further Comments:_____

Appendix 18: Peer Rating Form:

Demographic Information for Video Model Actors

	Ethnicity	Age	Gender
Actor 1	Caucasian	6 years 2 months	Male
Actor 2	Caucasian	6 years 1 months	Female

Peer Video Model Validation Panel Protocol for Actor 1

1. What were the strengths of the video model?
2. Did the video model demonstrate clear steps for each of the social skills?
3. Were the actors representative of typically developing children?
4. What were the limitations of the video model?
5. What steps did you observe for each skill?

Peer Video Model Validation Panel Protocol for Actor 2

1. What were the strengths of the video model?
2. Did the video model demonstrate clear steps for each of the social skills?
3. Were the actors representative of typically developing children?
4. What were the limitations of the video model?
5. What steps did you observe for each skill?

Appendix 19: Creating and Implementing Peer Videos

Creating the Peer Video

1. A task analysis of the stimuli and game play involving the target social behaviour skills should be conducted.
2. Target behaviours should be defined so as to be observable and measurable.
3. The therapist should conduct a baseline assessment to identify which elements of the task analysis the participant can perform without assistance.
4. One model should be used preferably for the creation of the video. When using Peer Video Modelling, the model should be of a similar age and gender to the participant.
5. As for SVM, correct equipment should be used.
6. A script based on the task analysis should be written.
7. Each step in the completion of a specific task should be videotaped, ensuring that the camera is held steady, with adequate picture and sound quality.
8. Each behaviour as demonstrated by the model should take 30-40 seconds as maximum.
9. The setting of the video should be the same as that in which the participant will be encountering the stimuli. Generalisation to other settings may be carried out at a later stage.
10. The desired actions, and the objects and people involved in the task, should be emphasised using close-up and zoom techniques as appropriate. This is to allow the child to imitate the actions the therapist wishes to teach and to filter out distractions.
11. The video should be edited by the therapist, and any errors/prompts/extraneous events or noises removed.

Appendix 19 continued:

Implementation of the Peer Video Model

1. The video should be shown in the same setting as that in which it was recorded at least initially.
2. The participant should be allowed to watch the video clip at least once.
3. The therapist allows the participant to watch the video. If required, the participant is prompted to in order to gain and/or keep his/her attention.
4. The video should be stopped after each step and the participant encouraged to display the desired behaviour.
5. The participant should be allowed at least 30 seconds to demonstrate the modelled behaviour.
6. The participant should be shown the video clip again if he/she fails to imitate the desired behaviours.
7. The number of viewings necessary for the participant to successfully display the desired behaviour should be noted.
8. Encouragement: whether or not the child has successfully imitated the behaviour in question, encouragement in the form of verbal praise should be offered if the child is behaving well and not exhibiting disruptive behaviours.
9. A programme for maintenance and generalisation of the desired behaviours across different settings, stimuli, people and time, should be put in place.
10. Assessment of the effectiveness of the video modelling process for an individual participant is quantified. Ongoing progress data including that from maintenance and generalisation probes is then examined to determine whether changes to the video modeling strategy and techniques are needed to improve the progress of an individual participant (Sigafoos et al., 2007).
11. Fading of prompting and of the use of video can be used as the participant performs the desired behaviours more and more independently. This also promotes maintenance of the skills gained.
12. Troubleshooting: The therapist adjusts the video strategy on identification of problems using questions such as:

    - Has the participant watched the video enough times?
    - Is the participant watching the video, but not focusing on the tasks in hand?
    - Does the participant require prompting to pay and keep attention, and to perform the desired behaviours?
    - Is the appropriate amount and type of reinforcement being given for performance of the desired behaviours?
    - Is the video too complex?

Appendix 20: Baseline Data Form for Peer Video

General Information

Date: _____ Time: _____

Day of intervention: _____

Name of participant**:** _____ Age:_____

Stimulus used: _____

Attention Span duration for T.V:_____

Comprehension:_____

Other relevant information:_____

_____

Baseline Observations

Target behaviours to be worked on:

- Eye contact ☐
- Initiating play ☐
- Requesting ☐
- Getting the other person's attention ☐
- Turn taking and waiting ☐
- Sharing ☐
- Ending Play ☐
- Other

  _____

Appendix 21: Peer Actor Consent Form

Dear Parent,

I am undertaking a research PhD at the Welsh Centre for learning Disabilities, Cardiff University. The purpose of this research is to compare the effectiveness of 3 types of interventions for children who are on the Autism Spectrum. The purpose of this video today is to reinact how typically developing children play with toys and interact with each other and adults. This video will be viewed by children on the Autism Spectrum aged 36-72 months and by their families. It will also be seen by the researchers. These videos will be used to teach the children on the spectrum appropriate play and social skills. When not in use, the video recording will be held on a memory stick in a locked safe box in a locked filing cabinet for the duration of the study. Following this study, the videos may be used as a teaching tool by Jamie Szymanski.

Please complete the slip below to confirm your consent for your child to be videotaped today. You can return the slip to me in the envelope provided. If you have any queries please contact me on #########

Many thanks for your help.

Yours sincerely

_____

Jamie Szymanski

I _____ give permission for _____ to be videotaped by Jamie Szymanski, PhD research student, as part of his PhD. I understand that this video will be viewed by children on the Autism Spectrum aged 36-72 months and their families and by the researchers and the university supervisors.

Date: _____ Signed: _____

Relationship to child: _____

I _____ give permission to be videotaped by Jamie Szymanski, PhD research student, as part of his research PhD. I understand that this video will be viewed by children with Autism aged 36-72 months and their families and by the researchers and the university supervisors.

Date: _____ Signed: _____

Appendix 22: Ethics Application: University College Cork

UCC Social Research Ethics Committee (SREC)

ETHICS APPROVAL FORM

Name of applicant	Jamie Szymanski Date 26/04/2012
Contact Details	Phone XXXXXXXXXX jamieszymanski@XXXXX
Department/Unit	Cardiff University, School of Medicine.
Title of project	**A comparative evaluation of Social Stories, Peer Video Modeling and Self Video Modeling in the teaching, maintenance and generalisation of Social Behaviour skills with children aged 36-72 months on the Autism Spectrum**

		YES	**NO**
1	Do you consider that this project has significant ethical implications?		No
2	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	Yes	
3	Will participation be voluntary?	Yes	
4	Will you obtain informed consent in writing from participants?	Yes	
5	Will you tell participants that they may withdraw from the research at any time and for any reason, and (where relevant) omit questionnaire items to which they do not wish to respond?	Yes	
6	Will data be treated with full confidentiality / anonymity (as appropriate)?	Yes	
7	If results are published, will anonymity be maintained and participants not identified?	Yes	
8	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?	Yes	
9	Will your project involve deliberately misleading participants in any way?		No

Appendix 22 continued:

10	Will your participants include schoolchildren (under 18 years of age)?	Yes	
11	Will your participants include people with learning or communication difficulties?	Yes	
12	Will your participants include patients?		No
13	Will your participants include people in custody?		No
14	Will your participants include people engaged in illegal activities (e.g. drug taking; illegal Internet behaviour)?		No
15	Is there a realistic risk of participants experiencing either physical or psychological distress?		No
16	If yes to 15, has a proposed procedure, including the name of a contact person, been given? (see no 23)	N/A	N/A

DESCRIPTION OF THE PROJECT

17. Aims of the project

The purpose of this research is to identify the most effective approach in the teaching, maintenance and generalization of social behaviour skills to a person on the Autism Spectrum to inform future best practice interventions. The following approaches will be analysed and compared: Social Stories, Peer Video Modeling and Self Video Modeling.

Appendix 22 continued:

18. Brief description and justification of methods and measures to be used (attach copy of questionnaire / interview protocol / discussion guide / etc.)

Experimental design: Counter-balancing method involving Social Stories, Self Video Modeling and Peer Video Modeling:

27 children will be recruited to participate in the study. This design will provide counterbalancing of the conditions across participants, interventions and games to control for condition order effect and pairing of intervention media with game type. Each child will be allocated a number according to the sequence in which he/she is recruited.

Condition Counterbalancing by Pairing of Independent Variables and Order of Condition Presentation

- Each game has been paired with each media type intervention, making 9 different pairs (conditions) e.g., wooden puzzle + social stories, wooden puzzle + peer video, wooden puzzle + self video (and likewise with each of the other games + intervention media type).
- Each pairing of game + intervention media type will be presented 3 times as first condition in the sequence (e.g. condition 1), 3 times as second condition in the sequence (e.g. condition 2), 3 times as third condition.
- All the children will be taught the target skills. This will be then adapted into a longitudinal study, including maintenance and generalisation probes.

1. **Baseline:** observation in target setting before intervention
2. **Intervention phase:** observation and evaluation following introduction of set intervention (i.e. social stories etc)
3. **Generalisation probe:** During the weeks following intervention, each child will receive probes for generalisation of target behaviours across people and location in the contextually similar event of stacking rings.
4. **Maintenance probe:** One month following intervention, each child will receive probes for maintenance of the target behaviours in the original context of wooden puzzle play. Following this, all children who do not demonstrate maintenance and generalisation will be taught the final event to criterion level. If it is proven, following analysis of the results, that a certain intervention(s) are more beneficial in teaching children on the Autism Spectrum a social behaviour skill, participants will be offered deferred sessions within 6 months of the completion of the project utilizing that intervention type(s).

Tools to be used:

- A Social Story on the skills will be created following Gray's (2010) guidelines on writing social stories.
- A Peer-Modeling video will be created specifically outlining the target skills.
- A Self-Modeling video will be created outlining the same skills with the child in the target settings.
- Individualised script outlining the study to be read to the participants to support the child's understanding that they can withdraw from the study.
- I have access to Speech and Language therapists who are trained Social Story writers.
- I have also completed a day course on writing Social Stories.
- I have a University Diploma in Multimedia and have all the required equipment.
- The Developmental Behaviour Checklist – Autism Screening Algorithm (Einfeld & Tonge, 2002) will screen for ASD as a back-up for formal diagnosis.
- Vineland Adaptive Behaviour Scales: Classroom edition (Sparrow, Balla & Cicchetti, 1985) will be used to assess levels of adaptive functioning.
- Preschool Language Scales 3 UK (PLS 3UK) (Zimmerman, Steiner, Pond, Boucher and Lewis (1997)) will be used to assess the receptive and expressive language skills of the participants.
- I am trained in direct observation techniques and have access to other trained observers for inter-rater reliability observations when required.

Data Analysis

If parametric assumptions for normal distribution are met, outcome data will be analysed using one-way ANOVA repeated measures across four conditions. The Friedman will be the non-parametric alternative.

19. Participants: recruitment methods, number, age, gender, exclusion/inclusion criteria

- 27 children aged 36-72 months with a diagnosis of Autism Spectrum Disorder/Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS)/Asperger's Syndrome with normal or borderline/mild intellectual difficulty. Children on the Autism Spectrum are not a homogeneous population. Additionally, intervention work with children with ASD is specialized, exacting

and time consuming. Therefore a small sample size will be used so that the optimum amount of data can be obtained through the careful, systematic design of experiments. This will allow the research to be included in future systematic reviews of the interventions to support best working practice.

20. Concise statement of ethical issues raised by the project and how you intend to deal with them

All participation in the study will be on a voluntary basis. A script has been written for the children participating in the study in order to help them to understand that they can finish playing at any point during a game should they so wish.

21. Arrangements for informing participants about the nature of the study (cf. Question 3)

All eligible participants will be informed by post of the study and will return the form enclosed to indicate their consent to participate in the study.

22. How you will obtain Informed Consent - cf. Question 4 (attach relevant form[s])

All eligible participants will be informed by post of the study and will return the form enclosed to indicate their consent to participate in the study. A simple individualised story will be read to the children outlining the study and explaining that they can withdraw at any time. This story will be read with the child at the start of each session and consent will be obtained from the child verbally in the presence of the child's guardian(s) and the researcher.

23. Outline of debriefing process (cf. Question 8). If you answered YES to Question 15, give details here. State what you will advise participants to do if they should experience problems (e.g. who to contact for help).

The parents/guardians will be informed throughout the study and at the end of the study about how their child is progressing. This will ensure that any problems or difficulties that arise will be dealt with immediately.

24. Estimated start date and duration of project.

This study will be the basis for my PhD. My PhD formally begins July 2010 and I aim to start my clinical trials May 2012, finishing October 2013.

Signed _____ Date _____26.04.2012_____

Applicant

Appendix 23: Ethical Consent from University College Cork

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Mr. Jamie Szymanski,
[redacted]

Oifig an Leas - Uachtaráin Taighde agus Nuálaíochta
Office of the Vice President for Research and Innovation

Urlár 4, Bloc E,
Áras na hEolaíochta Bia,
Coláiste na hOllscoile Corcaigh,
Bóthar an Choláiste,
Corcaigh, Éire.

4th Floor, Block E,
Food Science Building,
University College Cork,
College Road, Cork, Ireland.

T +353 (0)21 4903500
E vpresearch@ucc.ie
www.ucc.ie

2nd May 2012

Dear Jamie,

Thank you for submitting your revised research (project entitled ***A comparative evaluation of Social Stories, Peer Video-Modelling and Self Video-Modelling in the teaching, maintenance and generalisation of Social Behaviour skills with children aged 3-6 years on the Autism Spectrum*** #83r) to SREC for ethical perusal. I am pleased to say that the amended proposal is acceptable and we are happy to grant approval

We wish you every success in your research.

Yours sincerely,

S Hammond

Sean Hammond
Chair of Social Research Ethics Committee

Professor Anita R. Maguire BSc PhD CChem MRSC
Vice President for Research and Innovation

Ollscoil na hÉireann, Corcaigh
National University of Ireland, Cork

Appendix 24: Consent from Cardiff University for Ethical Approval from University College Cork

15/09/2011

Dear Dr Freedman,

I am a PhD student at Cardiff University School of Medicine, but my research will be based in Co. Cork , Ireland. On June of 2010 , I applied for ethical approval from your office,
while also applying for approval from University College Cork (UCC). I have now gained ethical approval from UCC. Do I still need to gain ethical approval from Cardiff University?

Please find attached the following:

1. A letter you previously sent to the UCC ethics Committee.
2. UCC, SREC accepted application letter.
3. PhD Application Form
4. Letter-information and consent form.

Please don't hesitate to contact me with any questions you have in regards to this.

Tel: 00353-XXXXXXXXXX

Regards
JAMIE SZYMANSKI
[attachment "CU Ethics Letter.pdf" removed by Andrew Freedman/wmdarf/CardiffUniversity]
[attachment "SREC Accept Revised Application Jamie Szymanski #83r.pdf" removed by Andrew Freedman/wmdarf/CardiffUniversity]
[attachment "Jamie PhD Application Form.doc" removed by Andrew Freedman/wmdarf/CardiffUniversity]
[attachment "Letter-Info-Consent Jamie.doc" removed by Andrew Freedman/wmdarf/CardiffUniversity]

Dear Jamie

No - as per my previous letter, ethical approval from UCC will suffice.
Good luck with your studies.

Best wishes

Dr Andrew Freedman
Reader & Consultant in Infectious Diseases
Cardiff University School of Medicine
Heath Park, Cardiff CF14 4XN
Tel: 029 2074 2184 (Sec)

Appendix 25: Letter Confirming Ethical Approval for both Study 1 and Study 2

ucc
Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Coláiste na nEalaíon, an Léinn Cheiltigh agus na nEolaíochtaí Sóisialta
College of Arts, Celtic Studies and Social Sciences

Scoil an Síceolaíochta Feidhmí
School of Applied Psychology

University College Cork,
Cork, Ireland.

T +353 (0)21 490 4551 / 4552
F +353 (0)21 427 0439
E infoapsych@ucc.ie
www.ucc.ie

22/4/2014

To whom it may concern,

I am happy to confirm that the work undertaken by Mr Szymanski for his PhD was reviewed and approved by the Social Research Ethics Committee, of which I am the Chair. I can further confirm that this approval covers both Study 1 and Study 2 of his thesis.

Yours faithfully,

S Hammond

Dr Sean Hammond

Chair of Social Research Ethics Committee, UCC

Professor John A Groeger
Head of School of Applied Psychology

Ollscoil na hÉireann, Corcaigh
National University of Ireland, Cork

Appendix 26: Participant Consent Form and Information Sheet

May 2012

Dear Parent (s),

I am contacting you to invite your child to take part in a research study evaluating the use of Social Stories™, Peer Video Modeling and Self Video Modeling in the teaching, generalisation and maintenance of social behaviour skills in children on the Autism Spectrum. Before you decide whether you would like to give your permission for your child to participate, it is important for you to understand why the research is being done and what it will involve. I have enclosed some information sheets and I ask that you take time to read them carefully before you decide. I have also enclosed a consent form which, if you agree to your child taking part, you will need to sign and return to me before we can commence.

I would like to emphasise that declining the invitation will in no way affect the intervention that your child currently receives through the Behavioural Services. Also, if you give your consent, you are still free to withdraw him/her from the study at any stage and without giving a reason. Your child's identity will be kept confidential throughout the project and publication of its results. However, you will be able to access any of his/her assessments or progress records on request.

I look forward to your response and do feel free to contact me on ########## if you need any further information.

Yours Sincerely,

Jamie Szymanski

PhD student.

Appendix 26 continued:

Information Sheet

A comparative evaluation of Social Stories™, Self Video Modelling and Peer Video Modelling in the teaching, generalisation and maintenance of Social Behaviour skills with children aged 36-72 months on the Autism Spectrum

Purpose of the Study. As part of the requirements for my PhD at Cardiff University, I am carrying out a research study. The study is concerned with the evaluation and comparison of Social Stories™, Peer Video Modelling and Self Video Modelling in the teaching, generalisation and maintenance of social behaviour skills in young children on the Autism Spectrum.

What will the study involve? The study will involve your child attending The Orchard Behavioural Clinic in Douglas for individual sessions focusing on learning specific functional social skills (e.g. play skills, requesting). Your child will be taught the skills through the use of Social Stories™, Peer Video Modelling or Self Video Modelling or a combination of these approaches.

- Social Stories™: this involves reading a specifically written story about the target skills with your child.
- Self Video Modelling: your child will watch a video of themselves performing the skills.
- Peer Video Modelling: your child watches a video of a model actor performing the skills.

Your child will be videoed during the study to document their progress and responses to the different interventions and to create the self modelling videos if required. Still photos may be taken of your child to be used in the creation of their personalised Social Stories™. These videos and photos must be viewed by Jamie Szymanski. However, consent for them to be viewed by Jamie's PhD supervisor(s) and research assistant is optional and will not affect your child's participation in this study. Assessments in the form of questionnaires and observational forms will be carried out by Jamie Szymanski on the first meeting to gain an understanding of your child's baseline abilities.

Why have you been asked to take part? You have been asked because your child is suitable for the study and I feel that it will provide valuable information on how best to support your child's learning in the future.

Do you have to take part? No. Participation is voluntary. To participate you need to sign the attached consent form and return it to me. If you decide to participate you should keep this information sheet and a copy of the consent form. You have the option of withdrawing before the study commences, even if you have agreed to participate, or you can withdraw after the study has started. You can withdraw within two weeks of the ending of the study and any data relating to your child can be destroyed.

The researcher will talk to your child before each study session outlining that day's activities. Before the session begins, your child will be asked to give their consent to participate in the session. This will take place in your presence.

Appendix 26 continued:

Will your participation in the study be kept confidential? Yes. I will ensure that no clues to your child's identity appear in the dissertation. Any extracts from what your child says that are quoted in the dissertation will be entirely anonymous.

What will happen to the information which you give: The data will be kept confidential for the duration of the study. On completion of the dissertation, they will be retained for a further six months and then destroyed. You can access any assessments or data relevant to your child during the study on request. The videos of your child's session and self modelling videos will be stored in a separate file on a password protected laptop. This laptop will be kept in a locked filing cabinet.

What will happen to the results? The results will be presented in the dissertation. Your child will be allocated a number and/or pseudonym for the purposes of preserving anonymity. They will be seen by my supervisors, a second marker and the external examiner. The dissertation may be read by future students on the course. The study may be published in an academic journal.

What are the possible disadvantages of taking part? I don't envisage any negative consequences for you or your child in taking part.

What if there is a problem? Before and after each session, I will discuss with you the focus of the session and how your child found the session. If there are any difficulties or problems you can contact me directly.

Timeline of the study?

Day one: meeting with Jamie Szymanski. The study is explained in more detail. Assessment of the child.

Day two: Baseline assessment at the behavioural clinic. Your child will be videoed while playing with three toys.

Day three: Interventions to teach social skills will be carried out at the behavioural clinic. Following the intervention, your child will be videoed to assess the acquisition of these skills.

Day four: One week following the intervention, maintenance and generalisation assessments will be carried out. This will involve your child playing with the toys used in the intervention, and two new toys. This will be done with the original therapist and then a research assistant.

Who has reviewed this study? Approval for the study has been granted from the Social Research Ethics Committee (SREC) at University College Cork.

Any further queries? If you need any further information, you can contact me: Jamie Szymanski: Tel: #########, email: ########@#####.com

If you agree to take part in the study, please complete the consent form overleaf.

Appendix 26 continued: Consent Form

Project title: A comparative evaluation of Social Stories™, Self Video Modelling and Peer Video Modelling in the teaching, generalisation and maintenance of Social Behaviour skills with children aged 36 -72 months on the Autism Spectrum

Names of researcher: Jamie Szymanski

Please sign your initials in the box

1. I confirm that I have read and understood the written information sheet for the above study and have had the opportunity to ask questions. ☐
2. I give permission for my child to be video recorded and have still photos taken. ☐
3. I give permission to Jamie Szymanski to edit these videos for the purposes of Self Video Modelling and to create a Self Video Modelling video, and to use the still photos for the creation of personalised Social Stories™. ☐
4. I give my permission for Jamie Szymanski to view these video recordings for the assessment of my child's results. ☐
5. I give my permission for Jamie's PhD supervisors and research assistant to view these video recordings for the assessment of my child's results. *(Consent for them to be viewed by Jamie's PhD supervisor(s) and assistant is optional and will not affect your child's participation in this study).* ☐
6. I understand that consent for my child's participation is voluntary and that I can withdraw him/her from the study at any time up until two weeks before the study ends without giving any reason or without his/her educational, health or legal rights being affected. ☐
7. I understand that my child's identity will be kept confidential throughout the project and its publication. I will, however, have access to any assessment or progress data relevant to the research on request. ☐
8. I understand that disguised extracts from the research may be quoted in the dissertation and any subsequent publication. ☐
9. I consent to my child taking part in the above study. ☐

Child's Name: _____ Parent/s Name: _____

Parent/s Signature: _____ Date: _____

Researcher's Signature: _____

Appendix 27: Examples of Scripts for Social Stories™ Used

Higher Language /Literacy Level

Social Story™ 1: Starting a Game

Sometimes, I want to start playing a game with someone. Playing a game with someone can be fun.

When I want to play a game with someone, it's important to get their attention.

I can get their attention by walking up close, looking at their face, taking their hands and saying "let's play".

This way they will know that I want to play. They might say "OK" or "Yes". Sometimes they might say other things that mean they want to play.

Sometimes, the other person does not want to play. This is OK. They

might say "No thanks" or "I don't want to".

If the person wants to play, then we can start playing the game.

Social Story™ 2: Taking Turns

Sometimes, playing a game with someone means taking turns. This means sharing the game, so that I take a turn, then the other person takes a turn.

A turn is when I pick up one piece of the game and put it in the right place.

When it's my turn I can point to myself and say "My turn" and take a turn of the game.

When it's the other person's turn they might say "my turn" or "my go" and take a turn. Sometimes they might say nothing and just take their turn, or point to themselves and take a turn.

I can hand them a piece when they say "my turn".

Then it's my turn again. I point to myself and say "my turn" and take a turn of the game.

The game goes on like this, every second turn.

Note: Each Social Story™, when presented to the participant, was presented on a single page following the Social Stories™ guidelines. Pictures were used where appropriate as per the guidelines. The Social Stories were adapted into praise Social Stories™ "recycling instruction into applause" as per Carol Gray's Social Story™ Book 2010, pp. lxxi.

Appendix 27 continued: Examples of Scripts for Social Stories™ Used

Higher Language /Literacy Level

Social Story™ 3: Finishing a game

Sometimes, I want to finish playing a game with someone.

There are different reasons for finishing a game. This might be because all the pieces have been put in and the game is finished. It might be because I am tired or thirsty or want some alone time. This is OK.

After finishing playing a game, we put it away.

When I want to finish playing a game with someone, it's important to tell them this.

I can say "Finished! Put away".

Then the other person will know that I want to finish playing the game. They might say "OK" or "Yes". They might say something else that means they understand.

Then I can put the game and the pieces into the finished box. The finished box has a sign on it with black and white squares.

Now we are finished playing the game.

Note: Each Social Story™, when presented to the participant, was presented on a single page following the Social Stories™ guidelines. Pictures were used where appropriate as per the guidelines. The Social Stories were adapted into praise Social Stories™ "recycling instruction into applause" as per Carol Gray's Social Story™ Book 2010, pp. lxxi.

Appendix 27 continued: Examples of Scripts for Social Stories™ Used

Lower Language /Literacy Level

Social Story™ 4: Starting a Game

Sometimes, it's fun to start playing a game with someone.

To do this I can walk up close, look at their face, take their hands and say "let's play".

They say "OK".

Then we can start playing the game.

Social Story™ 5: Taking Turns

Sometimes, playing a game with someone means taking turns.

When it's my turn I can point to myself and say "My turn" and take a turn of the game.

When it's the other person's turn they can say "my turn" and take a turn.

I can hand them a piece.

Then it's my turn again. I can point to myself and say "my turn" and take a turn of the game.

The game goes on, every second turn.

Social Story™ 6: Finishing a game

Sometimes, we want to finish playing a game with someone.

After finishing playing a game, we put it away.

When I want to finish, I can say "Finished! Put away".

The other person can say "OK".

Then I can put the game and the pieces into the finished box.

Then the game is finished.

Note: Each Social Story™, when presented to the participant, was presented on a single page following the Social Stories™ guidelines. Pictures were used where appropriate as per the guidelines. The Social Stories were adapted into praise Social Stories™ "recycling instruction into applause" as per Carol Gray's Social Story™ Book 2010, pp. lxxi.

Appendix 28: Checklist for the Order of Recording of Probes.

Participant number: _____

Counterbalancing order		
Condition 1	Condition 2	Condition 3

Day 2 Baseline

Baseline	5min break after each baseline	Intervention:	Game:	Social Skill:
1				
2				
3				

Day 3 Probe Day

Intervention 1 training session:			
Training session	Intervention:	Game:	Social Skill: Finish
1			
2			
3			
4			
If Self Video intervention record for *in vivo* probe:			
Intervention probe 1			
10 min break after intervention 1:			

Intervention 2 training session:			
Training session	Intervention:	Game:	Social Skill: Turn taking
1			
2			
3			
4			
If Self Video intervention record for *in vivo* probe:			
Intervention probe 1			
10 min break after intervention 2:			

Intervention 3 training session:			
Training session	Intervention:	Game:	Social Skill: Initiating play with Adult
1			
2			
3			
4			
If Self Video intervention record for *in vivo* probe:			
Intervention probe 1			
10 min break after intervention 3:			

Appendix 28 continued:

Day 4 Maintenance and Generalisation

Maintenance: same person with original games	5min break after each probe	Intervention:	Game:	Social Skill:
1				
2				
3				
Generalisation: same person with new game	5min break after each probe	Intervention:	Game:	Social Skill:
1				
Generalisation: same person with new game	5min break after each probe	Intervention:	Game:	Social Skill:
2				

Maintenance: new person with original games	5min break after each probe	Intervention:	Game:	Social Skill:
1				
2				
3				
Generalisation: new person with new game	5min break after each probe	Intervention:	Game:	Social Skill:
1				
Generalisation: new person with new game	5min break after each probe	Intervention:	Game:	Social Skill:
2				

Appendix 29: Procedures Checklist

Participant for whom the checklist is intended:

_____

Check off each numbered item.

Treatment Fidelity Checklist for Social Stories™: Day_____

Stimulus used:_____

Procedures Checklist

1. _____ Room prepared for participant. Personalised Social Story™ created for participant.
2. _____ Social Story™ is readily accessible for the participant.
3. _____ Child reads, or is read, the Social Story™.
4._____ Implementation guidelines followed.
5. _____ Comprehension questions are asked after child reads the Social Story™.
6. _____ Child immediately has the target stimuli at hand.

Treatment Fidelity Checklist for Peer Video Modelling: Day_____

Stimulus used:_____

Procedures Checklist

1. _____ Room is prepared for participant.
2. _____ Peer Video with model of same gender is readily accessible for the participant.
3. _____ Video is cued to the correct starting point.
4. _____ Participant watches the Peer Video.
5. _____ Participant immediately has the target stimuli at hand.

Treatment Fidelity Checklist for Self Video Modelling: Day_____

Stimulus used: _____

Procedures Checklist

1. _____ Room is prepared for participant.
2. _____ Self Video is readily accessible for the participant.
3. _____ Video is cued to the correct starting point.
4. _____ Participant watches the Self Video.
5. _____ Participant immediately has the target stimuli at hand.

Appendix 30: Checklist for Data Recording of Probes.

Participant number: _____

Counterbalancing order		
Condition 1	Condition 2	Condition 3

Baseline	Intervention:	Game:	Social Skill:		
1			X	Y	Z
2			X	Y	Z
3			X	Y	Z

Intervention 1:	Game:	Social Skill: Finishing game	
If Self Video intervention record for *in vivo* probe	X	Y	Z
Intervention probe 1	X	Y	Z

Intervention 2:	Game:	Social Skill: Turn taking	
If Self Video intervention record for *in vivo* probe	X	Y	Z
Intervention probe 1	X	Y	Z

Intervention 3:	Game:	Social Skill: Initiating play	
If Self Video intervention record for *in vivo* probe	X	Y	Z
Intervention probe 1	X	Y	Z

Maintenance probes: same person with original games	Intervention:	Game:	Social Skill:		
1			X	Y	Z
2			X	Y	Z
3			X	Y	Z
Generalisation probes: same person with new game	Intervention:	Game:	Social Skill:		
1			X	Y	Z
Generalisation probes: same person with new game	Intervention:	Game:	Social Skill:		
1			X	Y	Z

Maintenance probes: new person with original games	Intervention:	Game:	Social Skill:		
1			X	Y	Z
2			X	Y	Z
3			X	Y	Z
Generalisation probes: new person with new game	Intervention:	Game:	Social Skill:		
1			X	Y	Z
Generalisation probes: new person with new game	Intervention:	Game:	Social Skill:		
1			X	Y	Z

Appendix 31: Example of Children's Script for Consent

I can say "I don't want to "

Sometimes I go to Jamie's office with Mum. I will play games with Jamie. We might play Large Lego, Wooden Puzzle or Activity Bucket.

Jamie and I will be videoed playing with the toys.

When we have finished playing, Jamie and Mum will talk. I can

_____

Sometimes I don't want to play with Jamie, This is OK. I can say "to Mum "I don't want to.

Saying "I don't want to" is OK.

Note: Certain elements will be individualised for each child- e.g. use of pictures to aid understanding, what they can do while the parent and I are talking, who will be bringing them etc.

Appendix 32:

Data Recording Form – Page 1

Observer initials:	Recording starts when participant enters the clip and ends when game begins (a piece of game is picked up) or after 30 seconds or if participant walks away.

Participant number: Counterbalancing order:	Date:	Duration of video:
Intervention: Recording for:	Game:	Target Skill: Initiating Play with Adult

5 second intervals Shade intervals to denote end of recording time.	Scripted speech "Let's play" or approximation	Hand pull to initiate play or approximation	Unscripted speech	Unscripted behaviour	Eye contact 1 sec intervals Shade 1 second intervals to denote end of recording time.	Adult checklist Adult sitting on the seat with hands on lap "OK"
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Notes:_____

_____

_____

_____

_____

_____

_____

_____

Appendix 32 continued:

Data Recording Form - Page 2

Observer initials:	Recording starts when participant picks up a piece or initiated turn taking, and ends when last piece is in place or after 90 seconds or if participant walks away.

Participant number: Counterbalancing order:	Date:	Duration of video:
Intervention: Recording for:	Game:	Target Skill: Turn Taking

5 second intervals Shade intervals to denote end of recording time	Scripted speech "My turn" and or gesture or approximation	Takes a turn Appropriate (AP) Inappropriate (IN)	Unscripted speech	Unscripted behaviour	Eye contact 1 sec intervals Shade 1 second intervals to denote end of recording time.	Adult checklist "My turn" Gesture, kneeling / turn taking
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Notes:_____

_____

_____

Appendix 32 continued:

Data Recording Form- Page 3

Observer initials:	Recording starts when the last piece is put in place. Ends when the game is put in the box or after 30 seconds or if participant walks away.

Participant number: Counterbalancing order:	Date:	Duration of video:
Intervention: Recording for:	Game:	Target Skill: Ending play

5 second intervals Shade intervals to denote end of recording time.	Scripted speech "Finished , Put away" or approximation	Put the toy in the finished box. or approximation	Unscripted speech	Unscripted behaviour	Eye contact 1 sec intervals Shade 1 second intervals to denote end of recording time.	Adult checklist "OK"
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Notes:_____

Appendix 33: Scoring Form Questionnaire

1. Session		
2. Intervention	☐	1= SS; 2 = SVM; 3=PVM ;4= not applicable
3. Stimulus used	☐	1= Activity bucket; 2 = Large Lego; 3= Wooden shape puzzle;4= Rings; 5= New puzzle
4. Task taught	☐	1= finishing play; 2= turn taking; 3= initiating play; 4 = not applicable

Initiating Play

5. "Let's play" spoken	☐	0 = no verbalisation; 1=some attempt at verbalisation; 2= verbalisation approximates script but still incomplete;3= full verbalisation
6. "Let's play": time taken (secs)	☐	0= >30; 1=26-30; 2=21- 25; 3=16-20; 4=11-15; 5=6-10; 6=1-5
7. Hand pull	☐	0=none; 1= directional body language to engage the therapist at > 1m distance 2= directional body language to engage therapist< 1m distance; 3= Full hand pull
8. Hand pull: time taken to start (secs)	☐	0= >30; 1=26-30; 2=21- 25; 3=16-20; 4=11-15; 5=6-10; 6=1-5
9. Disruptive behaviours	☐	-2= significant disruptive behaviour; -1= a degree of disruptive behaviour; 0= none
10. Eye contact (secs)	☐	0= 0; 1-30
11. Eye contact assessment	☐	0= none; 1= inappropriate (excessive or not enough); 2= appropriate amount
12. Other actions of participant	☐	0= none; 1= walked out; 2= played alone; 3= hid under table; 4= other
13. Overall performance (initiation)	☐	%

Appendix 33 continued: Scoring Form Questionnaire

Turn taking

14. "My turn" Spoken ☐ 0=0 1=1 2=2 3=3 4=4

15. Gesture ☐ 0=0 1=1 2=2 3=3 4=4

16. Giving piece to therapist ☐ 0=0 1=1 2=2 3=3

17. Appropriate turns taken ☐ 0=0 1=1 2=2 3=3 4=4

18. Time to take all appropriate turns (secs) ☐ 0= >90 1=76-90 2=61-75 3=46-60 4=31-45 5=16-30 6=1-15 (Round down)
(must take at least 3 turns or score equals zero)

19. Inappropriate turns taken ☐ 0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7

20. Eye contact (secs) ☐ 0=0; 1-90

21. Eye contact assessment ☐ 0= none; 1= inappropriate (excessive or not enough); 2= appropriate amount

22. Disruptive behaviours ☐ -2= significant disruptive behaviour; -1= a degree of disruptive behaviour; 0= none

23. Other actions of participant ☐ 0= none; 1= walked out; 2= played alone; 3= hid under table; 4= other

24. Overall performance (Turn taking) ☐ %

Finishing play

25. "Finished, put away" Spoken ☐ 0 = no verbalisation; 1=some attempt at verbalisation; 2= verbalisation approximates script but still incomplete. 3= full verbalisation

26. "Finished, put away" time (secs) ☐ 0= >30; 1=26-30; 2=21- 25; 3=16-20; 4=11-15; 5=6-10; 6=1-5

Appendix 33 continued: Scoring Form Questionnaire

27. Put toy in finished box	☐	0= none; 1= picked up toy; 2= picked up toy and put in small box; 3= picked up toy and put in big box
28. Put toy in finished box (secs)	☐	0= >30; 1=26-30; 2=21- 25; 3=16-20; 4=11-15; 5=6-10; 6=1-5 (must score at least 2 in Q27 or score equals zero)
29. Eye contact (secs)	☐	0=0 ; 1-30
30. Eye contact assessment	☐	0= none; 1= inappropriate (excessive or not enough) 2= appropriate amount
31. Disruptive behaviours	☐	-2= significant disruptive behaviour; -1= a degree of disruptive behaviour; 0= none
32. Other actions of participant	☐	0= none; 1= walked out; 2= played alone; 3= hid under table; 4= other

33. Overall performance (Finishing play) ☐ %

Appendix 34: Scoring Form

Participant number	
Age	
Gender	
Ethnicity	
Vineland	Communication / Daily living / Socialisation / Motor Skills / Ad Beh composite
Vineland MBI	Internalising / Externalising / MBI Total
PLS-3	Auditory / Expressive / Composite
Read	

	B1	B2	B3	P1	P2	P3	IN	M1	M2	M3	GT1	GT2	G1	G2	G3	G4	G5
1	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	

Appendix 34 continued: Scoring Form

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
12																	
13																	
14																	
15																	
16																	
17																	
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30																	
31																	
32																	
33																	

Appendix 35: Longitudinal Scoring Form:

Participant number	
Comments	

	SP1	SP2	SP3	SM1	SM2	SM3	SGT1	SGT2	SG1	SG2	SG3	SG4	SG5
1	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
2													
3													
4													
5													
6													
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9													
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11													
12													
13													
14													
15													
16													
17													
18													

Appendix 35 continued: Longitudinal Scoring Form

	18	19	20	21	22	23	24	25	26	27	28	29	30
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													

Appendix 36:

Formula for Scoring Overall Performance (Composite Score)

Initiating Play

Q5 __ x 5 = __

Q6 __

Or

Q7 __ x 5 = __

Q8 __

Total score for Q5+Q6 OR Q7+Q8 = __

Q9 __

Q11 __

Q13 Total score __ = (Coding*) __ x4 = ____%

Turn Taking

Q14 __ x 2 = __

Or

Q15 __ x 2 = __

Total score for Q14 Or Q15 = __

Q16 __ x 2 = __

Q17 __

Q18 __ ÷ 2 = __

Q21 __

Q22 __

Q24 Total score __ = (Coding*) __ x4 = ____%

Appendix 36 continued:

Finishing Play

Q25 __ x 5 = __

Q26 __

Or

Q27 __ x 5 = __

Q28 __

Total score for Q25+Q26 Or Q27+Q28 = __

Q30 __

Q31 __

Q33 Total score __ = (Coding*) __ x4 = ____%

***Total score coding**

-2=0	16=18
-1=1	17=19
0=2	18=20
1=3	19=21
2=4	20=22
3=5	21=23
4=6	22=24
5=7	23=25
6=8	
7=9	
8=10	
9=11	
10=12	
11=13	
12=14	
13=15	
14=16	
15=17	

Appendix 37: Combined Results Tables

	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person	In Vivo
Social Stories													
Initiating play	48	496	332	240	324	140	232	140	140	140	148	140	-
Turn taking	68	444	418	448	344	368	444	310	326	416	370	366	-
Finishing play	272	544	492	352	376	456	416	532	364	456	4448	444	-
Combined	388	1484	1242	1040	1044	964	1092	982	830	1012	966	950	-
Average	21.5	82.4	69	57.7	58	53.5	60.6	54.5	46.1	56.2	53.6	52.7	-
Self Video Modelling													
Initiating play	56	508	424	512	516	504	508	516	500	504	416	408	160
Turn taking	48	550	524	354	340	408	470	506	422	444	428	392	116
Finishing play	208	408	524	356	388	412	444	476	204	244	272	464	200
Combined	312	1466	1472	1222	1244	1324	1422	1498	1126	1192	1116	1264	476
Average	17.3	81.4	81.7	67.8	69.1	73.5	79	83.2	62.5	66.2	62	70.2	26.4
Peer Video Modelling													
Initiating play	56	492	400	220	276	332	444	412	404	332	416	232	-
Turn taking	64	352	422	228	348	302	222	400	130	306	290	284	-
Finishing play	56	384	388	356	372	372	292	308	376	384	304	372	-
Combined	176	1228	1210	804	996	1006	958	1120	910	1022	1010	888	-
Average	9.7	68.2	67.2	44.6	55.3	55.8	53.2	62.2	50.5	56.7	56.1	49.3	-

Appendix 38: Social Stories™ Results Tables (B=Bucket ; L=Lego ; P=Puzzle)

Participant number	Stimulus used	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person
Social Story - Initiating play													
5	Bucket	8	100	100	100 L	100 P	8	100	8	8 L	100P	100	8
14	Bucket	8	0	8	8 L	8 P	8	8	8	8 L	8P	8	8
6	Lego	8	100	8	8 P	8 B	8	8	8	8P	8B	8	8
15	Lego	8	100	100	100 P	100 B	100	100	100	100P	8B	8	8
4	Puzzle	8	100	100	16 B	100 L	8	8	8	8B	8L	8	100
13	Puzzle	8	96	16	8 B	8 L	8	8	8	8B	8L	16	8
Combined		48	496	332	240	324	140	232	140	140	140	148	140
Average		8	82.6	55.3	40	54	23.3	38.6	23.3	23.3	23.3	24.6	23.3
Social Story – Turn taking													
9	Bucket	12	82	90	98 P	90 L	90	90	70	98P	84L	78	98
18	Bucket	8	96	80	96 P	92 L	94	86	74	90P	94L	96	82
7	Lego	8	84	78	66 B	54 P	82	90	72	98B	90P	90	88
16	Lego	16	16	8	16 B	8 P	8	8	8	8B	8P	8	8
8	Puzzle	8	84	88	88 L	8 B	8	84	8	8L	78B	8	8
17	Puzzle	16	82	74	84 L	92 B	86	86	78	24L	62B	90	82
Combined		68	444	418	448	344	368	444	310	326	416	370	366
Average		11.3	74	69.6	74.6	57.3	61.3	74	51.6	54.3	69.3	61.6	61
Social Story – Finishing play													
1	Bucket	72	100	92	92 L	92 P	92	92	92	92L	92P	92	92
10	Bucket	36	92	92	8 L	12 P	92	88	100	16L	92P	92	16
2	Lego	32	84	72	80 P	92 B	72	8	92	12P	72B	88	92
11	Lego	80	80	92	88 P	80 B	96	84	88	88P	72B	84	80
3	Puzzle	36	96	88	12 B	84 L	92	92	88	92B	92L	88	92
12	Puzzle	16	92	56	72 B	16 L	12	52	72	64B	36L	4	72
Combined		272	544	492	352	376	456	416	532	364	456	448	444
Average		45.3	90.6	82	58.6	62.6	76	69.3	88.6	60.6	76	74.6	74

Appendix 39: Self Video Modelling Results Tables (B=Bucket; L=Lego; P=Puzzle)

Participant number	Stimulus used	Baseline	In Vivo	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person
Self Video Modelling- Initiating play														
8	Bucket	16	56	100	100	100L	100P	96	100	100	100L	100P	8	8
17	Bucket	8	16	100	100	96L	100P	100	100	100	92L	96P	92	100
9	Lego	8	56	100	100	100P	100B	100	100	100	100P	100B	100	100
18	Lego	8	16	100	8	100P	100B	100	100	100	100P	100B	100	92
7	Puzzle	8	8	100	100	100B	100L	100	100	100	100B	100L	100	92
16	Puzzle	8	8	8	16	16B	16L	8	8	16	8B	8L	16	16
Combined		56	160	508	424	512	516	504	508	516	500	504	416	408
Average		9.3	26.6	84.6	70.6	85.3	86	84	84.6	86	83.3	84	69.3	68
Self Video Modelling – Turn taking														
3	Bucket	8	24	78	48	28P	44L	68	48	56	56P	58L	66	50
12	Bucket	8	8	94	94	92P	94L	94	88	80	90P	96L	86	20
1	Lego	8	8	98	98	96B	96P	98	96	96	96B	96P	96	96
10	Lego	8	12	96	90	44B	8P	66	56	88	8B	8P	66	62
2	Puzzle	8	56	94	96	86L	8B	8	92	96	82L	96B	24	74
11	Puzzle	8	8	90	98	8L	90B	74	90	90	90L	90B	90	90
Combined		48	116	550	524	354	340	408	470	506	422	444	428	392
Average		8	19.3	91.6	87.3	59	56.6	68	78.3	84.3	70.3	74	71.3	65.3
Self Video Modelling – Finishing play														
4	Bucket	72	64	88	84	68L	88P	72	88	92	4L	8P	64	72
13	Bucket	8	36	88	80	72L	28P	28	16	16	28L	28P	28	28
5	Lego	36	12	92	100	92P	92B	88	92	96	92P	100B	100	100
14	Lego	8	8	72	76	36P	8B	68	68	88	68P	8B	68	88
6	Puzzle	68	64	52	92	8B	92L	64	92	96	4B	92L	4	84
15	Puzzle	16	16	16	92	80B	80L	92	88	88	8B	8L	8	92
Combined		208	200	408	524	356	388	412	444	476	204	244	272	464
Average		34.6	33.3	68	87.3	59.3	64.6	68.6	74	79.3	34	40.6	45.3	77.3

Appendix 40: Peer Video Modelling Results Tables (B=Bucket; L=Lego; P=Puzzle)

Participant number	Stimulus used	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person
Peer Video Modelling - Initiating play													
2	Bucket	8	88	100	8L	8P	8	100	92	100L	100P	100	8
11	Bucket	8	8	8	8L	8P	8	8	8	8L	8P	8	8
3	Lego	8	100	8	16P	56B	16	80	16	96P	16B	100	8
12	Lego	8	100	84	80P	96B	100	100	96	92P	100B	100	100
1	Puzzle	8	96	100	100B	100L	100	100	100	100B	100L	100	100
10	Puzzle	16	100	100	8B	8L	100	56	100	8B	8L	8	8
Combined		56	492	400	220	276	332	444	412	404	332	416	232
Average		9.3	82	66.6	36.6	46	55.3	74	68.6	67.3	55.3	69.3	38.6
Peer Video Modelling – Turn taking													
6	Bucket	8	48	56	32P	70L	8	12	66	8P	8L	8	8
15	Bucket	8	8	90	82P	90L	98	88	76	8P	70L	78	78
4	Lego	8	78	86	8B	82P	90	8	90	0B	90P	90	90
13	Lego	16	60	16	8B	8P	8	8	8	8B	8P	8	8
5	Puzzle	16	98	90	90L	90B	90	90	98	98L	98B	98	96
14	Puzzle	8	60	84	8L	8B	8	16	62	8L	32B	8	4
Combined		64	352	422	228	348	302	222	400	130	306	290	284
Average		10.6	58.6	70.3	38	58	50.3	37.0	66.6	21.6	51	48.3	47.3
Peer Video Modelling – Finishing play													
7	Bucket	4	8	4	4L	4P	4	4	4	4L	4P	4	4
16	Bucket	8	8	12	8L	8P	72	8	8	8L	8P	8	8
8	Lego	8	88	92	92P	80B	92	88	92	88P	92B	88	92
17	Lego	16	92	100	92P	92B	100	96	100	88P	92B	92	88
9	Puzzle	16	100	92	100B	100L	100	92	100	100B	92L	92	92
18	Puzzle	4	88	88	60B	88L	4	4	4	88B	96L	20	88
Combined		56	384	388	356	372	372	292	308	376	384	304	372
Average		9.3	64	64.6	59.3	62	62	48.6	51.3	62.6	64	50.6	62

Appendix 41: Longitudinal Results for Participant 13

Main study and longitudinal results for Participant 13 (B=Bucket; L=Lego; P=Puzzle)

Participant 13	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person	In Vivo
Main Study													
Initiating (P) play (SS)	8	96	16	8 B	8 L	8	8	8	8 B	8 L	16	8	-
Turn taking (L) (PVM)	16	60	16	8 B	8 P	8	8	8	8 B	8 P	8	8	-
Finishing (B) (SVM)	8	88	80	72 L	28 P	28	16	16	28 L	28 P	28	28	36
Longitudinal													
Initiating (P) play (SS)	16	100	100	100 B	96 L	100	100	100	100 B	100 L	100	92	-
Turn taking (L) (PVM)	16	96	86	96 B	96 P	86	96	86	88 B	98 P	74	96	-
Finishing (B) (SVM)	80	100	88	96 L	88 P	88	88	100	100 L	84 P	84	92	36

Appendix 42: Longitudinal Results for Participant 16

Main study and longitudinal results Participant 16 (B=Bucket; L=Lego; P=Puzzle)

Participant 16	Baseline	Post Intervention Probe	Maintenance	Known Stimulus 1	Known Stimulus 2	Novel Stimulus 1 Rings	Novel Stimulus 2 New Puzzle	Novel Person Set Stimulus	Novel Person Known Stimulus	Novel Person Known Stimulus	Novel Stimulus 1 & Novel Person	Novel Stimulus 2 & Novel Person	In Vivo
Main Study													
Initiating (p) play (SVM)	8	8	16	16 B	16 L	8	8	16	8 B	8 L	16	16	8
Turn taking (L) (SS)	16	16	8	16 B	8 P	8	8	8	8 B	8 P	8	8	-
Finishing (B) (PVM)	8	8	12	8 L	8 P	72	8	8	8 L	8 P	8	8	-
Longitudinal													
Initiating (p) play (SVM)	16	96	100	96	96	96	96	96	100B	96L	100	100	8
Turn taking (L) (SS)	8	58	70	8B	8P	38	76	8	24B	8P	8	16	-
Finishing (B) (PVM)	12	100	92	92L	72P	88	92	92	92L	72P	96	92	-

Appendix 43: Below is a simplified grid detailing the randomised matching of interventions to target skills for each participant allocated during counterbalancing.

Initiating Play	Social Stories™	Self Video Modelling	Peer Video Modelling
	Pt. 4	Pt. 7	Pt. 1
	Pt. 5	Pt. 8	Pt. 2
	Pt. 6	Pt. 9	Pt. 3
	Pt. 13	Pt. 16	Pt. 10
	Pt. 14	Pt. 17	Pt. 11
	Pt. 15	Pt. 18	Pt. 12
Turn Taking	Social Stories™	Self Video Modelling	Peer Video Modelling
	Pt. 7	Pt. 1	Pt. 4
	Pt. 8	Pt. 2	Pt. 5
	Pt. 9	Pt. 3	Pt. 6
	Pt. 16	Pt. 10	Pt. 13
	Pt. 17	Pt. 11	Pt. 14
	Pt. 18	Pt. 12	Pt. 15
Finishing Play	Social Stories™	Self Video Modelling	Peer Video Modelling
	Pt. 1	Pt. 4	Pt. 7
	Pt. 2	Pt. 5	Pt. 8
	Pt. 3	Pt. 6	Pt. 9
	Pt. 10	Pt. 13	Pt. 16
	Pt. 11	Pt. 14	Pt. 17
	Pt. 12	Pt. 15	Pt. 18

Appendix 44: UK National Health Service: Levels of Evidence

The Oxford Centre for Evidence-based Medicine suggests levels of evidence according to the study designs and critical appraisal of prevention, diagnosis, prognosis, therapy, and harm studies:

- Level A: Consistent Randomised Controlled Trial, cohort study or clinical decision rule validated in different populations.
- Level B: Consistent Retrospective Cohort, Exploratory Cohort, Ecological Study, Outcomes Research, case-control study; or extrapolations from level A studies.
- Level C: Case-series study or extrapolations from level B studies.
- Level D: Expert opinion without explicit critical appraisal, or based on physiology, bench research or first principles