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THE EFFECTIVENESS OF COMPUTER AND VIDEO MODELLED SOCIAL STORIES ON THE NON-VERBAL SOCIAL SKILLS OF CHILDREN WITH ASPERGER'S SYNDROME.

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A dissertation submitted to the Discipline of Speech Pathology and Audiology, School of Human and Communication Development, Faculty of Humanities, University of the Witwatersrand, Johannesburg, in complete fulfilment of the requirements for the degree M.A. Speech Pathology by dissertation.

Johannesburg 2013

DECLARATION

I declare that this dissertation is my own unaided work. It is submitted for the degree of masters in Speech Pathology by dissertation at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination in any other university.

Lital Propheta

15 February 2013

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ABSTRACT

Background: Children with Asperger's Syndrome have deficits in daily social communication and pragmatic skills of varying degrees. A lack of appropriate use of eye contact during communication is a well-described marker of the social-pragmatic deficit that is characteristic of children with Asperger's Syndrome. This study investigated the effectiveness of a combined therapy approach including social stories, video-modelling and computers to address the impaired eye contact. **Method:** Five participants, between the ages of 6-12 years, with a diagnosis of Asperger's Syndrome took part. A multiple single subject ABAB design was applied for the purpose of this study. **Results:** There was an overall improvement in eye contact across all five participants. Other pragmatic behaviours were also positively affected. **Conclusions:** A combined type of intervention may be used effectively to improve the non-verbal social skills, specifically eye contact, in children with Asperger's Syndrome. Clinical and theoretical implications of the findings are discussed.

Keywords: Non-verbal social skills; pragmatics; eye contact; Asperger's Syndrome; social stories, video-modelling; computers

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LIST OF ABBREVIATIONS

ASD	Autism Spectrum Disorder
SST	Social skills training
PDD	Pervasive Developmental Disorders
DSM	Diagnostic and Statistical Manual of Mental Disorders
ICD-10	International Statistical Classification of Disease and Related Health Problems
IQ	Intelligence quotient
STS	Superior temporal sulcus
Mpfc	Medial prefrontal cortex
TPJ	Tempero-parietal junction
fMRI	Functional Magnetic Resonance Imaging
DVD	Digital Video Disc
P1	Participant 1
P2	Participant 2
P3	Participant 3
P4	Participant 4
P5	Participant 5

CHAPTER 1

INTRODUCTION

This chapter has been organised to introduce the problem of the study, clarifies the concepts, as well as presenting an outline of the chapters to follow. It also discusses the purpose and significance of this study and contributes to practice. The rationale and research questions are also discussed in chapter 2.

1.1 Statement of the Problem

Children with Asperger's Syndrome have life-long impairments in daily social communication and pragmatic skills despite their scores on traditional language tests, which reveal performance within the normal range (Bishop & Baird, 2001; Reichow, Salamack, Paul, Volkmar & Klin, 2008). The social deficits are of varying degrees, ranging from mild to severe (Moore, 2002). Impaired social skills such as eye contact, which are essential for effective social interaction, are lacking. Eye contact as a non-verbal behaviour is essential in terms of facilitating communication as it forms the basis of human interaction and social skills (Itier & Batty, 2009; Senju & Johnson, 2008). Eye contact is a marker for other social skills and provides the foundation for more complex social skills. This is a critical issue for children with Asperger's Syndrome as they struggle to initiate eye contact and comprehend the importance of maintaining eye contact, which in turn affects their development as social beings (Arnold, Semple, Beale & Fletcher-Flinn, 2000).

1.2 Purpose of the Study

Over the recent years, the prevalence of Autism Spectrum Disorders (ASD) has increased and specifically Asperger's Syndrome may be the fastest growing sector of this population (Sansosti & Powell-Smith, 2006; Rao, Beidel & Murray, 2008)). Asperger's Syndrome, a subset of ASD, is characterised by core impairments in social communication (Scattone, 2008), which contributes significantly to the overall communicative impairment in spite of

the linguistic and cognitive abilities of the individual (Carter, Davis, Klin & Volkmar, as cited by Wang & Spillane, 2009). According to the DSM-IV, individuals with Asperger's Syndrome show limited non-verbal communication, thus a poor indication of wanting to interact with another person (Wing, Gould & Gillberg, 2011). This study has targeted the non-verbal skill, specifically eye contact, as it is a marker for other non-verbal social skills and forms the basis on which to develop more complex social skills (Itier & Batty, 2009; Senju & Johnson, 2008).

People who are able to engage more appropriately within social settings are likely to be more accepted within society and will in turn be able to exist independently and cope with occupational demands within various settings. Intervention for social skills for persons with ASD is difficult, although there are various means of intervening. The types of interventions that have been previously used and documented in the research involve social stories, peer modelling, video modelling, cognitive behavioural training as well as theory of mind and social skills training (SST) (Wang & Spillane, 2009).

Children with Asperger's Syndrome present with increased visual learning abilities and types of intervention which incorporate visual modes have been found to be effective in improving the social skills of these individuals (Sansosti & Powell-Smith, 2006; Scattone, 2008). Social stories, video modelling as well as peer modelling have contributed towards evidence based practices (Wang & Spillane, 2009). Computer based intervention, although a relatively new area of research has also been found to be effective in providing intervention for children with ASD (Sansosti & Powell-Smith, 2008). Most of the research that has been conducted has looked at effectiveness of various types of intervention in isolation. The purpose of this study was therefore to investigate whether these types of effective intervention namely: social stories, video-modelling using peers, as well as computer-based intervention are effective when combined in terms of treating the non-verbal social skills, specifically eye contact, of children with Asperger's Syndrome.

1.3 Knowledge Gap

To date, there is not a lot of research on intervention of social communication with regard to non-verbal behaviours. The non-verbal behaviour which has been chosen for this specific study is eye contact. Eye contact as a non-verbal behaviour is essential in terms of facilitating

communication as it is the basis of human interaction and social skills (Itier & Batty, 2009; Senju & Johnson, 2008). The eyes are primarily involved in social and non-verbal communication as they assist with facial identification, reading of emotions as well as perceiving other's communicative intent (Itier & Batty, 2009). Eye contact is a very important pragmatic skill as it provides the foundation on which to base further more complex social skills and it is commonly thought that by providing intervention for eye contact, this will in turn improve the social skills of children presenting with developmental disorders (Iiter & Batty, 2009; Arnold, Semple, Beale & Fletcher-Flinn, 2000). It is known from the literature that eye contact is essential for communication; however, there is limited research both internationally and locally. The paucity of research regarding the effectiveness of the various types of therapies for pragmatics, specifically non-verbal behaviours such as eye contact, indicates a need for efficacy studies regarding various types of approaches.

1.4 Organisation of this study

The study has been organised into various chapters, which will be discussed below.

Chapter 1: In this chapter, I have provided a statement of the problem, and a brief description of the gap in research that has investigated the effectiveness of intervention on eye contact in children with Asperger's Syndrome.

Chapter 2: In this chapter, a theoretical background is discussed to provide support for this research, the rationale for the highlighting the significance of this research, as well as the research questions. Two prominent theories, namely the Amygdala theory and the Theory of Mind, form the basis of this discussion

Chapter 3: The methodology is described in this chapter. The aims of the study are presented, and the design of the study that was selected to address the aims is discussed and motivated. The participant selection criteria, as well as sampling method are described. The participants are described. Thereafter, the method that was used to implement the intervention is described in depth. Ethical issues involved in conducting this study are addressed, as well as issues relating to reliability and validity.

Chapter 4: The results of this study are presented in line with the aims of the study. The results show that the type of intervention that was selected to address the deficit in eye contact that was evident in the communication of the participants was effective.

Chapter 5: Finally, the conclusion chapter focuses on how the current study contributes to the literature with regard to intervention for children with Asperger's, as well as its contribution to the theoretical understanding of the nature of the communicative deficit of children with Asperger's Syndrome. Finally, suggestions are made with regard to further research.

CHAPTER 2

LITERATURE REVIEW

In this chapter a literature review is presented to provide an overview of autism spectrum disorders (ASD) and in particular Asperger's syndrome. The rate of occurrence of this disorder is discussed both internationally and locally as well as how Asperger's syndrome presents itself in the individual with regard to social deficits, specifically eye contact. An outline of the theory supporting this research is discussed as well as the crucial need for eye contact during communication by reviewing studies that have looked at the theories that provide explanations for the impaired eye contact found in children with ASD.

2.1 Pervasive Developmental Disorders and Asperger's Syndrome

Pervasive Developmental Disorders (PDD) is the umbrella term used to describe an extensive range of autistic spectrum disorders (Reichow et. al, 2008). According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the International Classification of Diseases (ICD-10), the three core deficits associated with autism spectrum disorders are impaired reciprocal social interaction, communication impairments, and repetitive behaviours or interests (American Psychiatric Association, 2000). At least one of these deficits should appear before three years of age (Tantam & Girgis, 2009). At the one end of the PDD spectrum are children who present with typical autism who are described as having severe impairments with regards to cognitive and language delays (Sansosti & Powell-Smith, 2008). On the upper end of the spectrum are children who present with PDD, known as High-Functioning Autism or Asperger's Syndrome (Sansosti & Powell-Smith, 2008). This study focuses in particular on the upper end of the spectrum i.e. Asperger's Syndrome.

In the literature review that is presented in this study, the terms Asperger's Syndrome, autism, PDD and ASD are defined in line with the literature. These terms are not interchangeable, even though the researchers do not always indicate the particular diagnosis of the participants. The limitations of this lack of specificity are considerable; and it highlights the problems that arise when consulting the literature.

According to Gillberg and Gillberg (1989) there are six criteria which must be met in order to verify the diagnosis of Asperger's Syndrome. These criteria include: impairment in reciprocal

social interaction, limited interests, imposition of routines and interests, odd speech and language skills, non-verbal communication difficulties, as well as motor clumsiness.

According to Attwood (2007), many clinicians prefer to use the diagnostic criteria of Gillberg and Gillberg (1989) as they characterise more precisely the original description of Asperger's, as well as the profile skills of children brought for a diagnostic assessment for Asperger's Syndrome. The DSM-IV and ICD-10 criteria are seen to be the most limiting and have thus been heavily criticized by clinicians as impractical in clinical practice. When using the DSM-IV or ICD-10 diagnostic criteria, the prevalence rates of Asperger's Syndrome in the USA are reported to vary between 1 in 33, 000 and 1 in 1200 children (Attwood, 2007). The Gillberg and Gillberg diagnostic criteria reveal prevalence rates of Asperger's Syndrome that occurs between 36 and 48 per 10,000 children, or between 1 in 280 or 210 children (Attwood, 2007). These statistics indicate that the Gillbergs' criteria are more sensitive in detecting children with Asperger's Syndrome. For the purpose of this study, however, the DSM-IV and the ICD-10 were used to confirm the diagnoses as they are more commonly used locally as well as in the literature used. Impairment in social communication is seen to be the fundamental characteristic of Asperger's Syndrome, which is recognized in all diagnostic measures (Attwood, 2007).

2.2 Epidemiology

Various epidemiological studies regarding PDD conducted over the past 15 years have indicated rising prevalence estimates of cases reported (Chakrabarti & Fombonne, 2005). Although there is much criticism levelled at the research on the statistical rates for Asperger's Syndrome, owing to the scarceness of research performed on the carefully diagnosed samples (Fombonne, 2003), there does indeed appear to be an increase in the prevalence of this disorder. The most recent prevalence study, which was conducted in 11 sites in the USA, was conducted in 2006 and revealed an average of approximately 1% or 1 child in every 110 as having an ASD (Rice, 2009). These statistics have indicated a 57% increase in prevalence of autism spectrum disorders between 2002 and 2006 (Rice, 2009).

According to Toth and King (2008), estimates show that Asperger's Syndrome occurs at a rate of approximately 2.5/10,000. However, according to Autism South Africa (2010), autism

occurs at a rate of 17.94/1000 which is similar to the statistics of the USA. Toth and King (2008) suggest that the increased prevalence rates could be indicative of modifications in diagnosis and or enhanced knowledge of the disorder. Due to the latter, more children are being referred to professional services or special education facilities than in the past (Fombonne, 2003). Interestingly, from 1998 to 2007, the number of children between the ages of 6-21 years, receiving intervention for ASD in public special education facilities in the USA had increased from 54, 064 to 258, 305 (Rice, 2009).

2.3 Social communication and pragmatics

The classic social communication impairment is characterised by a triad of impairments namely difficulties with social interaction, deficit in social communication (understanding as well as use of communication both verbal and non-verbal), and an impairment in social imagination, flexible thinking and imaginative play (Reichow et al., 2008; Tantam & Girgis, 2009). The DSM-IV criteria also states that a person presenting with Asperger's syndrome will present with deficits in social communication with at least two of the following problems: (i) with initiating various non-verbal behaviours, (ii) with forming age appropriate peer relationships, (iii) with spontaneously engaging in social interactions, or (iv) with social and emotional communication with others (Barnhill, Cook, Tebbenkamp & Myles, 2002). These impairments have been found to impact on the individual with Asperger's syndrome with regards to various social and work-related situations (Barnhill et al., 2002).

Communication impairments are one of the main indicators of ASD. Pragmatics includes the communicative intent of each conversational speaker as well as the tailoring of the language according to the conversational recipient in order to achieve these aims (Owens, 2004). The majority of aspects of language are governed by the pragmatics of the conversational and social environment (Owens, 2004). Social skills encompass various behaviours which are responsible for constructive social engagements (Rao, Beidel & Murray, 2008). The skills required include both verbal and non-verbal skills such as eye contact, smiling, initiating eye gaze, requesting and responding to questions, as well as providing and recognizing compliments during social interaction (Rao et al., 2008).

Pragmatics has been found to be more impaired than the structure of language, in terms of grammar (Owens, 2004). Hence, children with Asperger's Syndrome present with

problematic conversational skills with regard to their pragmatic responses (i.e. appropriate use and understanding of language in terms of the situation in which it occurs), as well as difficulty with the emotional meaning of communication, although they indicate no difficulty with the language content in terms of word meanings (Blacher, Kraemer & Schalow, 2003). Individuals with Asperger's Syndrome have difficulty with making use of socially contextualized language (Adams, Green, Gilchrist & Cox, 2002), which occurs when they need to interpret information produced by a speaker who uses various skills such as prosody, volume of speech, body language, facial expression, as well as hidden cues (Moore, 2002). The child with Asperger's Syndrome presents with impaired social skills thus lacking the various behaviours required for communication, which in turn leads to impaired intellectual and social maturation (Rao et al., 2008).

Non-verbal communication, which is central to this study, refers to communication involving but not limited to body language, direction of eye contact, use of voice, personal space as well as facial expression to convey one's beliefs, ideas and emotions (Tantam & Girgis, 2009). According to the DSM-IV, an individual with Asperger's Syndrome shows limited non-verbal communication, thus a poor indication of wanting to interact with another person (Wing, Gould & Gillberg, 2011). The individual with High functioning Autism or Asperger's Syndrome will lack the necessary social skills required for effective social interaction namely: inappropriate eye contact, limited joint attention, difficulty in initiating social engagements, impaired understanding of both verbal and non-verbal social cues, lack of sympathy and compassion for others suffering as well as inappropriate emotional responses (Rao et al., 2008). The non-verbal communication skills tie in with pragmatics or the tailoring of the spoken or written message according to the needs and wants of communicative partner or directing the communicative partner into a particular direction (Tantam & Girgis, 2009).

Individuals with Asperger's Syndrome present with great difficulties with both initiating as well as interpreting non-verbal communication. If one looks at typical Asperger's Syndrome, as presented in this particular study, in comparison to other types of ASDs, the individual with Asperger's Syndrome would present with deficits in non-verbal expression, limited or no reciprocated relationships, atypical interests as well as being sensitive to one's self (Tantam & Girgis, 2009).

This study is embedded within a social pragmatic theoretical framework guided by the early work of researchers including Prutting and Kirchner (1987) Penn (1985), as well as the work of Wetherby and Prizant (2005). A significant body of research has been led by Wetherby and Prizant in their work on children with social and pragmatic deficits. Their work has contributed to the development of theories of social pragmatic development. Initiated around the 1980s, the development of pragmatics has moved beyond a linguistic model, to encompass developmental and social aspects of communication (Owens, 2004). The social pragmatic theories encompass both pragmatic and social interactive components which highlight the importance of social experience in the development of language and communication (Bogdashina, 2005). This means that both the child and the surroundings actively take part in the process of developing language and communication skills (Wetherby and Prizant, 2005). Normal development requires a good working relationship between the cognitive functioning, social communication as well as the development of language and communication. In the case of a breakdown between these components, deficits occur as seen in the autism and Asperger's Syndrome (Wetherby and Prizant, 1997).

2.4 The Importance of Eye Contact for Communication

Establishing eye contact, a form of non-verbal communication, is the fundamental mode of communication between human beings and it has been found that in early development children discover that by looking at people they are able to connect with them (Farroni et al., 2002). Eye contact allows one to be able to follow another person's point of reference and this skill develops early on in childhood and forms the basis for the establishment of normal social understanding (Itier & Batty, 2009). There are various studies which have shown that infants are highly responsive to eye contact and around the age of one month already begin to engage in mutual eye contact with their mothers (Senju & Johnson, 2008; Arnold, Semple, Beale & Fletcher-Flinn, 2000). Studies have shown that infants tend to connect more with people that look directly at them in the face and that typically developing infants indicated improved neural processing of direct eye contact (Farroni et al., 2002).

Reciprocal eye contact, also known as dyadic eye contact, occurs early on in childhood development and involves the ability to monitor direct social interactions i.e. having the ability to detect the gaze of another person (Fasel, 2000). Later on in childhood development triadic eye contact or gaze following develops and is established by six months of age

(Emery, 2000; Arnold et. al., 2000). This means that the child is able to attend to another person or object as well as being able to identify if the self and the third party are focused on the same situation or object (Arnold et. al., 2000; Itier & Batty, 2009). This indicates that the child is beginning to perceive social settings (Clifford & Dissanayake, 2009). Joint attention, which develops naturally in typically developing children, is established between nine and fourteen months of age and facilitates the child's ability to observe the conversational partner's point of focus as both people attend to the same object (Clifford & Dissanayake, 2008; Itier & Batty, 2009). Joint attention, which involves both communicative intent, as well as dyadic and triadic eye contact, is crucial for the emergence of other social skills (Clifford & Dissanayake, 2008; 2009).

Shared attention involving both reciprocal gaze and joint attention occur when both people are aware of each other's point of reference and will use the eye contact to ensure that both parties are focused on the same point of reference (Emery, 2000; Itier & Batty, 2009). Shared attention then forms the foundation of the development of theory of mind which starts to develop by age four to five (Itier & Batty, 2009). Theory of mind is the ability to perceive the thinking processes and the intentions of the communicative partner and in turn shows an understanding of the person's mental states (Itier & Batty, 2009). Theory of mind is the ability to use eye contact to attend to external cues as well, and then being able to use social cognition to understand the mental state of the other person, interpreting their goals and ideas (Emery, 2000). Even though it has been found that children who are born blind develop theory of mind, it has been suggested that facial features, specifically the eyes, provide the main source of information needed for perceiving another person's mental state (Itier & Batty, 2009).

Eye contact indicates that one person has been acknowledged by the other and that once eye contact has been made by both parties, a conversation can begin (Levy, Ablon and Kächele & 2012; Perks, 2007). Once eye contact is made, and if maintained, it is indicative of wanting to engage in conversation; however, if the eye contact is not maintained, this may mean that the person does not wish to engage in conversation (Bara, 2010; Perks, 2007). Eye gaze gives significant information with respect to direction of things in space; however, it also provides necessary information for interpreting social settings in terms of visual perspective-taking, dishonesty, compassion as well as theory of mind (Emery, 2000). Normal development of a human being is dependent on the person's ability to perceive faces, in particular the eyes and direction of eye contact, and in turn to be able to perceive the mental state of the

communicative partner (Emery, 2000). Eye contact is involved in the development of theory of mind.

Eye contact is also a powerful tool for communication as it is the starting point of a conversation and is used as a means to connect with others (Perks, 2007). Cultural differences also play a crucial role in determining the level of eye contact made as various ethnic groups have different rules and expectations (Bara, 2010). Therefore eye contact is a universal behaviour but the difference is highlighted when it is used for communication purposes across the different cultures.

It has been found in the USA that the eye contact elicited by the Black and White population groups differs during conversation (Bara, 2010). The Black American population tends to make eye contact with their communicative partners when speaking but not when listening. This differs in the White population as they look at their communicative partner when listening, but when speaking the person will make intermittent eye contact and will only fixate when indicating the end of the turn in conversation (Bara, 2010). In South Africa specifically, there are certain cultures which view the lack of eye contact as a sign of respect for the conversational partner (Müller, 2000).

2.5 Eye Contact in Children with Asperger's Syndrome

Research conducted in Tokyo, Japan by Nakano, Tanaka, Endo, Yamane, Yamamoto, Nakano, Ohta, Kato and Kitazawa (2010) investigated temporal as well as spatial eye gaze patterns of both children and adults presenting with and without ASD, while watching video clips. 104 individuals participated in this study. The participants were divided into four groups i.e. children vs. adults and those presenting with ASD and those without ASD (control group). Both males and females participated. The particular focus of the study was to examine the eye gaze patterns on facial features as it has been documented that individuals presenting with PDD have deficits in perceiving facial expressions (Nakano et. al., 2010). The video clips used were from a movie or a children's TV show and consisted of one to three people who were either interacting with an audience or with one another. The direction of the eye contact was measured using a remote eye tracker. Results revealed that the typically developing individuals presented with predictable eye gaze patterns whereas the ASD individuals presented with altered eye gaze patterns. The results were analysed post hoc

frame by frame and showed that both the adults and children with ASD averted their eye gaze from the speaker before the other typical participants. It was also found that all the participants with ASD showed a preference for letters in the caption as opposed to the other participants who focused their eye gaze on the face of the person talking. The findings tie in with the results that were obtained from other studies, which identified that ASD individuals have a tendency to gaze at inanimate objects as opposed to human faces (Klin, Jones, Schultz, Volkmar & Cohen 2002). It is relatively difficult to compare eye contact in various countries, as eye contact is a culture specific behaviour, although eye contact is seen to be problematic across all cultures.

Similarly, Klin et al. (2002) conducted a study in the USA to monitor the eye gaze patterns of 15 male ASD participants during settings which depict daily social occurrences. Participants included 15 cognitively able males presenting with autism and 15 control participants who were matched in terms of age, sex and verbal IQ. Eye gaze patterns were recorded for 4 coded areas namely the eyes, mouth, body and inanimate objects. A total of five video clips lasting 2.42 minutes were used for each participant. The eye movements were recorded using a dark pupil corneal reflection oculography technique as well as hardware and software. Statistical examination of the results showed similarly that the ASD participants exhibited significantly less eye contact with regard to the eye area and more eye contact was made with inanimate objects and mouths. It was found that the control group exhibited significantly more eye contact with regard to the eyes and in fact twice more than the group with autism. In a natural social setting, participants with ASD reveal social incompetence as they show preference for looking at inanimate objects, mouths and bodies as opposed to the eyes of a person. Due to the fact that the individuals with ASD did not use eye contact in order to enhance their understanding of social settings indicates that the eyes may not be a significant source of information for them i.e. ‘the eyes are not meaningful to them’ (Klin et al., 2002, p. 814).

Research that has looked at eye tracking has found that individuals with ASD tend to look less at important social signals such as the eyes during social settings (Norbury, Brock, Cragg, Einav, Griffiths & Nation, 2009). Norbury et al. (2009) conducted a study in the United Kingdom, which looked at the eye gaze patterns within the ASD population but also took into consideration those with language deficits and those without. The eye movements of 28 teenagers presenting with ASD as well as 18 typically developing age-matched peers

were measured as they watched videos of peers interacting in common social situations. The study recorded the amount of time that the participants spent gazing at eyes, mouths and other items within the social setting. This particular study also found that the participants with ASD and intact language abilities engaged in less eye contact than those with a language deficit and typically developing individuals. It was found that eye gaze with regard to the mouth facilitated better social communication amongst those with ASD. According to Klin et al. (2002), it was also noted that improved social behaviour was related to increased fixation times to the mouth as opposed to the eyes. The researchers were of the opinion that the increased gaze patterns of ASD individuals to the mouth, was to assist them within social settings and to increase their social cognition from the literal linguistic message (Klin et al., 2002).

In a study conducted by Nummenmaa, Engell, von dem Hagen, Henson and Calder (2012) in Finland, 18 healthy adult participants between the ages of 18 to 30 years were required to complete a questionnaire that contained 50 questions in order to determine the degree of the ASD characteristics they present with and thereafter a functional magnetic resonance imaging fMRI study looked at the gaze perception of ASD individuals when looking at faces in various directions either changing (left, right, left right etc.) or constant (right, right etc.). This study examined whether there were any quick adjustments made in the individuals' direction of awareness or interest. This particular study showed that there are neurological differences in the functioning of the structures within the brain during social cognition. It was found that the ASD characteristics can predict the neural response to eye contact in normal developing individuals. The results of this study indicate that in normal developing individuals, the neural response to eye contact across the social attention network i.e. the amygdala, superior temporal sulcus (STS); medial prefrontal cortex (Mpfc); and tempero-parietal junction (TPJ); is seen to be strongly associated with the amount of ASD features that they present with. This correlates with previous studies that could not identify a specific neural indicator of ASD; however, they have repeatedly shown abnormal functioning of the same neural sections.

Pelphrey, Morris and McCarthy (2005) also conducted an fMRI study and it was similarly found that in ASD individuals, various brain regions such as the superior temporal sulcus; STS area in particular lack in sensitivity to intentions revealed during eye gaze shifts. A total of 19 individuals participated in this study namely those presenting with autism, 1 female and

9 males whose ages ranged between 17.9 to 50.7 years as well as 9 control individuals between the ages of 15.5 to 32.4 years. fMRI scanning was conducted on all the participants while they viewed a small checkerboard that become visible and flashed in an animated character's visual field. During the congruent (goal directed) testing, the animated character would turn her eye gaze towards the checkerboard, thus confirming what the participant would expect; however, during the incongruent (non-goal directed) testing, the character's eye gaze would shift towards a vacant space thus going against the participants expectations. It was found that the STS region of the brain was stimulated during viewing shifts; however, the control subjects were the only ones who presented with activity that differed during the congruent and incongruent viewings. This lack in sensitivity contributes to the eye gaze processing deficits seen in ASD individuals.

This study further confirms the results of the previously mentioned studies that subjects with ASD present with major deficits in terms of the way in which they look at faces as they tend to look more at non-feature areas as opposed to the feature areas such as the nose, eyes and mouth. These particular results also correlate with other studies which suggest that ASD individuals do not present with difficulties with eye gaze discrimination but rather difficulties in terms of using the information from eye gaze to interpret social situations that include contextual subtleties as well as the objectives of another individual.

2.6 The nature of eye contact in Asperger's Syndrome

Children presenting with autism have atypically developing eye contact which may be present from early on in life (Senju & Johnson, 2008). Individuals presenting with ASD seem to have difficulties with various types of social interactions in terms of their neural processing of eye contact, direction of eye gaze, sharing of attention as well as perception of mental states within specific social situations (Emery, 2000; Farroni et. al., 2002). One of the earliest symptoms of autism is when a child is unable to share in joint visual attention, meaning the ability to share attention with others in a social setting (Emery, 2000). This difficulty limits the chances of the child learning social skills, which in turn negatively affects both the social and language development of the child (Nation & Penny, 2008). It has been found that the amount of eye contact made by an autistic child is no different from the typically developing child but rather the quality of the eye contact differs i.e. how the child uses the eye contact within social situations (van der Geest, Kemner, Verbaten & van Engeleland, 2002). An

example of this is when autistic children turn their head towards the conversational partner; however, they do not make direct eye contact with the person's eyes but rather look past the person (van der Geest et al., 2002).

It has been found that early on in childhood development individuals with autism seem to show an inclination to look at non-living objects and show no particular interest for the human face (Pelphry, Sasson, Reznick, Paul, Goldman & Piven, 2002). It has also been reported that children diagnosed with specifically Asperger's syndrome, whose IQ scores are within the normal to superior range, also exhibit difficulty with recognition of facial features, gender, age and facial expressions (Itier & Batty, 2009). Interest of faces usually develops while the child is young with the exception of children on the PDD spectrum (Baron-Cohen et al., 1996). Children with autism seem to gaze less at faces of people in comparison to normal developing children and in the case that eye contact is made, the perceptual processes and exploratory ocular movements appear to be atypical (Itier and Batty, 2009). Eye contact, observed in the PDD population, during spontaneous viewing or during facial emotional recognition, focuses on facial features including the mouth, ears, forehead or the chin of the conversational partner, with less eye contact made directly with the eyes (Dalton et al., 2005; Klin et al., 2002).

Children with ASD demonstrate differences in the processing of faces but they also seem to participate less frequently in mutual eye contact as well as having difficulty in following the eye gaze of another person (Nation& Penny, 2008). According to Leekam et al. (1998; 2000), there is data which shows that the ability for a child with ASD to monitor eye contact of another person is delayed. The children on the PDD spectrum are able to identify another person's point of reference; however they have deficits in the ability to instinctively check and follow a change in the conversational partner's eye and head direction. Various studies seem to agree that the development of natural eye contact and joint attention correlates with the child's mental age in that children with ASD are required to be older and need to have developed expressive language in order to follow eye contact of another person more spontaneously (Nation & Penny, 2008).

Furthermore it has been suggested that individuals who present with ASD have difficulty in identifying faces of people that they know. They also present with difficulties in interpreting mental states and thus have a poor understanding of another person's ideas, requirements or intentions (Pelphrey et al., 2002).

2.7 Theories of eye contact deficits in Asperger's Syndrome

Two significant theories; Amygdala and Theory of mind are presented. The amygdala theory is presented as a neurological theory and theory of mind is presented as an example of a cognitive theory. These are linked in some respects even though they may be presented in the literature as separate theories.

2.7.1 Amygdala abnormality

Asperger's Syndrome is generally thought of as a neuro-developmental disorder (Moore, 2002).

Atypical eye contact in the ASD population has been attributed to theories surrounding the abnormal structure of the amygdala (Birmingham, Cerf & Adolphs, 2011; Spezio, Huang, Castelli & Adolphs, 2007). According to Senju and Johnson (2008), the impaired eye contact in individuals with PDD may occur due to the structural makeup of the sub-cortical structures that are responsible for eye contact such as the amygdala and/or it could result from the structural pathway leading to the amygdala. Functional magnetic resonance imaging (fMRI) has shown evidence that the superior temporal sulcus (STS) and amygdala facilitate gaze processing (Emery, 2000). The amygdala has been shown in numerous studies to be responsible for social communication, understanding of emotional states, aspects of facial recognition, attention, as well as reward processing (Birmingham et al., 2011). Magnetic resonance imaging (MRI) has shown evidence that there is a structural malformation of the amygdala which is strangely stimulated when fixating the eyes of the face (Birmingham et al., 2011). The STS is expected to play a role in perceiving that the head, eyes and body are essential for social interaction while the amygdala is responsible for the social cognition of what the eyes are seeing (Emery, 2000).

The study conducted by Birmingham et al. (2011) compared social attention in the form of eye contact between ASD and amygdala lesions using eye tracking during a task involving complex social pictures that contained faces. Results of this study showed that the participants with ASD looked less frequently at the eyes when the task required social attention. Individuals with ASD look less at the eyes because they are usually unaware of socially appropriate information and are unable to adjust their focus as a function of task (Birmingham et al., 2011). The study that was conducted by Spezio et al. (2007) looked at the way in which the amygdala is primarily responsible for eye contact during real conversations

with a conversational partner. This study identified that focal damage to the bilateral amygdala did not affect the quantity of the eye contact but rather the quality of eye contact with regards to looking at the face (Spezio et al., 2007).

Studies involving the research of autistic brains have shown that the structure of the amygdala is different to that of a normal person's brain in that the neurons of specific nuclei of the amygdala are packed more tightly together (Emery, 2000). Baron-Cohen and his colleagues (Ring, Wheelright, Bullmore, Brammer, Simmons & Williams, 1999) assessed the eye gaze patterns of normal and high-functioning autism or Asperger's syndrome participants on tasks whereby they had to interpret the mental states of photographs of eye stimuli specifically. During this task, fMRI was used in order to examine the individuals' brains. The results revealed that in the AS individuals, only the prefrontal and superior temporal cortices were stimulated during the task involving the interpretation of mental states whereas the normal participants indicated stimulation of the amygdala in addition to the prefrontal and superior temporal cortices (Emery, 2000). This finding could be interpreted as the amygdala being responsible for attaching mental states to visual stimuli.

There have been studies that were conducted on monkeys which looked at the anatomical and neuropsychological makeup of the brain in terms of the amygdala, the anterior temporal cortex and the prefrontal cortex (in particular the orbitofrontal cortex), which found that all these areas are necessary for social cognition and perceiving mental states (Emery, 2000). Research using neuro-imaging has also revealed that the orbitofrontal cortex is essential for theory of mind and when looking at individuals with Asperger's syndrome, their results are similar to that of individuals with orbitofrontal cortex damage in that gaze processing and interpretation of mental states differ in comparison to individuals with dorsolateral prefrontal cortex damage (Emery, 2000).

Emery (2000) has highlighted in his study that various previous studies conducted between the years 1997 to 1999 have revealed that individuals with autism present with presence of eye gaze and simple eye gaze; however, they are unable to engage in joint attention and struggle to perceive mental states. This information ties in with the Theory of mind theory, which is discussed in the next section. Due to the structural differences in the brain in terms of the amygdala and the orbitofrontal cortex, theory of mind may be poorly developed, thus affecting the social cognition of these individuals.

2.7.2 Theory of mind abnormality

Theory of mind is the ability to describe and anticipate other individual's behaviour by interpreting mental characteristics such as thoughts, ideas, needs and wants (Gallagher & Frith, 2007). In order to have a theory of mind, one needs to understand that people's actions will be influenced by their underlying aim and one also needs to understand that people interpret the world in different ways, which may differ from one person to the next. Additionally one needs to have the ability to perceive people's actions based on their perspectives as well as one's own perspective of the world. Both perspectives need to be compared and contrasted in order to be able to mentalize (Gallagher and Frith, 2007).

Joint attention has been suggested to be an underlying skill needed for the establishment of theory of mind (Wilde Astington & Barriault, 2001). A study by Charman, Baron-Cohen, Swettenham, Baird, Cox and Drew (2000) showed that the ability to alter gaze direction in children at 20 months of age was significantly associated with the later development of theory of mind in normal developing children at 44 months. Joint attention requires observation in changes in the direction of eye gaze necessary for determining other people's goals and in order to anticipate future behaviour (Bristow, Rees & Frith, 2007). Individuals with ASD present with an underlying deficit in joint attention, as they may have poor sensitivity to direction of eye gaze as seen in younger children with ASD. Older children with ASD may have intact direction of eye gaze but have poor social cognition (Nation & Penny, 2008). Poor joint attention leads to an impaired theory of mind, which in turn is responsible for the difficulties that these individuals have with socialization, communication and thought processes (Frith, 2001; Gallagher & Frith, 2007).

Neuro-imaging has been used in order to investigate which structures of the brain are necessary for a person to be able to have social cognition and it has been found that the superior temporal sulci (STS), the anterior paracingulate cortex and the bilateral temporal poles are structurally involved (Gallagher & Frith, 2007). The anterior paracingulate has been suggested to be the primary structure involved in mentalizing; however, the STS and the bilateral temporal lobes have also been found to be stimulated in research concerning theory of mind as they assist in the mentalizing process. The exact function of the STS is not clearly known and the bilateral temporal lobes are "a store for personal semantic and episodic memories" (Gallagher & Frith, 2007, p. 81). Other structures involved in social cognition are the orbitofrontal lobe and the amygdala. According to the study by Baron-Cohen et al.

(1999), individuals were required to perceive mental states from other individual's eye expressions, it seemed indicative that the amygdala is responsible for perceiving eye contact information or for the understanding of emotional actions. The orbitofrontal cortex is involved in social cognition; however, it is not directly involved in theory of mind as it forms part of the system in terms of interpreting avoidance behaviours or other general emotional stimuli (Gallagher & Frith, 2007). The above mentioned structures of the brain in combination with attention are necessary for perceiving visual stimuli and together are known as the '"social attention network" (Nummenmaa et. al., 2012; p. 2).

Baron-Cohen's classic study in 1995 was aimed at establishing a cause for abnormal eye contact in the paediatric autistic population and his study attempted to provide a cognitive theory regarding this abnormality. Baron-Cohen's study had implications for future research in terms of understanding this abnormal eye gaze (Nation & Penny, 2008). The study explored the difficulty that children with autism have with eye contact and the relation between this difficulty and the understanding of mental states (Baron-Cohen, Campbell, Karmiloff-Smith, Grant & Walker, 1995). The research highlighted the fact that children with autism are unable to understand that a change in another person's head and eye movement is an indication of that person's focus and direction of interest (Nation & Penny, 2008). Four experiments were carried out in this study. The first experiment revealed that children with autism have adequate visual perspective taking; however, the next three experiments revealed that children with autism have great difficulty with the visual processing in terms of perceiving mental state concepts regarding the needs, intentions and thoughts of another person when looking at the eyes of a person. From these results it can be understood that the poor ability to perceive mental state concepts leads to the failure to understand that eye-direction signifies a range of mental states (Baron Cohen et al., 1995).

Leekam et al. (1997, cited by Nation & Penny, 2008), also supports the above finding, that children with autism are able to detect direction of eye contact in the absence of interpreting another person's mental state; however, they have great difficulty in doing so when needing to perceive mental states. It is important to understand that cognitive ability is not necessary for eye gaze following behaviour but rather that cognition is required for the ability to understand the aim of the eye gaze i.e. we follow another person's focus in order to view the direction of interest and in order to follow the same point of reference as a starting point for the conversation (Nation & Penny, 2008).

2.8 Intervention

Children with Asperger's Syndrome present with social communication impairments that go on to affect the individual in adulthood with both social relationships as well as work related situations. These social communication impairments are life-long, and thus by providing early intervention the impairment may be lessened or prevented (Rao et al., 2008). Speech Language therapists are primarily responsible for providing the intervention for pragmatic deficits and specifically conversational skills (Owens, 2004).

Research on the treatment of Asperger's Syndrome is limited despite both the rising interest in Asperger's Syndrome as well as greater rates of referrals (Klin, Volkmar & Sparrow, 2000). There is also limited research data regarding the effectiveness and limitations of several recognized approaches of intervention for Asperger's Syndrome (Klin et al., 2000). These gaps indicate a need for further research to be conducted in order to validate effective intervention programmes for Asperger's Syndrome, which is currently seen to be a significant clinical problem (Sansosti & Powell-Smith, 2008). Due to children with Asperger's Syndrome being placed in mainstream schooling and being exposed to various social settings, which can be highly pressurising and demanding for these children, more interventions need to be tailored according to their needs (Rao et al., 2008).

There are several strategies which have been found to be universally successful in the social interventions for children with Asperger's Syndrome. In Denning's (2007) review of the factors that contribute to successful social management programmes, a number of factors were identified such as teaching particular skills; how to begin a conversation; modelling target behaviours displayed by the interventionist. This is achieved by using a scripted dialogue or by providing a model response to a particular scenario; the inclusion of peers in the therapeutic process as intervention agents; and the combination of written content and images which provides an easily accessible concrete format. Denning's (2007) review showed that scripted dialogue and the involvement of peers in the therapeutic process resulted in the most optimal results in the children applying the learnt behaviours to other situations. He recommended that future research needs to further investigate whether it is essential that these factors are integrated in order to ensure improved social behaviours. The present study will therefore incorporate and evaluate the effectiveness of these above mentioned components in the approaches used to teach appropriate social behaviours.

One of the approaches used to teach appropriate social behaviours to children with Asperger's Syndrome, is the use of social stories™, which were originally created by Carol Gray in 1991 (Attwood, 2007). Social stories are brief personalized stories that are written from a child's perspective and are used to help the child understand difficult social interactions using visual aids and texts (Gray, 1998). They are used to describe social situations as well as help the individual make sense of social situations (Hutchins & Prelock, 2006). The use of social stories provides predictability for the children for various social interactions in terms of explaining what may happen and what is behaviourally appropriate in various social settings (Ivey, Heflin & Alberto, 2004). To date, there have been many research studies conducted on the relative effectiveness of social story interventions, which have been found to be successful in increasing the social understanding and social behaviour in children with autism and Asperger's Syndrome (Hagiwara et al., 2000, cited in Attwood, 2007, p. 70). Further in-depth research of social stories is required in order for clinicians to have assurance when deciding on using social stories as a means of potential intervention (Sansosti, Powell-Smith and Kincaid, 2004 in Sansosti and Powell-Smith, 2006, p. 9).

Secondly, there is data indicating that children with Asperger's Syndrome benefit from using computers as they essentially offer an alternate form of social interaction; however, it is a reasonably new area of research which requires further exploration (Moore, McGrath & Thorpe, 2000). Various comparison studies in the autistic population reveal that computer based interventions generally produce successful results such as higher levels of motivation, loss of inappropriate behaviour, elevated levels of concentration and in some cases improved learning in comparison to traditional teaching methods (Goldsmith & Le Blanc, 2004). Children with autism spectrum disorders generally find computers inherently motivating (Sansosti & Powell-Smith, 2008). This may be due to the fact that children with autism spectrum disorders have been found to be visual learners (Whalen, Liden, Ingersoll, Dallaire & Liden, 2006). There are different explanations as to why computers are viewed as an effective educational strategy namely: computers act as a border between the interactants and thus detach the individual both socially and emotionally; the computer provides stability in terms of the need for familiarity; and computers permit the individual to work at his or her own pace (Rajendran & Mitchell, 2000).

Computer technology is continuously expanding and contributing to new possibilities for both assessment and therapy when working with children and this needs to be further investigated in terms of its potential (Calam, Cox, Glasgow, Jimmieson & Larson, 2000).

Computer usage is becoming increasingly available to children within the classroom, and thus it is essential that one further explores how such technology can be used to improve the scholastic, behavioural, and social skills of children with autism spectrum disorders (Sansosti & Powell-Smith, 2008). This study aims to investigate the effectiveness of computers in eliciting eye contact.

Thirdly, video modelling has also been documented as being one of the effective techniques used to increase appropriate behaviours among children with autism spectrum disorders (Banda, Matuszny & Turkan, 2007). Video modelling entails the child watching a video-tape or digital video disc (DVD) of people acting out appropriate social behaviours (Banda, et al., 2007). Adults or peers may act out the appropriate behaviours; however, it has been found to be more successful when peers are used as models of appropriate behaviour for children with autism spectrum disorders (Apple, Billingsley & Schwarz, 2005). Video modelling intervention is one of the favoured types of intervention as children with autism spectrum disorders effectively learn skills via visual modes of instruction (Banda et al., 2007). According to Attwood (2007), children with Asperger's Syndrome frequently take pleasure in watching repeated viewing of the same movie. This repeated exposure is seen to be beneficial for these children to help them better understand social communication and social behaviour (Attwood, 2007). The suitable behaviours are modelled efficiently and discretely, which facilitates the child's ability to remember and to act out these skills (Sansosti & Powell-Smith, 2008). Research has shown that video modelling increases the preservation and encouragement of the learned behaviours such as communication and socialization (Banda et al., 2007). Hence research has shown that video modelling intervention is influential in changing critical behaviours including conversational speech skills, perspective-taking, play sequences, and social initiations. However, there is a paucity of research that examines the effectiveness of video modelling intervention on social interaction especially eye contact which this study aims to investigate (Sansosti and Powell-Smith, 2008).

According to Wang and Spillane's meta-analyses (2009), various studies investigated the types of interventions that have been conducted over the last ten years to address the social skills of children with ASD. A total of 38 studies were reviewed, 36 of which were single case studies and 2 which were group experimental research. It was found that the results differed with regards to the various types of interventions implemented and the types of research studies differed within the mode of treatment. It was found that social stories, peer modelling as well as video modelling all essentially met the criteria necessary for evidence

based practice, however, video modelling was found to be evidence based as well as being highly successful in terms of intervention (Wing & Spillane, 2009).

The current study thus investigated the effects of combining three recently developed and as yet scarcely researched techniques for teaching non-verbal social skills to children with Asperger's Syndrome. Further research is indicated to determine the success and possible limitations of combining various techniques as presented by the study conducted by Sansosti and Powell-Smith (2008). The training of children with Asperger's Syndrome should be based on strategies which incorporate both the visual learning strengths of these children as well as allowing for repeated exposure of the appropriate social skills or behaviours (National Research Council, 2001, cited by Sansosti & Powell-Smith, 2008, p. 163). In order to meet these requirements this study will incorporate the combination of the above mentioned potentially successful strategies namely social stories, computer assisted intervention, and video modelling to offer optimal therapeutic input.

2.9 Rationale for this Study

It is thus known from the literature that eye contact is important in the development of children as it facilitates communication and is a marker for other pragmatic skills as well as the development of theory of mind (Itier & Batty, 2009; Senju & Johnson, 2008). To date there is a paucity of research guiding us on intervention of social communication with regard to non-verbal behaviours, specifically eye contact. This therefore creates a need for efficacy studies researching the various types of therapies available for pragmatics, specifically non-verbal social skills and in particular eye contact.

2.10 Research Questions

The following research questions were developed:

i. Does a combined therapy approach (i.e. combination of social stories, video modelling using peers and the use of computers) elicit eye contact?
ii. Is there evidence of learning due to the effectiveness of the therapy i.e. does the eye contact become more appropriate?

Appropriateness is determined by different variables. Eye contact cannot be measured in terms of quantity as it is not a reliable evaluation of eye contact. It has to be measured in terms of quality but quality is not a fixed entity. It relies on a various features such as age, culture, communicative act etc. This means that eye contact is a complex thing which is analysed subjectively. Eye contact in terms of 'appropriateness' was measured by looking at a number of features including time, reason for eye contact, culturally appropriate and language context etc.

iii. Was there greater level of eye contact during speaking and/or listening in conversation? i.e. the change in appropriateness of eye contact

iv. Was the change in eye contact associated with change in other physical non-verbal social engagement behaviours?

Was the type of communication activity associated with change in both eye contact and the general non-verbal behaviours?

CHAPTER 3

METHODOLOGY

3.1 Aim

The main aim of this research study was to determine the effectiveness of computer and video modelled social stories on the non-verbal social skills of children with Asperger's Syndrome, specifically eye contact.

3.2 Hypothesis

The use of the technology and social stories will effect change in eye contact in children with Asperger's Syndrome.

3.3 Sub-aims

i. To determine if combined therapy improves eye contact i.e. does the eye contact become appropriate.
ii. To identify whether there is a greater level of eye contact during speaking and/or listening in conversation i.e. the change in appropriacy of eye contact.
iii. To investigate if the change in eye contact is associated with change in other physical non-verbal social engagement behaviours.
iv. To identify whether the type of communication activity is associated with change in both eye contact and the general non-verbal behaviours.

3. 4 Research Design

A mixed research design was used for this study. Mixed method research is being used more frequently in the research conducted by health care researchers (Doyle, Brady & Byrne, 2009). Mixed research design came about when the limitations of using either quantitative or qualitative designs were identified (Doyle et al., 2009). It allows the researcher to use a combination of designs in order to identify factors that cannot be identified using only one

type of research design. Mixed designs in the health care sector, seem to be beneficial as the impairments are not clear cut and require that the problems be addressed in a variety of ways (Doyle et al., 2009). A mixed methods design was chosen for this study as the quantitative measures looked at visual inspection and the qualitative measures interpreted the comments and appropriateness of eye contact.

A multiple single subject ABAB design was applied for the purpose of this study. The single case study can be seen to be advantageous in that it provides in-depth, detailed information about each participant (Gravetter & Forzano, 2006). A single case design can also provide important information regarding the success of different types of interventions, applied singularly or simultaneously with other interventions, when treating communication disorders (Haynes & Johnson, 2009). This is important to consider when observing children on the PDD spectrum, as each child on the spectrum presents differently and the aim is to evaluate the effect of the treatment on a particular individual such as the individual with Asperger's syndrome. In single case studies, the aim is to apply a particular type of intervention repeatedly on a specific individual and to measure the change over time. When using single case studies in the PDD population, there are also some limitations including not being able to use the placebo effect, the fact that the disorder changes over time, as well as the carryover effect (Rothenberg & Samson, 2009).

The ABAB design is quasi-experimental whereby an evident occurrence is identified and monitored over time using at least one quantifiable measure (Maxwell & Satake, 2006). A quasi-experimental design involves all the elements of a true experiment with the only difference being that is does not randomly allocate participants to intervention and control groups but rather allocates participants based on logistics or convenience (Maxell & Satake, 2006; Haynes & Johnson, 2009). The ABAB design is made up of four phases (Gravetter & Forzano, 2003). The initial phase, known as phase A, provides a baseline, followed by treatment known as phase B (Haynes & Johnson, 2009). These two phases are then repeated. The ABAB withdrawal design study has been found to be particularly effective as it allows the researcher to quantify the behaviour during a second withdrawal and treatment phase. In the case of the behaviour decreasing and returning to baseline levels, this provides verification for a causal relationship between the treatment and the modifications in the subject's behaviour (Haynes & Johnson, 2009). The presence and success of the cause and effect relationship can be evaluated by the behaviour altering each time that the treatment phase is initiated or withdrawn. Evidence of whether the treatment had an influence on the

behaviour can be provided as well as confirmation of whether this type of treatment had no influence on the behaviour. Reliability of the experiment is greatly dependent on the extent of the response i.e. return to baseline measures (Gravetter & Forzano, 2003).

The ABAB design is seen to be more ethical than the ABA design as there are two baseline phases and two treatment phases which in turn eliminate the possibility for another reason for the change in the behaviour (Jackson, 2006). Increased repetition of the AB has also shown to increase the effect of the study. By ending with phase B i.e. the treatment phase, it is seen to be more ethical as the study ends with the phase that has (seemingly) shown to be evident as most favourable to the behaviour under the study (Maxwell & Satake, 2006). An ethical concern arises when effective treatment is withdrawn as this is opposes good clinical practice; however there are two factors which assist in rationalizing the process namely; the withdrawal phase is short-term, and secondly final withdrawal of treatment is realistically necessary. When the process returns to the baseline phase it can be seen as a practice phase in order evaluate the success of the treatment (Gravetter & Forzano, 2003). In the case of the behaviour not returning to baseline, this can be viewed as a desirable clinical result as the clinician applied a treatment programme which remediated the behaviour and when the treatment was withdrawn, the desirable behaviour continued. In contrast, the experimental view posits that the reliability of the results are greatly compromised if the behaviour indicates no change when the treatment is withdrawn as this leaves the researcher with reservations regarding the treatment. The experiment is seen to be acceptable in the case of there being some evident behavioural change once the treatment has been withdrawn (Gravetter & Forzano, 2003). In this particular study, a possible concern may be that social stories are intended to elicit long term effects and by removing the social stories, the participant's behaviour may not fully return to baseline measures (Denning, 2007).

During the study the participants continued to receive speech language therapy focusing on other areas such as language and auditory processing skills. Language is seen to be holistic and this means that pragmatics is part of intervention; however, non-verbal social skills were not focused on in therapy. This study aimed to provide therapeutic intervention for specific pragmatic skills i.e. non-verbal social skills specifically eye contact. The speech-language therapist of each participant was consulted initially to inform her of her client's participation in the study; however, she was not involved in the process in order to prevent the Rosenthal effect, which refers to inadvertent effect on the outcomes measured due to speech therapist having certain expectations of the child (Haynes & Johnson, 2009). The results of the study

would be discussed with her once the study has been completed. If the study proved that the computer and video modelled social stories were effective techniques used to increase appropriate behaviours, the researcher would promote the continuation of the specific techniques, introduced in the study's intervention. In the case of this study revealing results that the treatment techniques were ineffective, the researcher would also share this as it contributes to evidence. The participants involved would continue to receive speech language therapy following the completion of the study.

3.5 Sample size

Five children diagnosed with Asperger's syndrome participated in the study. This small number of participants was influenced by two factors: although many children present with the symptoms that match Asperger's Syndrome, only a few are given a formal diagnosis at a young age, hence it is relatively difficult to source participants who fit the diagnosis criteria.

3.6 The participants

3.6.1 Inclusion and exclusion criteria

i. Children between the ages of six to twelve years participated in the study. Although expectations of a child differ at the different ages, this study was judging appropriateness of eye contact in relation to each age group.
ii. The children presented with an existing diagnosis of Asperger's Syndrome that was determined by a paediatric neurologist or a psychiatrist using the DSM-IV to confirm diagnosis. As mentioned earlier, according to Attwood (2007), the Gillberg and Gillberg (1989) diagnostic criteria are more favourable; however, this study took place in a South African context and for this purpose the DSM-IV confirmed the diagnosis. This may be seen as a limitation of the study; however, this is the diagnostic measure used in South Africa and thus the study had to fit the criteria.
iii. The children with low to above average range cognitive functioning, as determined by a formalized IQ test, were included. This information was obtained from the child's school records.
iv. The participants were required to be able to communicate functionally as confirmed by a standardized language measure which was conducted by the speech therapist

e.g. CELF-R- Clinical Evaluation of Language Fundamentals- Revised Edition (1987). This test was administered as a routine test in the standard assessment battery of the school, and the results were obtained from the school records.

v. The children were required to be in an English medium school as this was the language spoken by the researcher as well as the language in which the study was conducted.

vi. The only exclusion criterion was that the children did not present with any organic abnormalities, such as hearing loss, cognitive deficits (below average IQ) or seizures which may have affected the child's ability to respond to the intervention consistently.

vii. All information was obtained from the children's school records following permission granted by the parents and the school to access this information.

3.6.2 Description of Participants

Five Caucasian male participants, who attended the same private remedial school, were recruited for this study. The participants were aged between 9 and 11 and between grades 1 and 6. All the participants were English speaking. The demographic information of the participants is presented in Table 1.

Table 1: Demographic Characteristics of Participants

Participant	Age	Grade
P1	9	3
P2	7	1
P3	10	3
P4	10	4
P5	11	6

3.7 Procedure

The study was conducted at a private school for learning disabled children in Gauteng, South Africa, during school hours. Although ideal for control purposes, it was not possible to conduct the collection of data at the same time each day due to the organisation of the school day. The researcher did, however, make sure that there was variability in terms of the times

during the school day. The intervention took place in the same room throughout the data collection and the participants and researcher sat in the same place each time.

3.7.1 Identification of target behaviour

The target behaviour i.e. eye contact, was determined in all participants using the Prutting and Kirchner (1987) checklist prior to conducting the study. There are various pragmatic checklists available to assess pragmatic skills (Gallagher, 1990). For this study the Prutting and Kirchner (1987) checklist was used to assess the pragmatics skills and in particular non-verbal social skills. The Prutting and Kirchner checklist is appropriate for children and is used commonly locally (Ridley, 2011). The checklist is divided into three main areas namely: verbal speech acts, paralinguistic skills, as well as non-verbal social skills (Gallagher, 1990).

All the participants in this study presented with impaired eye contact as well as other impaired non-verbal skills as obtained in the results on the Prutting and Kirchner (1987) checklist . Eye contact was specifically chosen for this study as it is seen to be a marker for other non-verbal social skills (Farroni et al., 2002; Itier and Batty, 2009; Senju & Johnson, 2008). Once eye contact was chosen as the target behaviour, each participant was then initially observed, during an interaction by the researcher and various factors were recorded namely; significant signals of the behaviour, descriptions of the setting that were particular to that behaviour, as well as the chain of events that occurred prior to and following the behaviour (Sansosti and Powell-Smith, 2008).This information was necessary as it assisted the researcher in determining what was applicable when constructing the social story and video clip.

3.7.2 Pre-baseline

The researcher evaluated the participants' comprehension of the social stories prior to the treatment phase. They were required to answer questions related to the social story to ensure understanding of the content in order to prevent this from affecting on the results.

3.7.3 Phase A- Baseline

During phase A known as the baseline, the researcher interacted with the participants; however, no intervention was introduced. Specific opportunities were set up in order for the

participants to spontaneously initiate the target behaviour. Each participant started the baseline phase at the same time; however, each participant had varying time period of baseline measures i.e. participant one had two baseline measures, while participant two had three baseline measures and so on. This means that the intervention was introduced in a staggered fashion to minimize possible confounds as well as reducing the likelihood that some other unrelated variable produced the results (Jackson, 2006).

These baseline interactions lasted approximately 15 minutes and took place in the therapy room and were recorded using a digital video camera. No intervention was provided before or during this phase. The researcher measured the appropriateness of eye contact. A 1-5 Likert scale was used to record the eye contact, which was observed throughout the 15 minute interactions.

3.7.4 Phase B- Intervention

During phase B, known as the intervention phase, the researcher was responsible for providing the intervention. The researcher had the responsibility of switching on the computer programme necessary for viewing the computerized social story and video clip. The researcher was in the room in order to turn on the equipment and make sure that there were no technical faults. The researcher remained in the room while the child viewed the social story and video; however she sat away from the child in order to try eliminate any influence that the researcher's presence may have on the child. The researcher provided each child with the same set of instructions; in the form of an instructional booklet with a pictorial guide (see Appendix B):

"You are going to sit at the computer and listen/read a short story on the computer. You will be able to move through the story by pressing a button (show the child the 'enter' button). You can read the story on your own but you will also hear a voice telling you the story as you move through each slide. After you have listened/read the story, you will watch a short video clip. Once you are done listening to the story and watching the video, you will come to the therapy room and we are going to practice what you have seen on the computer."

The observations of the video occurred immediately before the targeted event i.e. in contrived situations set up the therapy room. Contrived settings refer to specific situations that are set up in the therapy room which will allow the child to practice the behaviours observed in both

the social stories and video clips (Sansosti & Powell Smith, 2008). Observations were recorded by a video camera as in the baseline phase i.e. 15 minutes in length twice over three sessions until a noticeable improvement was recorded, i.e. the child was able to produce the target behaviour at least twice or more spontaneously. Once an improvement was recorded as per these criteria, therapy stopped for 1 week. Phase A then once again was introduced whereby each participant had one second baseline measure. The reintroduction of phase B occurred once again until a noticeable improvement was recorded i.e. the child was able to produce the target behaviour at least twice or more spontaneously.

The child was informed of the video recording prior to the study; however, during all the video recordings throughout the study, the camera was placed in an inconspicuous place in order to prevent the Hawthorne effect, which refers to a change in the participant's behaviour due their awareness of them being observed (Haynes & Johnson, 2009).

3.8 Materials to model appropriate eye contact

One social story (see APPENDIX C) was designed for all participants. The social stories were designed using Gray's criteria for writing social stories (1998). Social stories are written from the perspective of the individual with autism and are written in first person, in the present tense and need to provide a lot of information regarding the particular situation that is being addressed. Two to five descriptive sentences are required for every directive sentence, which may include perspective sentences. Descriptive sentences include information relevant to the particular social situation and the directive sentences describe how the individual is required to behave in order to appear more socially appropriate. A perspective sentence may include information describing the mental states of other people including emotions or ideas and so on (Gray 1998).

The social stories were transferred into power point presentations using Gray and Garand's (1993, cited by Sansosti & Powell-Smith, 2008) criteria which incorporates a combination of descriptive, prescriptive and directive sentences. Descriptive sentences describe relevant information pertaining to the social setting. Prescriptive sentences describe the mental states of the people and directive sentences describe the appropriate behaviour relevant to the social setting (Gray 1998). The social stories included Board Maker Pictures ® as it made the story more exciting for a child and may facilitate better understanding of the underlying meaning of the social story (Sansosti & Powell-Smith, 2008). A short video clip, with an average

duration of 1 minute, of the social story was then constructed using similar-aged peers, who were from the same remedial school; however, they did not present with any pragmatic disorders. The recording of the video clip was done using a Canon Digital IXUS 70 camera. The social story and video model were then transformed into a slide show on Microsoft PowerPoint on a Dell XPS M1330 computer, which the child was then able to view independently. The social story also had voice-over when the child moved through each slide. Thereafter the child watched the video clip.

Various games were played with each child for an average duration of 15 minutes per session and the recording of the therapy sessions was also done using the Canon Digital IXUS 70 camera.

3.9 Games used to assess eye contact

The games that are discussed below were used during both phase A and B. They were used to enable each participant with an opportunity to use eye contact.

Snakes and ladders is a board game whereby each player moves a token along a sequence of squares according to throws of a dice. A ladder allows the player to move forward more quickly towards the finish whereas landing on a snake requires the player to move backwards towards the start of the game.

Tumbling monkeys is a game whereby each player is required to pull out coloured sticks which are secured in a plastic palm tree. At the top of the palm tree are plastic monkeys which fall to the bottom. The sticks are pulled out according to the roll of the dice. The aim of the game is to land up with the least amount of monkeys at the end of the game.

Pop a pirate is a game which requires each player to place swords in the sides of a barrel where a pirate is hiding inside. The player which makes the pirate pop out loses the game.

Catch me if you can is a game which requires the players to move around the board according to the throw of a dice and who ever reaches the end first is the winner.

Guess-who? – This game is a game whereby one player chose a mystery face and the one player was required to guess the other player's character by asking various questions related to facial features and by process of elimination. This game requires some linguistic ability in order to play the game. Questions need to be asked and then answered by the alternate conversational partner. For example, Question: "does your person have red hair?" Answer: "yes/no".

30 Seconds (Junior version)- This game is a conversational based game which requires the speaker to present descriptive features of the words seen on each card and in turn the listener has to listen in order identify the words. This game places high linguistic demands on the players and could only be played with those participants who could read the items on the card. An example: Word on the card is "zebra" and the speaker has to describe this: "this is a type of animal with black and white stripes. You find it on the plains of Africa".

3.10 Data Analysis

A rating scale i.e. 1-5 Likert scale (see APPENDIX D) was used to record the results of the appropriateness of eye contact. Each participant's data was plotted on a graph using the 1-5 rating Likert scale.

1= No or minimal eye contact

2=Little eye contact

3=Some appropriate use of eye contact

4=Eye contact mostly appropriate

5=Appropriate eye contact

A Likert scale is beneficial to use as it is straightforward and adaptable and it is frequently used to evaluate people's thoughts, feelings, beliefs etc. (Göb & Ramalhoto, 2007; Johns, 2010). The data that was collected during the baseline and intervention phases was visually evaluated in order to determine the effectiveness of the intervention. Visual inspection of data plotted on a graph involves the analysis of the level, trend, and stability of the target behaviour that occurs during the baseline and intervention phases (Dattilo, 2000). The level refers to the average performance during each phase, trend refers to the direction of the slope due to an increase or decrease in performance during each phase, and variability refers to the level of fluctuation within each phase (Horner, Carr, Halle, McGee, Odom & Worley, 2005).

There are several advantages in inspecting the data visually when evaluating the effectiveness of treatment. Visual examination allows the researcher to note changes which may not be of statistical importance but may have clinical implications. The researcher is also able to consider sources of variability as opposed to simple overall effect size (Richards, Taylor, Ramasamy, & Richards, 1999). There are also limitations in using visual inspection and an

example is that visual analysis lacks the exact rules for determining whether a treatment effect has occurred and thus relies on the analyst's subjectivity (Hojem & Ottenbacher, 1988).

Inter-rater reliability was calculated by a statistician using a software package called SPSS, which is used for statistical analysis (Nie, 2009). This was calculated using Cohen's Kappa, a measure of agreement between the researcher and rater one, between the researcher and rater two, as well as between the two inter-raters.

3.11 Ethical considerations:

Application to the Human Research Ethics Committee (Non-Medical), at the University of the Witwatersrand was presented and was approved. (See appendix E) Following ethical clearance, the researcher contacted the principal of the school and an information letter (see appendix A) explaining the aims and procedures of the study was given. A meeting was set up and the details of the study were further explained.

A parent information letter and informed consent form (see appendix A) was given to each parent or legal guardian of a child that was invited to take part in the study. The information letter explained the details and requirements that the study entailed so that parent or legal guardian was made fully aware of their child's role in the study. The parent information sheet indicated that their child's participation was voluntary and they were under no obligation to participate in it and could discontinue at any time without being penalised. The parent or legal guardian was also made aware that the intervention provided in this research was separate from the speech therapy that the child was already receiving and was a recognised form of therapy. Furthermore, that, it would not replace the original therapy sessions which would address other areas of required intervention. This intervention was to be seen as additional therapy.

Once parent permission was obtained, the child was invited to take part in the study and a verbal assent (see Appendix A) was attained. The purpose of the study was fully explained to the child and it was made clear as to what was expected from him. The child was also told that participation in the study was voluntary and he may withdraw from the research at any time without being penalised in any way. Once the child decided to take part in the study, he was required to sign a verbal participant information assent form in the presence of a witness.

The parents were also informed that confidentiality would be maintained throughout the study and the child's details would only be made available to the researcher, maintaining anonymity.

3.12 Reliability and Validity:

3.12.1 Reliability

Reliability refers to the consistency of a measurement. Research is viewed as reliable if the same results are obtained repeatedly. One is unable to measure reliability precisely; however, it can be approximated in a variety of ways (Cohen, Manion & Morrison, 2007). This study measured inter-rater reliability in order to ensure reliability of results amongst the three independent raters and in order to avoid a bias of opinion. A lay person and a speech therapist with over 15 years of experience were chosen in addition to the researcher to rate the videos in order obtain a holistic opinion and not just a clinical perspective. The raters were given specific instructions for rating the videos in order to ensure that all three raters were measuring what they were supposed to. They were both instructed on observational techniques as well as behavioural descriptions. Inter-observer agreement was calculated to ensure that the recordings made by each examiner were consistent (Haynes & Johnson, 2009).

Inter-rater reliability ensured that there was a limited bias of opinion. It was calculated in order to ensure that the coding system was effective. Inter-rater reliability was calculated using Cohen's Kappa, a measure of agreement between the researcher and inter-rater one, between the researcher and inter-rater two, as well as between the two inter-raters. Inter-rater reliability (Kappa) is calculated in order to study the level of agreement between two people (raters/observers). This is essential for establishing whether the coding or measurement system was effective. A statistical calculation of inter-rater reliability is Cohen's Kappa, which varies from 0 to 1.0 (although negative numbers are possible) where large numbers indicate enhanced reliability, values near or less than zero indicate that agreement is attributable to chance only (Landis & Koch, 1977). The recordings were viewed by the researcher and another speech-language therapist as well as one layman. Each examiner viewed the recordings individually, so as to prevent an influence on the results. The researcher then determined if there was agreement i.e. the results correlated.

Statistics Results

$p < 0.005$ (95% confidence interval) ($\alpha < p$)

Kappa	Interpretation
< 0	Poor agreement
0.0 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 1.00	Almost perfect agreement

This study was also deemed reliable in that it was based on a study conducted by Sansosti and Powell-Smith (2008), in which the intervention brought about marked changes in the pragmatic skills of children with high functioning autism. Another feature, which contributed to the reliability of this study, is the fact that Boardmaker ® pictures were used, which makes this study easily replicable as these pictures are used globally. The equipment used for this study is obtainable and affordable thus also indicating that this study can be easily replicable.

3.12.2 Validity

Validity refers to the study measuring what it is supposed to be measuring. It is essential for the test to be valid in order for the results to be functional. Validity is not determined by one single factor but rather by multiple components that illustrate that the study is measuring what it is intended to measure (Cohen et al., 2007). This study aimed at measuring the appropriateness of eye contact, which is relatively difficult to measure as appropriacy is a subjective notion. A 1-5 Likert scale was used to measure the appropriateness of eye contact when observing the videos. This particular scale was chosen as it has been found to be a successful key measure of appropriacy as in the studies conducted by Penn (1985) and Prutting and Kirchner (1987).

CHAPTER 4

RESULTS

The main aim of the research was to determine the effectiveness of computer and video modelled social stories on the non-verbal social skills of children with Asperger's Syndrome. Multiple single case studies were selected, given the heterogeneity of the population, as well as the intensity and time requirements of efficacy studies. Eye contact was chosen as a marker of non-verbal behaviour. This allowed the researcher to determine if this type of intervention was effective across all the case studies focusing on the same non-verbal behaviour and to draw comparisons across the multiple single case studies.

Data was analysed using visual examination (Dattilo, 2000). The researcher and the two raters observed each video and rated the data according to the aims, using rating scales presented on a checklist. Throughout the observations, the researcher and the raters made qualitative notes, which were included in the analyses.

The results are presented in sections in line with the aims of this study.

4.1 The demonstrative changes in eye contact

The participants' performance is presented on a bar graph, in Fig 1, with a 1-5 rating scale on the y-axis and A-B intervention point on the x-axis ('A' known as the baseline period when there is no intervention and 'B' being a period during intervention). The 1-5 Likert rating scale was used to rate the quality of the eye contact made by each participant. The rater is indicated on the right side of the bar graph. The researcher and both raters are represented on each bar graph providing a visual representation for each participant's performance, as well as to the see the variability among the three raters.

Participant 1 (P1)

Some eye contact was observed prior to the intervention with participant 1; however, it was not well sustained during both listening and speaking. Once the intervention was introduced (initial B), the eye contact appeared to be more frequent as he seemed to listen and look at the researcher more intently and as the session progressed his use of eye contact became more sustained. After the third period of intervention it was evident that P1 eye contact had

increased, as he was able to make and sustain appropriate eye contact with his conversational partner during listening and speaking. He would only tend to look away from his conversational partner when he appeared to be thinking or when he was required to look down at the game.

The results of the second period of no intervention was conflicting, as the researcher and the second rater observed that the participant's eye contact decreased with the second period of no intervention (second A); however the first rater noted that the participant's quality of eye contact remained the same. This may have been due to the fact that the researcher and second rater observed the same sections of the recordings whereas the first rater may have also watched other sections. Overall, a consistent improvement was recorded by all three raters as improved eye contact was observed since the initial recording of a session with no previous intervention.

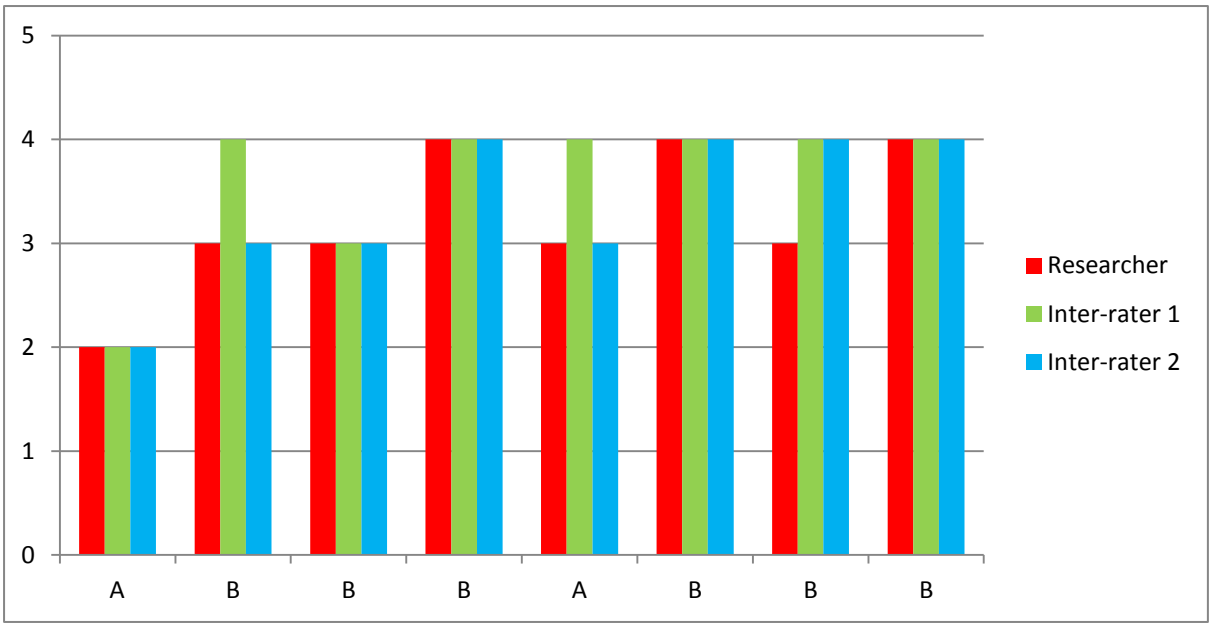

Figure 1: Ratings of eye contact throughout the study period: P1

The Kappa results indicate that there was moderate agreement between the researcher and irater 1 and also between rater 1 and 2. The researcher and rater 2 presented with substantial agreement in terms of the ratings of appropriateness of eye contact.

Table 2: Kappa results and interpretation of Participant 1

Rater	Kappa Value	Interpretation
Researcher * Inter-rater 1	.415	Moderate agreement
Researcher * Inter-rater 2	.795	Substantial agreement
Inter-rater1 * Inter-rater 2	-.556	Moderate agreement

Participant 2 (P2)

Participant 2 showed very little eye contact during the first three sessions when no intervention had been provided. His eye contact was extremely fleeting and did not appear to be communicative, as he only used it to look at something he needed. Initially he only used eye contact to look through the pieces of the game and every time he looked at the researcher, he would close his eyes. After the first session of intervention P2 demonstrated improved initiation of eye contact as he began to use his eye contact to check if his responses were correct in the game. His eye contact was not sustained but was more frequent and appropriate during the game. Nonetheless, during spontaneous conversation his eye contact was very limited. In the next two sessions, thereafter, his eye contact was more sustained and he began to look at the therapist when he was speaking, and looked for her responses and much more frequently and with enjoyment. His eye contact was initiated mostly when he was listening during the conversation and less frequently when he spoke.

Once the intervention was stopped, the quality of the eye contact decreased. Once the second period of intervention was introduced, P2 presented with improved eye contact; however it was not as effective as the initial period of intervention. This may have been due to the change of activity (game of snakes and ladders to a game of 'guess who') and thus the eye contact practiced and learned did not appear to carry over to the new game. The 'guess who' activity required more focus on the picture cards, which may have contributed to the decreased amount of improvement. His joint attention, however, improved greatly as a result of his improved eye contact.

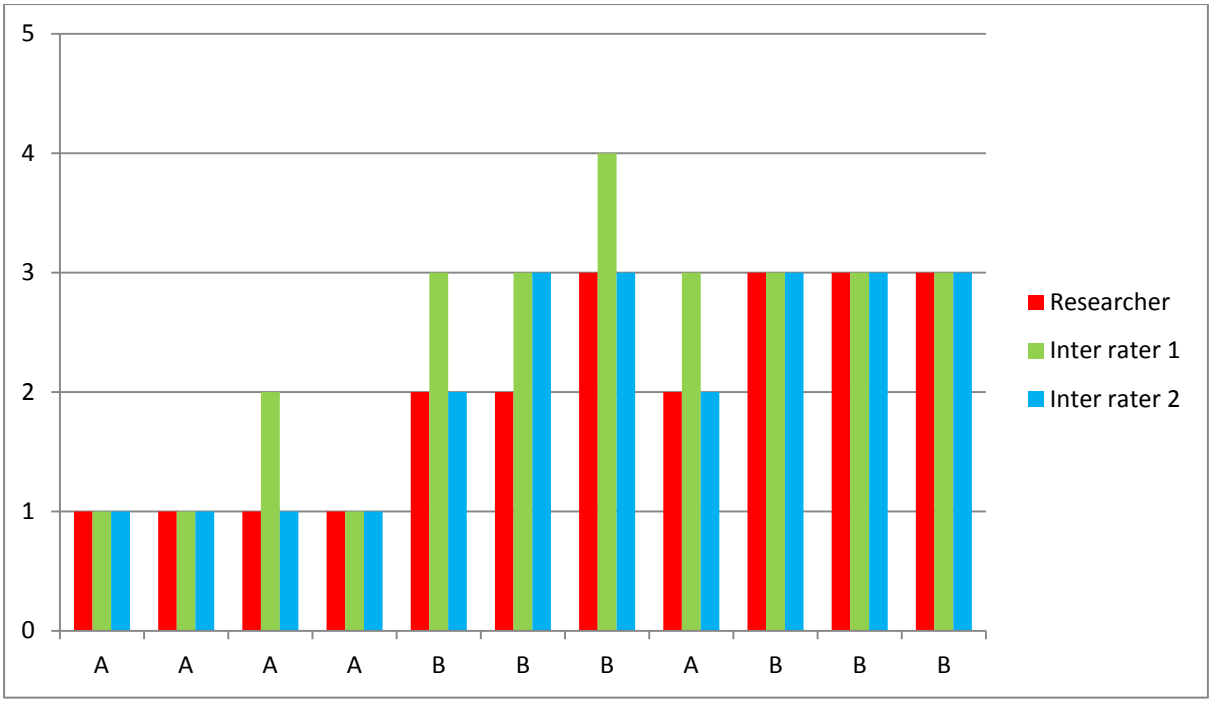

Figure 2: Ratings of eye contact throughout the study period: P2

The Kappa results reveal that there was fair agreement between the researcher and rater 1 as well as between the researcher and rater 2. Moderate agreement was found between rater 1 and 2.

Table 3: Kappa results and interpretation of Participant 2

Rater	Kappa Value	Interpretation
Researcher * Inter-rater 1	.329	Fair agreement
Researcher * Inter-rater 2	.329	Fair agreement
Inter-rater1 * Inter-rater 2	-.429	Moderate agreement

Participant 3 (P3)

Participant 3 was able to initiate some eye contact during the period of non intervention. In both the initial sessions prior to the intervention, his eye contact started off as fleeting; however, as both the sessions progressed his eye contact was a little more sustained. There was a distinct increase in his ability to sustain the eye contact during both listening and speaking in conversation once the intervention was provided. P3 began to initiate conversation as well as introduce new topics of conversation. It was noted, however, that his level of interest in the conversation did have some influence on the level of eye contact made

during the conversation. He was able to include humour into his responses and enjoyed eliciting a response from his listener as was evident by the way in which he used his eye contact to gauge his listener's response. He also used a variety of facial expressions to facilitate his communication and was also able to interpret his communicative partner's facial expressions, as indicated by actions and comments.

Once the intervention was stopped, his eye contact decreased; however not to the level that was initially rated prior to the first period of intervention. His eye contact showed improvement once again after the intervention was reintroduced. The last session showed improvement, however not as much, as a new activity was introduced ('guess who' game) which caused some distractibility due to excitement. As the game progressed, his eye contact improved and there was shared enjoyment observed between both conversational partners.

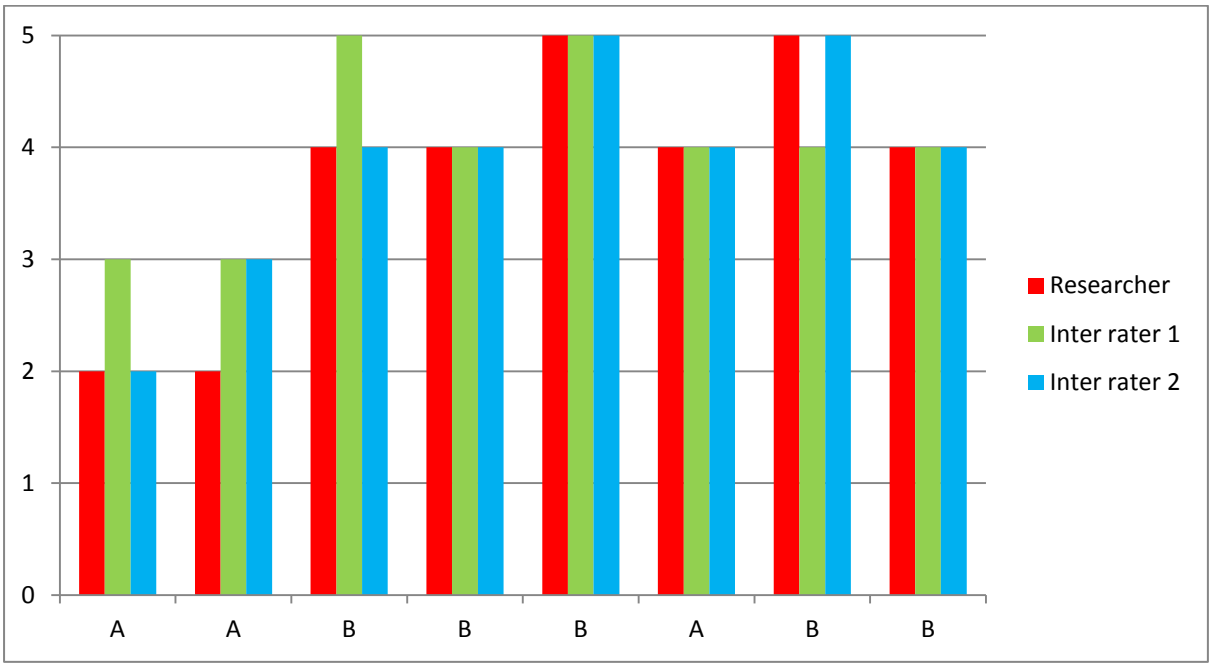

Figure 3: Ratings of eye contact throughout the study period: P3

Results reveal that the Kappa co-efficients varied as there was fair agreement between the researcher and rater 1. There was an almost perfect agreement between the researcher and rater 2 and there was moderate agreement between the other two raters.

Table 3: Kappa results and interpretation of P3

Rater	Kappa Value	Interpretation
Researcher * Inter-rater 1	.273	Fair agreement
Researcher * Inter-rater 2	.810	Almost perfect agreement
Inter-rater1 * Inter-rater 2	.429	Moderate agreement

Participant 4 (P4)

In the initial session prior to intervention (first A) P4 walked into the session making no eye contact and he appeared to be anxious. After he began to relax, he made some eye contact but remained very rigid and his eye contact was not always sustained. In the second session (second A), P4 made some good eye contact when he was speaking to the therapist; however, he would look away when he was listening to her response as she was providing him with suggestions to his problem that he was talking about. Appropriate eye contact was noted when the topic of conversation was of his choice. In the final session prior to the first set of intervention, P4 was relaxed and although he was making eye contact, it did not appear that he was using it to read any of the therapist's non-verbal cues. He did look away and made very little eye contact when he became distracted by his coloured pens that he had brought with him to the session.

During the first session when the intervention had been introduced (initial B), P4 made very little eye contact as a new activity had been introduced, which in turn caused him to become highly distracted. He could not move his attention and focus from the objects of the game. Towards the end of the session, when the therapist moved the topic of conversation to something of interest, he made some appropriate eye contact when he listened to the therapist. Thereafter in the next two sessions, while receiving the intervention, P4 made some good use of eye contact when listening to the therapist; however, it did depend greatly on the topic of conversation. His eye contact had shown some improvement from the initial 'B' session, as the game was changed in order to prevent any great distractions.

When the period of no intervention was reintroduced, there was a slight decrease in his eye contact; however, not as great as the initial period of no intervention. His eye contact began to improve slightly, once the intervention was activated again. He started showing signs of

using the eye contact as a communicative tool in order to gauge whether his listener understood what he had said and if not, he would tailor the message accordingly. The eye contact was seen to be a learnt behaviour and was not very natural. He would begin making eye contact initially, then as the session progressed it would seem to waver and deteriorate; however, towards the end of the session he would remember 'the learnt behaviour' and his eye contact would once again improve.

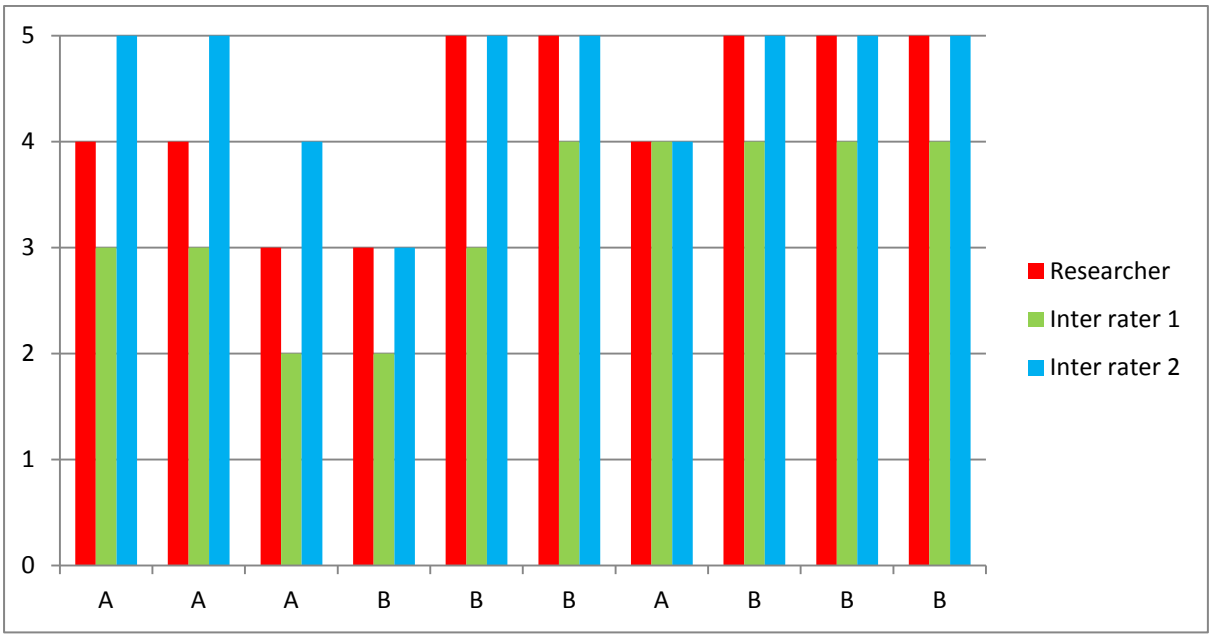

Figure 4: Ratings of eye contact throughout the study period: P4

Poor Agreement was found between the researcher and rater 1 as well as between the other two raters. Moderate agreement was found between the researcher and rater 2.

Table 4: Kappa results and interpretation of P4

Rater	Kappa Value	Interpretation
Researcher * Inter-rater 1	-1.39	Poor agreement
Researcher * Inter-rater 2	.474	Moderate agreement
Inter-rater1 * Inter-rater 2	-0.034	Poor agreement

Participant 5 (P5)

In the first two sessions when no intervention had been introduced, some eye contact was observed by the raters; however it was fleeting. It appeared to be very uncomfortable for P5 to initiate and sustain the eye contact as he would scowl during eye contact. At times there was some sustained eye contact but then he would rub his eyes and then look away. In the third session (third A), P5 seemed to be interested in the topic of conversation and he was able to sustain his eye contact during the discussion. It was clear P5 was beginning to use the eye contact as a communicative tool in terms taking note of his listener's response and looking at the therapist for clarity.

The introduction of intervention (initial three periods of intervention) indicated a little improvement in terms of the eye contact; however, at times the eye contact was fleeting. His eye contact would deteriorate towards the end of the sessions possibly due to fatigue. The shift of games in the second 'B' also caused some anxiety which was observed when playing a game, which was more conversational due to a time pressure. In the third 'B' session the initiation and maintenance of eye contact was dependent on his mood, as he seemed to make little eye contact due to his subdued nature on that particular day.

The next period of intervention was successful in terms of eliciting eye contact. P5's scores showed an overall improvement. His facial grimacing was far less and he was able to sustain the eye contact better than during the first period of intervention. His level of interest in the topic of conversation still seemed to impact on the quality of eye contact made as he would make little or no eye contact when he was uninterested. His eye contact decreased towards the end of each session; however, it was maintained for a longer period of time during the second period of intervention.

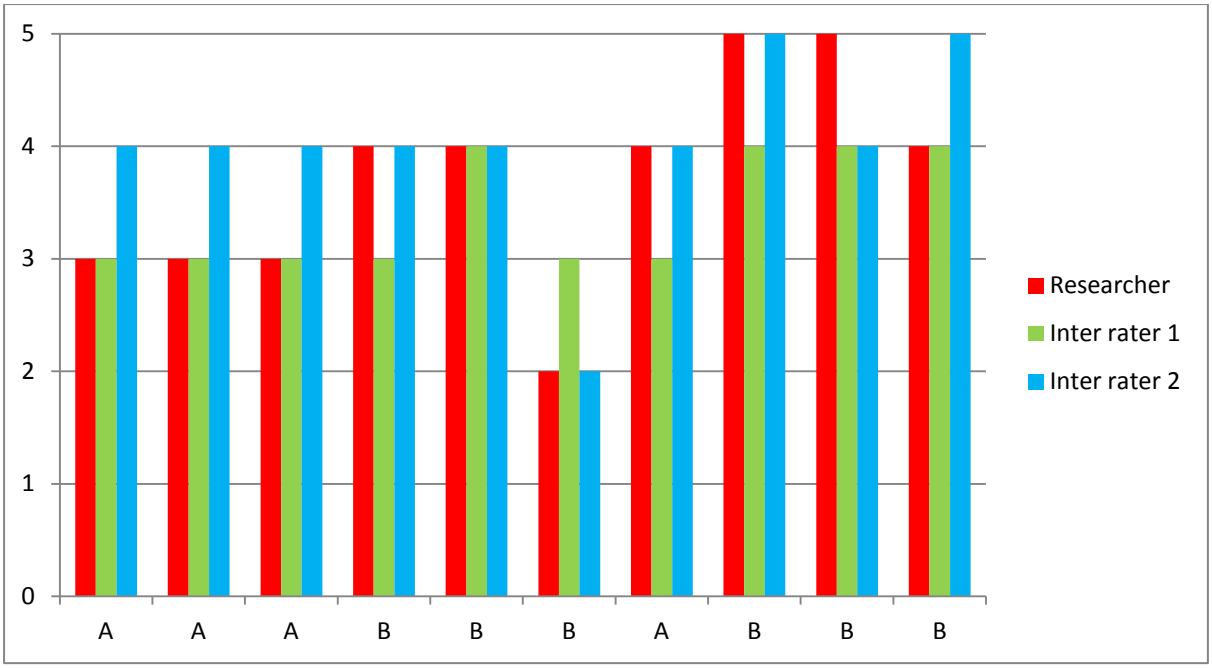

Figure 5: Ratings of eye contact throughout the study period: P5

Fair agreement was found between the researcher and both raters. Poor agreement was found between rater 1 and 2.

Table 5: Kappa results and interpretation of P5

Rater	Kappa Value	Interpretation
Researcher * Inter-rater 1	.242	Fair agreement
Researcher * Inter-rater 2	.254	Fair agreement
Inter-rater1 * Inter-rater 2	-.111	Poor agreement

4.1.2 Summary of findings

The results that were obtained in accordance with the first sub-aim indicate that there was an overall improvement in the appropriateness of eye contact made by each participant. The figures shown signify the amount of change that occurred over time as each participant was able to make and sustain better eye contact by the end of the study. The graphs show how the quality of the eye contact improved as the study progressed, where each participant demonstrated improved eye contact during each period of intervention in comparison to the decreased amount of eye contact made during the periods of no intervention, specifically the initial period of no intervention.

Poor agreement was found in the Kappa results between rater 1 and rater 2 in the interpretation of P4 and P5. This may have occurred due to the fact the two raters were not trained together on how to rate the video recordings. The raters may have watched different sections of the video recordings as it was not specified which sections of the recordings were to be watched.

4.2. Extent of change in eye contact during speaking and/or listening during conversation

The raters all seemed to agree on the amount of change graded during speaking and listening with regards to each participant. A 1-3 rating scale was used.

Participant 1 (P1)

P1 showed some eye contact prior to the first period of intervention; however, the eye contact appeared to be fleeting and not well sustained.

Once the intervention was introduced, there was evidence of eye contact made during both speaking and listening during conversation. However, it appeared that the eye contact was more sustained during listening. During speaking P1 would look away more frequently as he appeared to be processing the information and formulating his response. It was also evident that the quality of his eye contact improved, in terms of sustainability, when the topic of conversation, such as animals, interested him.

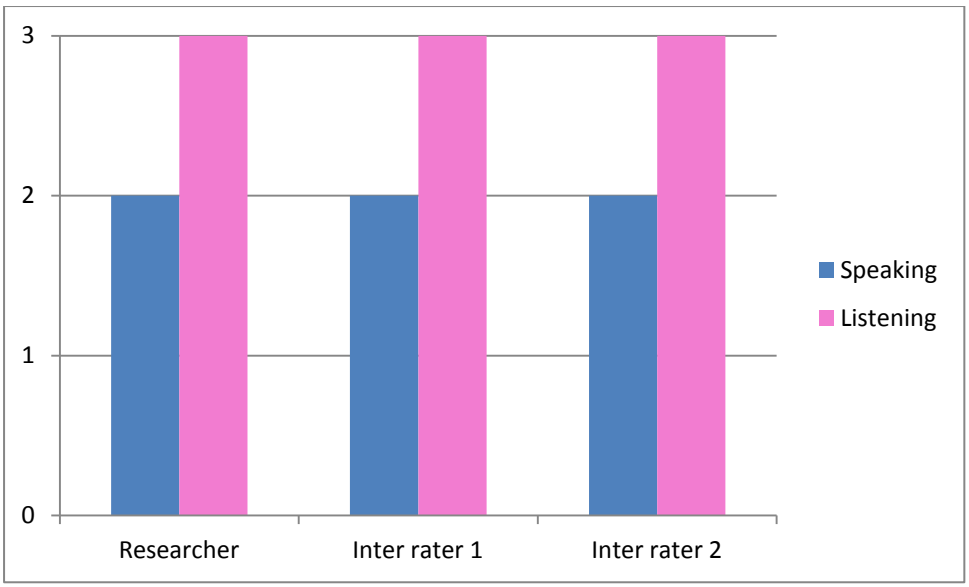

Figure 6: Ratings of eye contact during periods of listening and speaking: P1

Participant 2 (P2)

Very little eye contact was observed during the sessions prior to the first period of intervention both during speaking and listening in conversation. Once the intervention was introduced, P2 appeared to be more relaxed. His eye contact appeared to increase during conversation, particularly during listening as he would use his eye contact to facilitate his conversation. He monitored his responses by looking at the reaction of his conversational partner. The eye contact was seen to be of a better quality in terms of sustainability when the topic of conversation was of interest to him.

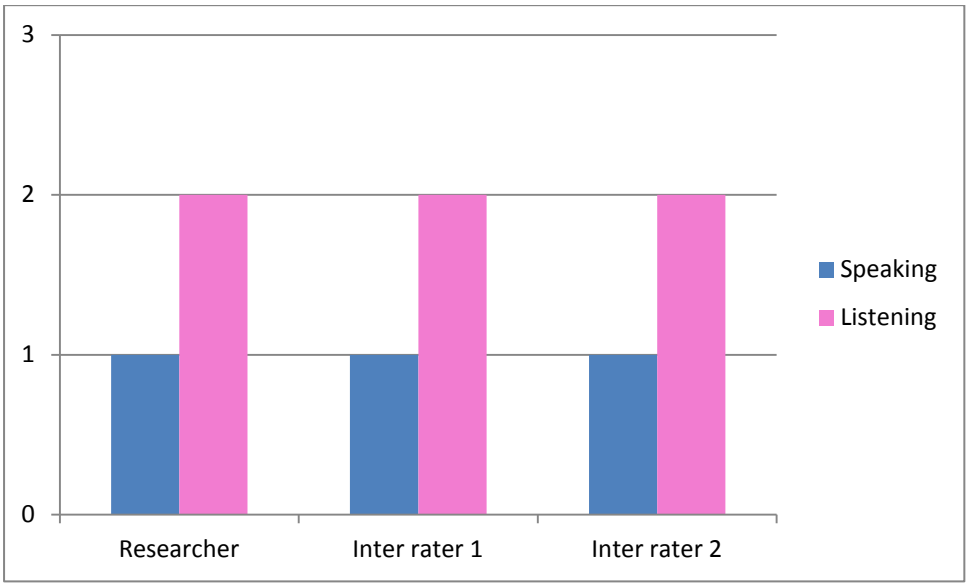

Figure 7: Ratings of eye contact during periods of listening and speaking: P2

Participant 3 (P3)

During the period of non-intervention, P3 displayed some eye contact during conversation. The eye contact appeared appropriate and sustained at times. During the period of intervention, he demonstrated improved quality of eye contact during both speaking and listening during conversation. He used his eye contact effectively to engage with his communicative partner and was able to sustain the eye contact throughout most of the conversation, during speaking and listening, as observed in both periods of intervention.

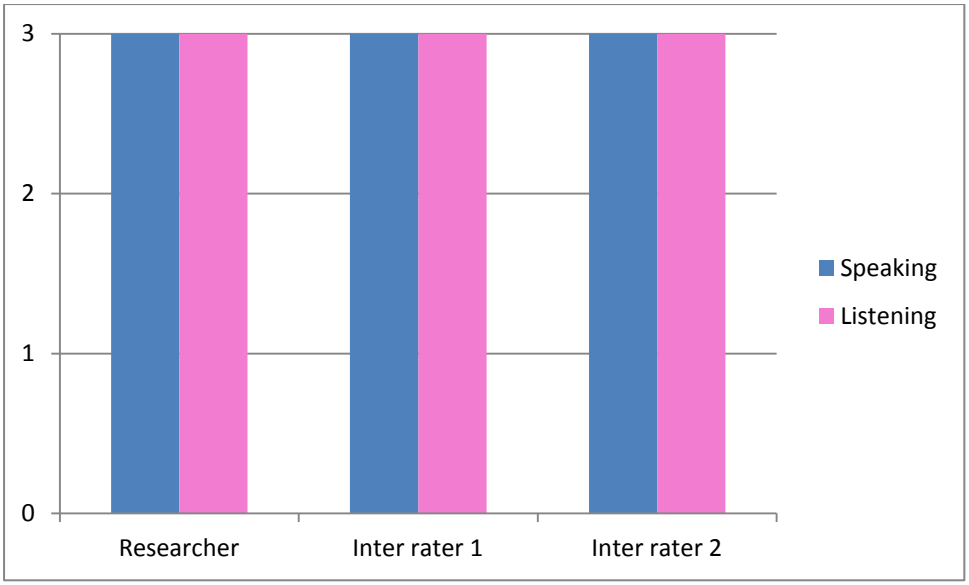

Figure 8: Ratings of eye contact during periods of listening and speaking: P3

Participant 4 (P4)

Initially, eye contact present was observed prior to the intervention; however, it was fleeting and mostly when P4 was speaking. During the intervention period it was observed that his eye contact improved as he was able to sustain his eye contact in both speaking and listening contexts; however, the improvement was noted particularly during speaking and specifically when the topic of conversation was of his choice. The topic of conversation had a great effect on the quality of eye contact made during conversation.

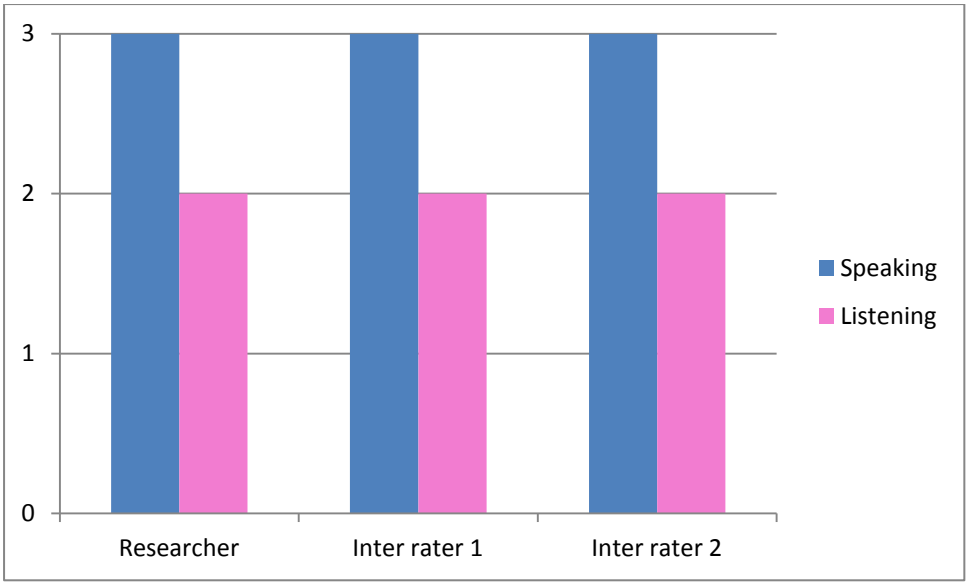

Figure 9: Ratings of eye contact during periods of listening and speaking: P4

Participant 5 (P5)

The participant presented with some eye contact prior to the intervention during both speaking and listening; however, the eye contact was fleeting. Once the participant become more relaxed and the intervention had been introduced, the eye contact appeared to improve equally during speaking and listening as P5 began to use the eye contact as a communicative tool.

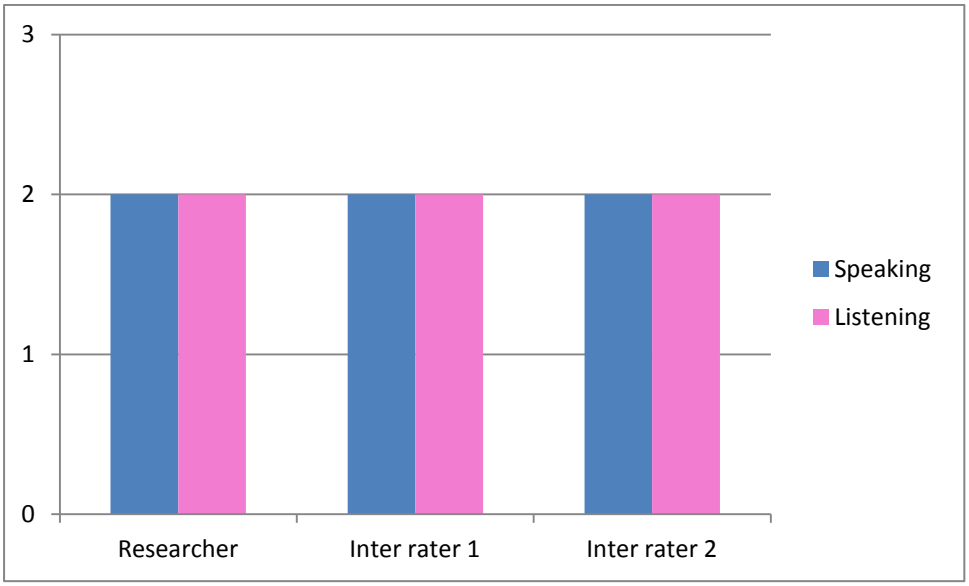

Figure 10: Ratings of eye contact during periods of listening and speaking: P5

4.2.1 Summary of findings

The results that occurred with regard to this aim indicate that there was more success in terms of eliciting eye contact during periods of listening during conversation across all participants. Eye contact during speaking also showed some improvement; but not as improved as during the periods of listening. P3 and P5 showed improved eye contact during periods of both listening and speaking. It was found that the participants started to use the eye contact as a communicative tool in terms of monitoring their responses. The topic of conversation seemed to have an effect on the quality of the eye contact made as the eye contact appeared to be better during topics of conversation which interested the participants.

4.3 Association of change in the behaviour with change in other physical non-verbal social engagement behaviours.

Although the aim was to investigate whether the improved eye contact would affect other non-verbal pragmatic behaviours, it was also on the basis of both the theories described in chapter 2 that some verbal pragmatic behaviours would accompany the changes in eye contact. It was due to the breadth of the possible non-verbal behaviours that are available for communicative use, and because the primary focus listed was to measure eye contact, the qualitative data was analysed to determine whether other non-verbal behaviours were noted to have changed. The other behaviours that were observed in post treatment were commented on qualitatively and are now described for each participant.

Participant 1

Two changes were noted consistently in the quantitative reports. The first was that the Participant 1 turned to face his conversational partner which provided for him with the opportunity to use the eye contact as an effective communicative tool in terms of maintaining the conversation. The second aspect of change that was reported on was that the conversation was more easily maintained and P1 began to initiate conversation as opposed to the researcher introducing the topic.

Participant 2

As P2's quality of eye contact improved, he began to use it in order to monitor his own responses by looking at his conversational partner's response. Other pragmatic behaviours

also started to occur in response to the improved eye contact. P2 was able to start initiating conversation as well as being able to maintain the topic of conversation. There was also evidence of improved joint attention. The development of the various pragmatic areas seemed to have created a more natural conversational setup with a more natural flow of social interaction.

Participant 3

P3 initially indicated some use of eye contact; however, as the eye contact improved, he seemed to engage himself more with his conversational partner. He used his eye contact to monitor his own responses as well as that of the conversational partner. He would modify his responses if he saw that his conversational partner had not understood his response. His body positioning also improved in relation to his conversation partner as he turned to face his partner more within the conversation. His ability to maintain a conversation also improved as a result.

Participant 4

It was seen that as the eye contact improved over time, his ability to use the eye contact as a communicative tool developed. He was then able to use the eye contact to determine the facial response of his conversational partner and in turn he would provide more verbal clues when his conversational partner appeared to require this. Turn-taking within the conversation appeared to have shown a little improvement as he was starting to develop the ability to pick up on the social cue that it was his turn to end his conversational turn and allow the other conversational partner to speak.

Participant 5

Initially the eye contact appeared to cause the participant to feel uncomfortable as he would tend to pull unnatural facial expressions when doing so. As the intervention progressed this behaviour appeared to disappear and the eye contact appeared more natural in nature. P5 began to use the eye contact to facilitate better listening as well as a communicative tool in terms of looking at his conversational partner for clarity. The improved eye contact also improved his ability to engage with his communicative partner and it appeared that he began to initiate conversation as well as some improved topic maintenance.

4.3.1 Summary of findings

Various other pragmatic behaviours, both verbal and non-verbal, seemed to be positively affected in tandem with the improvement in eye contact during conversation. It was observed that the participants began to engage more with their conversational partner in terms of using the eye contact as a communicative tool as a means of monitoring their own responses. Both joint attention as well as turn-taking within the conversation improved. It was recorded that there was an overall improvement in the maintenance of conversation due to the improved eye contact. Increased initiation of topic was also observed. The results indicate an overall improvement in the participants' ability to engage more with their conversational partner during conversation.

4.4 Association of the type of conversational activity with change in both the eye contact and the general non-verbal behaviours.

Various activities were selected to be included during the sessions such that they each differed in terms of the linguistic demands and social communicative loading that they placed on the participants. The use of various activities showed how the children performed differently on different tasks.

Participant 1 (P1)

Initially a board game (Snakes and Ladders game) was used which required limited conversation and thus limited eye contact. The conversation was spontaneous and mostly unrelated to the game; however a marked difference in the improved quality of eye contact was noted. The other two activities that were introduced were more conversational based activities ('guess who' game and 30 Seconds game), which encouraged conversation to take place surrounding the activity as well as spontaneous conversation. The 30 seconds game was a talking and listening activity which created a conversational set up, whereby each conversational partner had the opportunity to speak and then listen during which eye contact was mostly observed. The 30 seconds activity indicated the most consistent and improved quality of eye contact made.

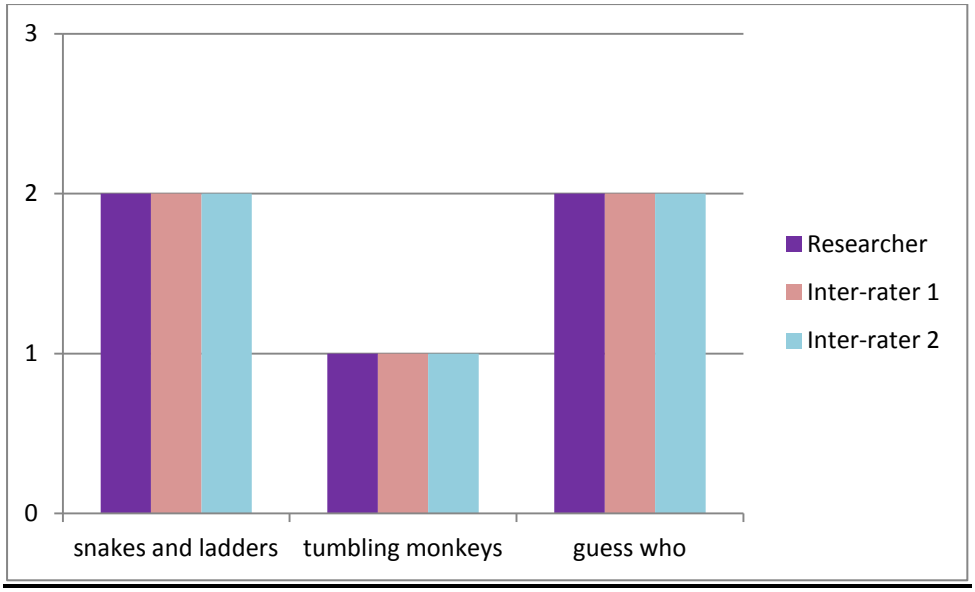

Figure 11: Ratings of eye contact during various activities: P1

Participant 2 (P2)

It was observed that the two games (Snakes and Ladders game and Catch me if you can game) were less effective in terms of eliciting eye contact as opposed to the other game ('guess who' game), which elicited more eye contact of a more sustainable nature. Even though this was a game, which the participant had not yet been exposed to, he seemed less distracted and was able to show improved eye contact.

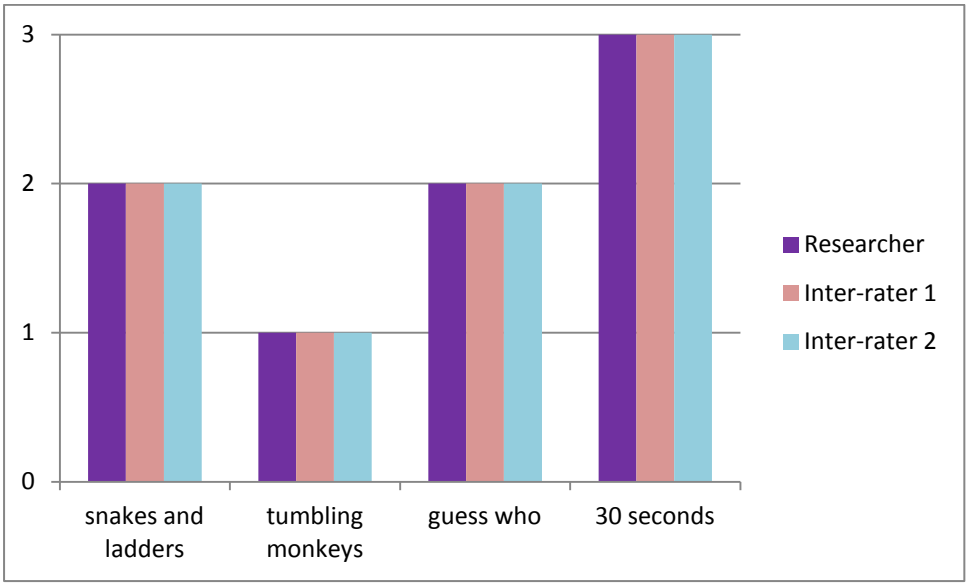

Figure 12: Ratings of eye contact during various activities: P2

Participant 3 (P3)

Two activities were played with P3. A difference was observed in the eye contact elicited during both activities as it was noted that the quality of eye contact improved more during the conversational type activity (30 seconds game) as opposed to the game, which possibly required less conversation. The 30 seconds game provided less distraction than the snakes and ladders activity and thus the elicitation and sustainability of eye contact was better during this particular activity.

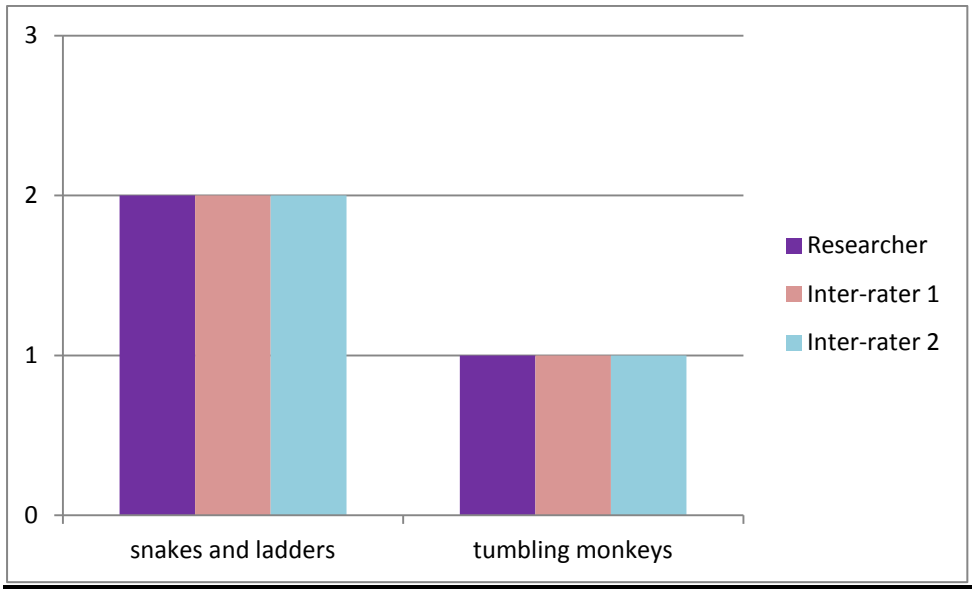

Figure 13: Ratings of eye contact during various activities: P3

Participant 4 (P4)

A marked difference was noted in the quality of eye contact made and sustained by P4 during the various activities. The Tumbling Monkeys game was distracting for P4 as it was a new task which seemed overwhelming for him and thus he appeared to make very little or no eye contact during this activity. The Snakes and Ladders was a more familiar task and thus seemed less distracting for him, thus allowing him to initiate and sustain his eye contact more easily during conversation. During the 30 second game, the eye contact made was seen to have improved in terms of initiation and sustainability of eye contact.

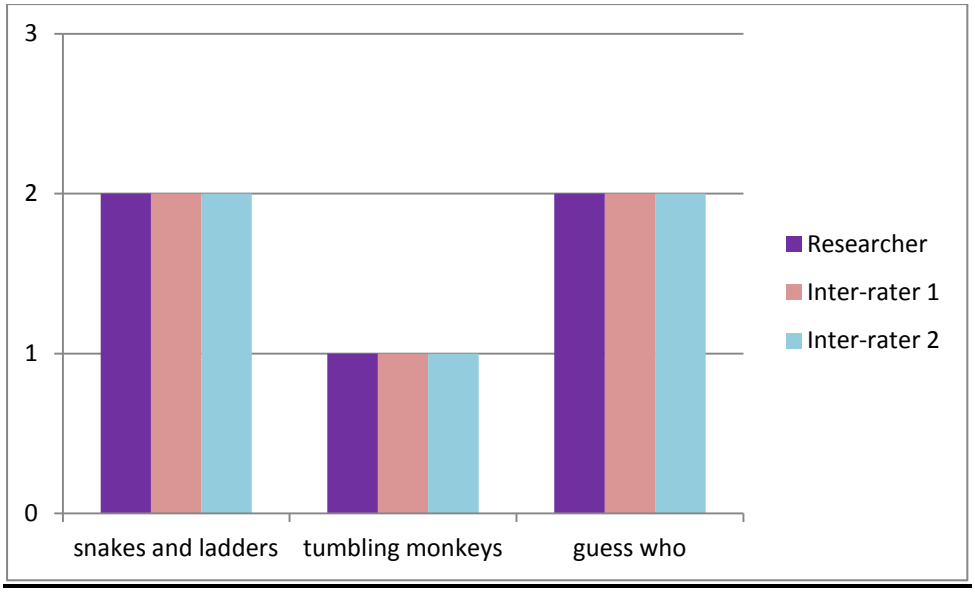

Figure 14: Ratings of eye contact during various activities: P4

Participant 5 (P5)

Various activities were used within the sessions with P5 to elicit eye contact. It was observed that the two games (Tumbling Monkeys game and Pop a Pirate game), which P5 had not previously been exposed to were less successful in terms of eliciting eye contact. The snakes and ladders game was a familiar task for him, which possibly provided less distraction and thus allowed for better eye contact. The more conversational based activities i.e. 'guess who' and 30 seconds, which required a conversational setting seemed to elicit good eye contact and in particular the 30 seconds game.

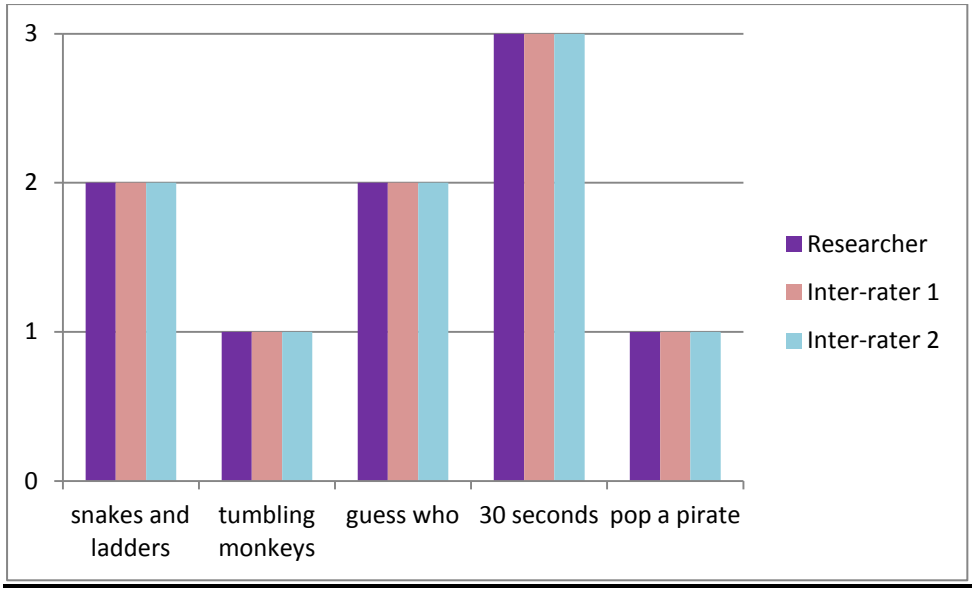

Figure 15: Ratings of eye contact during various activities: P5

4.4.1 Summary of findings

The results that were obtained in accordance with the fourth sub-aim indicate that there were varying amounts of improvement observed with regard to the different tasks used. When a more familiar task such as snakes and ladders was used, there was less distractibility and thus better eye contact was observed as opposed to a newly introduced activity such as Tumbling Monkeys, which increased the distractibility and hence the quality of eye contact decreased. It was also observed that the eye contact made during activities, which placed higher linguistic demands and social communicative loading, such as the 'guess who' game and the 30 seconds game, were more effective in terms of eliciting and sustaining eye contact.

4.5 Summary of Results

In line with the main aim of the study of determining the effectiveness of computer and video-modelled social stories on the non-verbal social skills, specifically eye contact, of children with Asperger's Syndrome, it was found that there was an overall improvement in eye contact among all participants. Eye contact improved overall in terms of the initiation as well as the quality of the eye contact improved as it became more sustained. It was found that the eye contact improved during acts of listening in conversation in all participants; however, it was found that eye contact improved less significantly during speaking in conversation. As a result of the general improvement in eye contact, made during conversation, it was found that other pragmatic behaviours were elicited, both verbal and non-verbal behaviours such as

increased joint attention, improved body language as well as initiation and maintenance of conversation. The various activities that were selected elicited varying degrees of eye contact and this may have been due to the varied linguistic and social communicative loading that they placed on the participants but there was still improvement. It was seen that the activities which were more familiar to the participant as well as more communicative based, were more effective in terms of eliciting appropriate eye contact.

CHAPTER 5

DISCUSSION

The results obtained in this study indicate that the intervention method was effective in changing the appropriateness of eye contact in children presenting with Asperger's syndrome. In addition to the change in the appropriateness of eye contact elicited, the change in eye contact was also associated with changes that were observed in the general pragmatic behaviours e.g. facing the conversational partner, increased joint attention and so on. It was also found that an activity which was conversational-based was more effective in eliciting eye contact than other activities which were more structured and did not require conversation. Finally it was found that that there was a general increase in eye contact during activities that required listening. The discussion that follows is presented in line with the aims of the study.

5.1 Change in the appropriateness of eye contact

All the participants used eye contact more appropriately as a result of the intervention that was used. This change indicates that eye contact, which is a non-verbal social or pragmatic skill, is malleable. Thus, the malleability of eye contact as shown in this study provides motivation for the implementation of a combined type of intervention as used in this study. The point being made is that this study confirms that the inappropriate use of eye contact, which is a strong indicator of Asperger's Syndrome, can be changed.

This coincides with a set of theories that propose that the amygdala plays an essential role in supporting, encouraging and implementing eye contact. To date, researchers, who have conducted studies that have been based on the amygdala theory e.g. Birmingham et al. (2011) and Spezio et al. (2007) have suggested that the quantity of eye contact is similar in children with ASD and typically developing children. They have, however, stated that the quality differs. The present study supports the results of these studies, showing that in fact the participants used eye contact inappropriately prior to the intervention.

The present study clearly shows how the appropriateness of eye contact can be changed. This significant result has implications in understanding the function of the amygdala in development as well as showing the malleability of the neurological pathways that are thought to support the use of eye contact. Similarly, the result that eye contact is malleable,

shows that Theory of mind is not a fixed, unchangeable and static construct. The Theory of mind theory, in relation to eye contact, implies that eye contact in the ASD population is used inappropriately with children with Asperger's due to poor joint attention (Nation and Penny, 2008). One of the core features of the methods of intervention used in this study i.e. computers, social stories and video-modelling heavily encouraged joint attention. Thus by using intervention which encourages joint attention, the appropriateness of eye contact changed. The results of the present study thus indicate that theory of mind can be changed. Prizant and Wetherby (2005), for example, in their various research studies, have shown that children with Asperger's Syndrome and Autism are able to demonstrate changes in their linguistic and pragmatic behaviours after intervention has been implemented. These studies as does the present one, all support the idea that theory of mind is malleable. This provides for a strong theoretical motivation for providing intervention for children with Asperger's Syndrome.

In addition, the changeability of eye contact supports the notion that Wetherby and Prizant have supported throughout their work that the approach to autism and or Asperger's Syndrome should be developmental. Their 1997 publication described the foundation upon which their subsequent work was based. They stated that social, communicative and intellectual growth establish a basis for understanding deficits in communication as well as for implementing successful and developmentally appropriate interventions (Prizant and Wetherby, 2005).

The present study was based on a way in which to determine a change in eye contact, in terms of appropriacy that has not been used in much literature. This way of measuring eye contact is in contrast to other studies, which have looked at eye contact in terms of quantity as well as the nature of eye contact. The present study identified eye contact within a social pragmatic theoretical framework and thus eye contact is seen to be a pragmatic skill that could be evaluated like other pragmatic skills have been evaluated. Pragmatic skills have evaluated by well known researchers such as Penn (1985), Prutting and Kirchner (1987), in terms of their appropriateness. In line with this way of measuring appropriateness, as well as to articulate with the social pragmatic framework, the present study investigated the change in appropriateness of eye contact as quantity provides no indication of socially appropriate behaviour, the amount of eye contact is difficult to put in relation to appropriateness in social communicative settings. Furthermore, this study determined the change in appropriateness, which has not been addressed in previous literature. The majority of the research that was

consulted, as discussed in Chapter 2, indicated that the researchers looked more at the nature of eye contact as opposed to the type of intervention required to remediate this impairment. The results of the current study demonstrate how individuals with Asperger's Syndrome can be taught a behaviour, which can then facilitate their social pragmatic communication.

5.2 Changes noted in other pragmatic behaviours

Eye contact, as a social pragmatic behaviour, usually coincides with other pragmatic behaviours as was shown in the results of the present study.

"Communication is complex, dynamic and context dependent" (Olswang, Coggins & Timler, 2001, p.51), and thus intervention brings about a number of different changes. A clinician may want to change a particular behaviour; however, due to the nature of communication, other behaviours may in turn change as a result of the intervention (Olswang et al., 2001). No single outcome measure would ever be possible; rather, a range of outcomes may be expected (Olswang et al., 2001). In the present study, the focus was to bring about a change in the appropriateness of eye contact; however, changes occurred in both eye contact as well as other pragmatic behaviours such as joint attention, maintenance of topic and so on. This validates that communication is holistic and complex and each component cannot be worked on as a single entity but rather as a whole.

Although this study collected the qualitative data in a subjective and descriptive manner, the raters, one of whom was a layman, identified that the changes in eye contact were accompanied by changes in other social pragmatic behaviours. This was to be expected as Prizant and Wetherby (2005) have written about this type of interdependency in their research. If one, for example, has to use eye contact, one has to essentially turn one's head and or body to face the communicative partner. The present study showed that eye contact changed other pragmatic behaviours.

5.3 The effectiveness of the combined therapy approach

Although there is very limited research regarding intervention for eye contact, there are several types of interventions which have been used to provide treatment for social

communicative deficits. In this study, 3 types of intervention were used together namely social stories, video-modelling using typically developing peers and the use of computers.

The types of intervention used were effective. Perhaps they were effective because they appealed to young, modern-day children who are familiar with computers and technology. Children in today's modern society are increasingly more exposed to technology ranging from televisions, internet, video games and computers (Hutchby & Ellis, 2001). One needs to address the deficits using a mode of intervention which is motivating and appealing for a child in today's contemporary world society.

Communication is a social act, which is conveyed through both verbal and non-verbal acts and the way in which one communicates, will affect one's connection with other people (Farroni et al., 2002). The social pragmatic theories put forward that both language and non-verbal behaviours are used to convey social meaning. Social stories are central to the social pragmatic theoretical framework as they demonstrate social meaning within social contexts. The social stories that were used in the intervention in the present study established social meaning within a social communicative setting (Ivey et al., 2004). Social stories were specifically chosen as they show how communication is used to connect with others and eye contact is a type of behaviour which shows whether one is connected to others or not. Thus the type of intervention in combination with eye contact has great power in demonstrating how one can connect to others. The results of the present study resonate with results obtained in other studies in that the social stories were effective in changing a type of social behaviour (Wing & Spillane, 2009). In the present study the social stories were effective in actively teaching the participants about impaired eye contact and how it negatively impacts on communication. It was also effective in explaining to them how to make appropriate eye contact during conversation. Social stories are a type of intervention within the social pragmatic theoretical framework which are essential in creating an awareness amongst children with Asperger's Syndrome who require someone to actively bring their attention to the impaired behaviour such as eye contact. The present study highlights how one is able to increase the child's joint attention through the use of stories and in turn positively changing the appropriateness of eye contact.

In the present study, video modelling using similar aged peers was also seen to be effective in changing the appropriateness of eye contact. Again, this type of intervention is appealing to a child in terms of using technology (Bandy et al., 2007). In the same way that social stories

actively teach appropriate behaviours to children with Asperger's Syndrome, so does video modelling as seen in the present study. Peer modelling was effective as it was meaningful for the children and by using peer to peer demonstration of appropriate eye contact, it came across as more obvious for the children as they interact more with their peers during the school day. In the present study, children were able to relate more easily to similar aged peers. This relative comfort in the presence of peers was found by Apple et al. (2005). Video modelling also functions within the social pragmatic theoretical framework in that it allows the child to observe meaning of an appropriate social behaviour within a social setting (Bagdashina, 2005).

The use of computers in the intervention provided in the present study was effective in sustaining the participants' level of interest and motivation. This may coincide with the fact that in today's modern world society, children are becoming increasingly exposed to technology and technology forms part of daily living (Sansosti and Powell-Smith, 2008). The present study contributes to the current body of literature in showing how computers can be used for providing intervention for children with Asperger's Syndrome and showing how effective this technology can be in terms of being part of the therapeutic process.

The present study supports the use of a combined therapy approach in terms of providing intervention within the social pragmatic theoretical framework. The positive results are in agreement with the results obtained in the study conducted in 2008 by Sansosti and Powell-Smith as well as Wilkinson (2010). The combined therapy approach has proven to be effective in providing the children with opportunity to learn behaviour, in this case eye contact, and then providing them with the opportunity to practice the behaviour within a social setting. The children develop a social sensitivity through social experiences and learn how to change and monitor their behaviour within various social settings (Bagdashina, 2005). By working within the social pragmatic theoretical framework, the children are assisted in developing appropriate social behaviour and are able to form more solid connections with others and in turn allowing them to feel more socially acceptable and satisfied (Bagdashina, 2005).

5.3 Importance of context

The social pragmatic theoretical framework is dependent on providing the child with different social experiences (Bagdashina, 2005). In the present study, various types of activities were used during the intervention and varied in terms of the communicative demands. The types of activities chosen, set up various social communicative settings to allow each participant to practice appropriate eye contact. The results revealed that various tasks elicited more conversation and provided more of an opportunity to practise the eye contact as opposed to the other activities, which were more structured and required less conversation to carry out the task. Due to a variety of activities being carried out there were various outcomes; however, this was to be expected as communication is a complex phenomenon and is context dependent (Olswang, Coggins & Timler, 2001).

Activities were chosen in accordance with what the participants enjoyed playing as well as ensuring that a variety of activities were used throughout the therapy in order to vary the communicative demands. Clinicians need to develop an understanding of the relationship between the behaviour, which needs to be modified and the types of resources available. According to Timler, Olswang and Coggins (2005), when providing intervention for children with social communication difficulties, it is necessary to choose types of intervention that view what normally developing children do when they engage in social communicative settings. Activities that were chosen are commonly used amongst normally developing children. By varying the activities, the social context will vary and thus the demands placed on the children will, too vary (Olswang, 2001). This was confirmed in the present study, as it was agreed amongst all the raters that in P1, P3, P4 and P5, eye contact was elicited the most during the activity ‘30 Seconds’. This may have been due to the fact that it placed higher communicative demands on the child and thus required more conversation, therefore providing more opportunities for eye contact. In participant 2, ’30 Seconds’ was not played due to his age and rather ‘Guess Who’ was played. Both ’30 Seconds’ and ‘Guess who’ required the participants to take turns in speaking and listening in order for the game to take place. The communicative demands were thus increased and the participants displayed improved ability to elicit eye contact.

Although the setting of the intervention was not varied in terms of providing other communicative partners in addition to the researcher, the activities were varied in order to gain a certain level of generalisation of the behaviour, namely eye contact (Olswang et al., 2001). The results did show that all the participants' eye contact improved with all the materials used; however, some activities were more effective in eliciting the eye contact. This may be due to the fact that social performance may vary considerably as a function of context and various context differences may as a result impact on the child's performance in different social settings (Olswang et al., 2001). Future research may want to focus on the impact of context on social pragmatic skills and how various contextual factors such as activities used, varied communicative partners and settings impact on the intervention for social pragmatic behaviours.

5.4 Eye contact during speaking and/or listening during conversation

Speaking and listening form the fundamental building blocks for communication and are absolutely necessary for communication (Ghapanchi & Taheryan, 2012). This is also important to consider within the social pragmatic theoretical framework as the differences that occurred in the level of eye contact observed during speaking and listening showed that context had a big role to play. According to the research that has been conducted, it is questionable as to whether speaking and listening are related or seen as separate entities (Menenti, Gierhan, Segaert & Hagoort, 2011). Menenti et al. (2011) argue that due to the fact that the speaker and listener generally have a common understanding, the linguistic representation in both speaking and listening should be similar. However, a study conducted by Menenti et al. (2011), used fMRI adaptation to record neurological results during both speaking and listening during conversation i.e. speech production and speech comprehension. It was found that the various neural areas were involved almost equally during speaking and listening for semantic, lexical and syntactic processing. The fMRI results showed that there was no overlap in the motor cortex, which only occurred during a speaking-only activity. In this research study, it was generally found there was more elicitation of eye contact during periods of listening during conversation as opposed to during speaking in conversation. Only two of the participants, P3 and P5 showed improvement in both speaking and listening and P4 showed more improvement during speaking and less during listening. The reason for the overall improvement in listening may be due to the fact there is less motor activity occurring

during listening and thus the motor system is primarily activated for eye contact. The motor system does not seem to play an active role during listening (Menenti et al., 2011). P4 appeared to improve in both listening and speaking, although he performed slightly better during speaking in conversation. This may have been due to the topic of conversation being of interest to him. It has been found that when having a conversation about specific topics, individuals may use longer speaking turns in the conversation as well as slower rates of speech (Yuan, Liberman &Cieri, 2006).

According to published research, it has been found that adults engage in listening 40-50% of the time during communication and 25-30% of the time engaging in speaking during conversation (Ghapanchi & Taheryan, 2012). During periods of listening a person uses various cognitive and linguistic strategies to facilitate this process, namely cognitive strategies for problem solving, predicting, understanding etc.; metacognitive strategies for planning, monitoring, evaluating and so on; social strategies to facilitate understanding as well as affective strategies which allow the listener to deal with feelings and attitudes which may affect comprehension of the message. A speaker is also required to draw upon the various mentioned skills as well as the responsibility of directing the conversation in terms of making sure that the conversational partner understands the message i.e. tailoring of the message to suit the listener (Zhang & Goh, 2006). Speaking during conversation requires the use of many more processes and this may be the reason for most of the participants' improvement in their eye contact during listening. A further possible reason could be that one has had more practice with listening i.e. during learning, the child engages in more listening as opposed to speaking within the classroom. This coincides with the above mentioned statistics. A child may spend most of his day listening and this, coupled with the limited amount of motor cortex involvement, may allow for better listening during conversation.

The results of the present study highlight the importance of context in terms of the various communicative demands being placed on the individual. The context plays an important role in influencing how one communicates according to different demands (Olswang et al., 2001). The present study showed how eye contact differed according to the various communicative demands that were placed on the participants in relation to the various activities that were chosen.

CHAPTER 6

CONCLUSION

6.1 Summary of the research

Immersed within a social pragmatic theoretical framework, this study researched the effectiveness of intervention for remediating the non-verbal behaviours, specifically eye contact, of children with Asperger's Syndrome. Five children between the ages of 8-11 years were enrolled in an intervention effectiveness programme over a period of 8-11 weeks. A combined therapeutic intervention including social stories, video-modelling and computers was used. Results revealed that a relatively simple set of procedures brought about a marked change in all the participants with regard to improved appropriateness of eye contact. This change in eye contact is necessary and may have implications for other areas of social communication as it prepares the child with the skills necessary for them to function within society. Results of this study are important for both clinical and research purposes.

6.2 Clinical Implications

The intervention used in this study is relatively simple to produce and administer due to it being simple to construct and cost effective. Materials that were used are easily available and are widely used, such as PowerPoint, social stories and Board Maker ®. Board Maker ® pictures were used in order for the images to be standardised thus allowing others to use the same materials. Although these materials are widely used, a limitation may be that not all speech and language therapists have access to these particular materials, such as a computer to use PowerPoint or Board Maker ® pictures. In addition, the therapist needs to be able to know how to use the programmes used in this study and also needs to be familiar with the way in which social stories are written as they have a specific format.

The Likert scale was used to measure the appropriateness of eye contact. This is a well documented scale which is commonly used in the literature in terms of rating social pragmatic behaviours (Prutting & Kirchner 1987; Penn, 1985). A possible limitation of this study may have been that a 1-5 Likert scale was used for visual inspection of the data whereas future research may want to look at using a 1-7 or 1-10 Likert scale. This may allow for better rater reliability as it provides a wider scale of choice.

Eye contact is a marker for other non-verbal behaviours (Itier and Batty, 2009), and by providing an effective tool to improve eye contact, other social communicative behaviours may improve as a result, as seen in the present study in terms of joint attention. Future research should investigate whether by improving other non-verbal social behaviours such as joint attention, eye contact may improve as a result.

6.3 Future Research Implications

Future research investigating the use of this type of combined intervention should include a larger sample size. Despite observable improvement, this needs to be further validated by a bigger sample size with regards to eye contact as well as other pragmatic behaviours, both verbal and non-verbal.

In addition, this study used a small age range and future studies should look at a greater one. By using a larger age range one will be able to see if the age of the child influences the effectiveness of the intervention on eye contact.

There was observable improvement with regards to eye contact; however, future research should vary the context in which the eye contact is practised. The participants should have more opportunities to practise the behaviour in multiple settings with various individuals to ensure carry-over and generalisation of the behaviour.

Future research should have the raters rate the same sections of the recordings to ensure reliability and validity. This may also account for improved inter-rater reliability results. In future studies, the raters could also have a more in depth explanation of what appropriateness is in relation to eye contact before rating the videos.

This type of intervention should be applied to other populations with social communicative disorders in future research. This could further validate the use of this type of combined intervention.

6.4 Limitations

There were a number of important limitations in this study which may have influenced the results and should be noted when interpreting them. This study addressed a non-verbal

behaviour, specifically eye contact, of Asperger's children; however, the literature review incorporated studies which looked at cases of individuals with ASD. This inconsistent use of terminology has implications for comparing the findings of this study to others.

This study used multiple single case studies which does not allow for generalisation of results. Future studies should incorporate a larger sample size with a larger age range. The larger sample size may allow for further validation of the effectiveness of the intervention.

Inter-rater reliability could have been improved if possibly a 1-7 or 1-10 Likert scale was used. Another limitation in the present study may have been that the researchers viewed varying sections of the video clippings of the participants. Future research should have the raters all watch the same or each video clipping in its entirety.

This study provided intervention for eye contact within a specific context i.e. with the researcher only. This allowed the participants to practice the eye contact with only one individual. There was no generalisation of this behaviour within various settings with different individuals i.e. teacher, parents, peers and so on. Results of the study could have been further validated had there been maintenance sessions to ensure stability of the skills.

6.5 Conclusion and Implications

By using a social pragmatic type of intervention, it enables children with Asperger's Syndrome to experience appropriate eye contact. The ability to actively experience appropriate eye contact within a social pragmatic setting creates an awareness that eye contact enables them to share in communicative interactions. This may positively impact on other areas of communication as it allows for more fulfilling and satisfying engagements and relationships to be established.

"The eyes are the window to the soul". By providing children with Asperger's Syndrome with the opportunity to improve eye contact, they will be able to engage with others on a deeper level. This study is a contribution to the literature that shows how this can be achieved.

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APPENDIX A

CONSENT AND VERBAL ASSENT FORMS

Principal Information Letter

I am Lital Propheta, a Speech and Language Therapy Masters student at the University of the Witwatersrand, executing a research project. The title of the research project is: **The Effectiveness of Computer and Video Modelled Social Stories on the Non-Verbal Social Skills of Children with Asperger's Syndrome.**

Children with Asperger's Syndrome have difficulties with social communication, which are represented by difficulties in social interaction. The child will experience difficulties with non-verbal communication in terms of input and output. The input problem involves difficulties with interpreting facial expressions and body language, making eye contact, as well as interpreting hidden cues. The output problem involves limited use of body language, and if used they are inappropriate. These skills need to be actively taught to the children with Asperger's Syndrome as these difficulties can lead to impaired social engagement. One approach used to teach appropriate social behaviours is the use of social stories which are brief personalized stories which help the child make sense of social situations. The stories will be presented on a computer using a Power Point as children with Asperger Syndrome have been found to be visual learners and computers have also been found to be motivating. An additional technique will be a video model of peers acting out the appropriate behaviour as discussed in the social story. It has been found Research-based data regarding the effectiveness of various treatment programmes is limited and this indicates a need for further research to be conducted in order to validate effective treatment programmes for children with Asperger Syndrome, which is currently seen to be a significant clinical problem.

In order to implement my research, I would value the involvement of children from your school. This would entail the child having to receive additional speech language therapy at no additional cost; however, it must be noted that it will not replace the child's original therapy. This study would implement therapy techniques specific to the non-verbal social communication skills. A particular non-verbal communication behaviour will be identified for each child, using a checklist, which will be filled in by each child's speech language therapist. The study involves a period of no intervention and a period of intervention which is then repeated in order to determine the effects of the therapy provided. During the intervention phase, the child will receive intervention twice a

week for 30 minutes until a noticeable improvement has been recorded. The no intervention and intervention phase will then be repeated at a later stage until a noticeable improvement has been recorded once again. During the study the child will be recorded using a video recorder. The recordings will assist the researcher in recording the behaviours and determining whether the treatment techniques have had a positive effect.

The parents will be contacted via a parent information letter explaining the study in terms of their child's involvement and the implications of their involvement. A consent form will be attached in the case of the parent agreeing to their child's participation. Each child's participation in this study is voluntary and they are under no obligation to participate in it. Each child will be free to discontinue at any time. Should the child discontinue they will not be penalized in any way. The child will be given a verbal assent in the presence of a witness and if he or she agrees to participate, he or she will be required to sign or mark the attached verbal assent form.

Each child's details and results will be coded in order to ensure anonymity, and these codes will be made available only to the researcher. The child's speech language therapist will be contacted in order to inform her of the participation of the child and to provide her with feedback once the study has been completed.

I trust that you will consider the research in order to develop a greater understanding of the various treatment techniques for children with Asperger's Syndrome and that you will thus allow me the opportunity to include children from your school in the above-mentioned research.

If you agree for your children from your school to participate in this study, you will be required to sign the informed consent form attached.

Yours sincerely,

Ms. Lital Propheta	**Mrs. Karen Levin**
Speech Language Therapist	**Head: Speech Language Pathology**
	Research Supervisor

Informed Consent

"Effectiveness of Computer and Video Modelled Social Stories on the Non-Verbal Social Skills of Children with Asperger's Syndrome."

The purpose of the study has been explained to me in the information sheet and I understand what is required.

NAME OF SCHOOL

_____

PRINCIPAL OF SCHOOL

_____

Printed name Signature Date and Time

CONTACT DETAILS

Researcher: Lital Propheta **082-5640480**

Supervisor: Karen Levin **011-7174584**

Parent Information Sheet

I am Lital Propheta, a Speech and Language Therapy Masters student at the University of the Witwatersrand, executing a research project. The title of the research project is: **The Effectiveness of Computer and Video Modelled Social Stories on the Non-Verbal Social Skills of Children with Asperger's Syndrome.**

In order to implement my research, I would value the involvement of your child among two other children. This would entail your child having to receive additional speech language therapy at no additional cost; however, it must be noted that it will not replace your child's original therapy. This study would implement therapy techniques specific to the non-verbal social communication skills. A particular non-verbal communication behaviour will be identified for your child, using a checklist, which will be filled in by each child's speech language therapist. The study involves a period of no intervention and a period of intervention which is then repeated in order to determine the effects of the therapy provided. During the intervention phase, the child will receive intervention twice a week for 30 minutes until a noticeable improvement has been recorded. The no intervention and intervention phase will then be repeated at a later stage until a noticeable improvement has been recorded once again. With your permission, the researcher would like to record your child using a video recorder during all sessions. The recordings will assist the researcher in recording the behaviours and determining whether the treatment techniques have had a positive effect. The recordings will also be viewed by two other qualified speech language therapists in order to ensure that the data is analysed fairly. Your child's details and results will be coded in order to ensure confidentiality, and these codes will be made available only to the researcher. Your child's speech language therapist will be contacted in order to inform her of your child's participation and to provide her with feedback once the study has been completed.

Your child's participation in this study is voluntary and they are under no obligation to participate in it. You child will be free to discontinue at any time. Should your child discontinue they will not be penalized in any way.

I trust that you will consider the research in order to develop a greater understanding of the various treatment techniques and that you will thus allow me the opportunity to include your child in the above-mentioned research.

If you agree for your child to participate in this study, you will be required to sign the informed consent form attached. Feedback on the study will be made available on request.

Yours sincerely,

_____

Lital Propheta

Speech Language Therapist

Informed Consent

"Effectiveness of Computer and Video Modeled Social Stories on the Non-Verbal Social Skills of Children with Asperger's Syndrome."

The purpose of the study has been explained to me in the information sheet and I understand what is required of my child. I understand that participation is voluntary and that I am free to withdraw my child from the research at any time without my child being penalized in any way. My child's information and results will remain confidential and will be used to research purposes only.

MY CHILD'S NAME

_____

PARENT/LEGAL GUARDIAN

_____

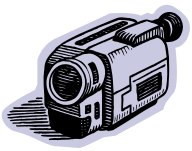
Printed name Signature Date and Time

CONTACT DETAILS

Researcher: Lital Propheta **082-5640480**

Supervisor: Karen Levin **011-7174584**

Verbal Assent

Hello my name is Lital. I am a Speech Language Therapist. I am also a student  at the University  of the Witwatersrand and I am doing research . Research is something that you do to get more knowledge and to find out about things. My research is about finding if this type of therapy may help you when you are having conversations  with other people. By taking part in my research, you will play a special game on the computer . After that I will then record you on camera  and you will get to see yourself.

If you decide that you don't want to be in the study after we begin, that's okay. Nobody will be angry or upset. I have discussed the study with your parents and you should talk to them about it too.

If you decide that you want to be in this study, please write your name on the next page.

Thank you.

Verbal Participant Information Consent

"Effectiveness of Computer and Video Modeled Social Stories on the Non-Verbal Social Skills of Children with Asperger's Syndrome."

The purpose of the study has been explained fully to the participant and he/she understands what is required of them. He/she understands that participation is voluntary and that he/she is free to withdraw from the research at any time without being penalized in any way. The writing samples will remain confidential and then information gathered will be used for research purposes only.

PARTICIPANT:

_____

Printed name Signature/Mark Date and Time

RESEARCHER:

_____

Printed name Signature Date and Time

WITNESS:

_____

Printed name Signature Date and Time

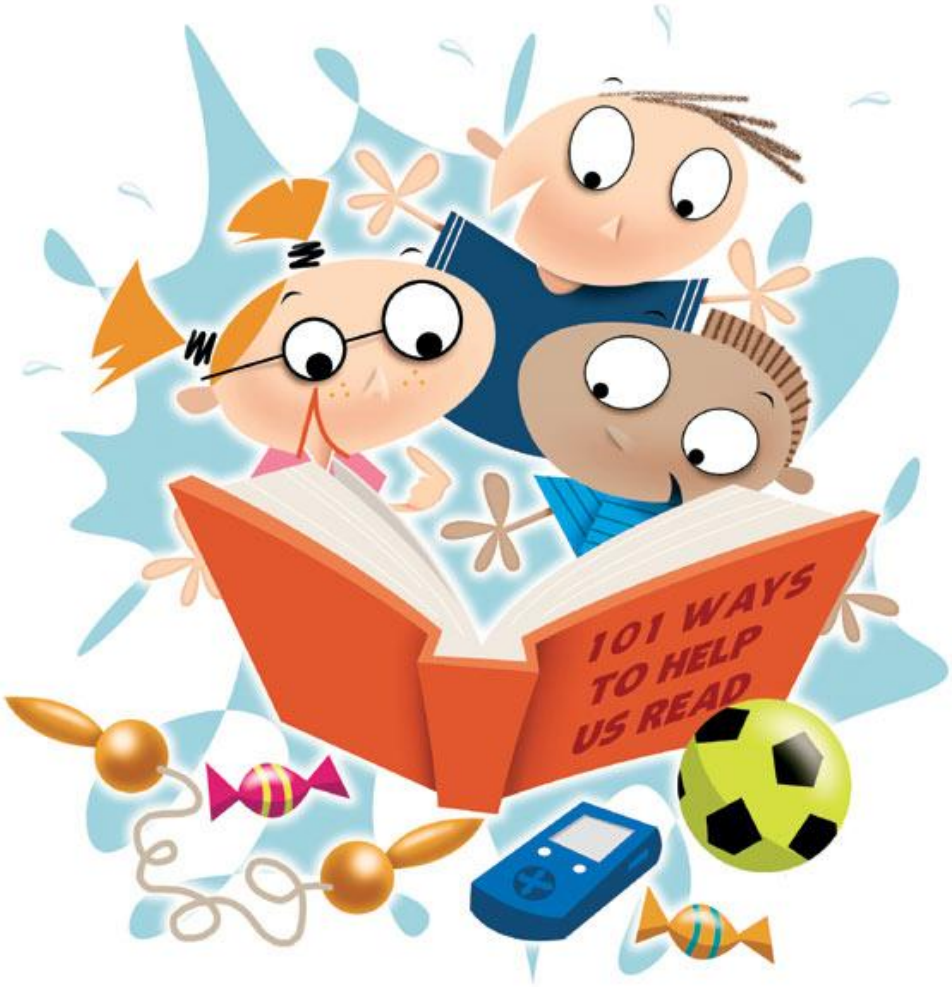
APPENDIX B

INSTRUCTIONAL BOOKLET WITH A PICTORIAL GUIDE

You are going to sit at a computer



And listen/read a short story

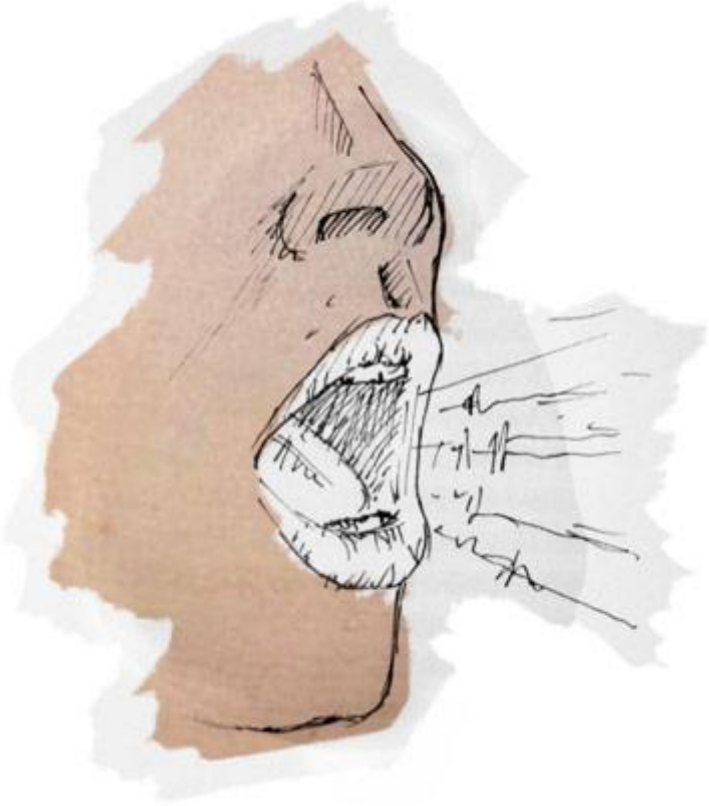


You will be able to move through the story

by pressing the ‘enter’ button

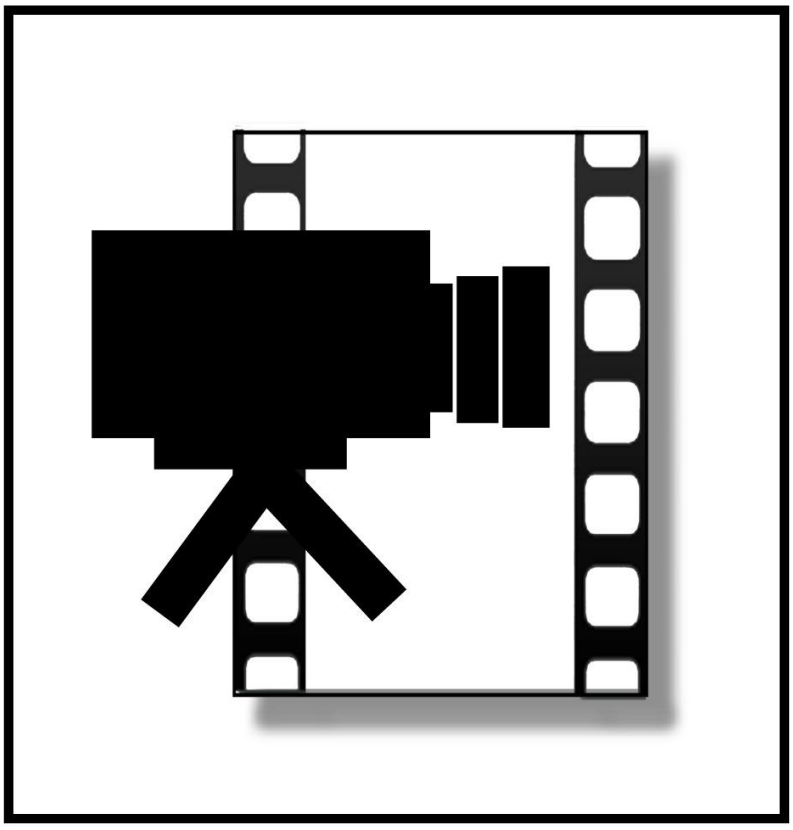


You can read the story on your own but you will also hear a voice telling you the story as you move through each slide.



After you have listened/read the story,

you will watch a short video clip.



Once you are done listening to the story and watching the video, you will come to the therapy room and we are going to practice what you have seen on the computer.



APPENDIX C

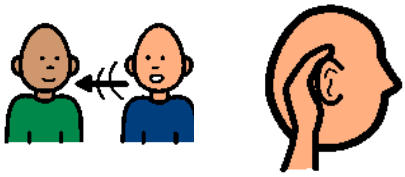
SOCIAL STORY USED

Point Social Story

Looking at a Person During Conversation



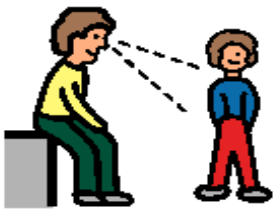
When a person speaks to me I try to listen



This is a good thing to do



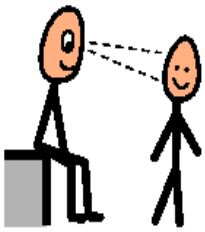
Looking at the person who is speaking to me is useful



This shows the other person that I am listening



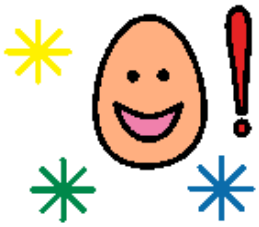
Sometimes I try to look at a part of their face



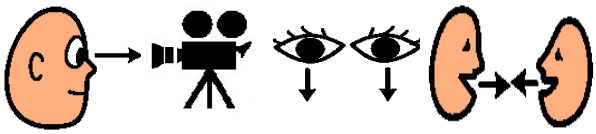
I try to do this so that the other person knows that I am listening



The person who is speaking to me will like this a lot



You are now going to watch a video which will show you how to look at a person during conversation.



APPENDIX D

LIKERT RATING SCALE

1-5 Likert Rating scale for appropriateness of eye contact

Rater: ----------

Participant: ----------

Phase: ----------

1= No or minimal eye contact

2=Little eye contact

3=Some appropriate use of eye contact

4=Eye contact mostly appropriate

5=Appropriate eye contact

Non appropriate Appropriate

1---------- 2 ----------3 ----------4 ----------5

Additional Remarks:

_____

_____

_____

_____

APPENDIX E

CLEARANCE CERTIFICATE FOR THE HUMAN RESEARCH ETHICS COMMITEE (NON-MEDICAL) AT THE UNIVERSITY OF THE WITWATERSRAND

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (NON MEDICAL)
R14/49 Propheta

CLEARANCE CERTIFICATE **PROTOCOL NUMBER H1 10219**

PROJECT The effectiveness of computer and video modelled social stories on the non-verbal social skills of children with Asperger's Syndrome

INVESTIGATORS Ms L Propheta

DEPARTMENT Speech Pathology and Audiology

DATE CONSIDERED 18.03.2011

DECISION OF THE COMMITTEE* Approved with caution for sensitivity to young cohort of students

NOTE:

Unless otherwise specified this ethical clearance is valid for 2 years and may be renewed upon application

DATE 04.04.2011 **CHAIRPERSON** .....
(Professor R Thornton)

cc: Supervisor : Dr K Levin

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

Signature

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES