The University of Nottingham

UNITED KINGDOM • CHINA • MALAYSIA

School of Psychology

An evaluation of the 'Lego® Therapy' intervention used to support children with social communication difficulties in their mainstream classroom

by

Sarah Elizabeth Joy Boyne

Thesis submitted to The University of Nottingham for the degree of Doctor of Applied Educational Psychology

July 2014

“The [LEGO] brick is a universal language. If a kid from China were to meet a kid from Chicago, they don’t have to speak the same language but they could build something together”

Richard Stollery, a British LEGO® executive,
as quoted on The Telegraph (2007)

“The most effective kind of education is that a child should play amongst lovely things”

Plato

Abstract

This study presents an evaluation of the Lego® Therapy intervention (LeGoff, 2004) for six children, aged six to ten, with varying social communication difficulties. Lego® Therapy is a small-group, child-led and peer-based social development programme. Relevant theory and existing literature is explored firstly, before a systematic review of social communication intervention evaluations is presented. This is followed by a review of current Lego® Therapy studies, highlighting the limited evidence base that has been developed thus far. The present study's aims of extending and applying more reliable and valid research designs to evaluate the intervention are then presented.

An ABA single case experimental design (SCED) was used to evaluate the effectiveness of the intervention in increasing, maintaining and generalising the social confidence and independence, as well as the sense of school belonging, of the participants. Weekly classroom based video observations, which were coded, using an adapted version of Thunberg, Ahlsen and Sandberg's (2007) Communication Coding Scheme, explored the participant's social confidence and independence development and maintenance. Pre, post and delayed measures using The Social Competence Inventory (Rydell, Hagekull & Bohlin, 1997) and The Belonging Scale (Goodenow, 1993) assessed the participant's parent and teachers perceptions of skill generalisation and the participant's self-reported sense of school belonging.

Outcomes from the SCED showed that the majority of the participants (five out of six) improved in at least one of the social communication skills measured and this maintained post intervention for three of the participants. An increase in perceptions of the participant's social communication skills was reported within the school (five out of six) and home environment (three out of six). All participants rated a high level of sense of school belonging prior to the intervention, and change was variable per participant following the intervention.

Study limitations require acknowledgement when considering the outcomes, particularly the generalisability of the findings due to the design of the study and stability of some of the participant's Baseline phases that reduce the reliability of the measures. The study concludes with some support for the positive impact Lego® Therapy can have on social confidence and independence. Recommendations are made for future research to enhance the growing evidence base for this intervention.

Acknowledgements

The author would like to thank:

All the children, families and school staff who made this research possible, particularly to the school staff who worked hard to implement the Lego® Therapy sessions and conduct the observational measures.

Members of the Educational and Child Psychology Service, in which the author was on placement with, for their guidance and support throughout the research process.

Nick Durbin, the author's personal tutor, and members of the tutor team at the University of Nottingham for their mentoring and supervision throughout the entire D.App.Ed.Psych course and particularly during the research project.

Fellow trainees, 'Team TEP', for becoming such important people in the author's life, their knowledge, unconditional support and guidance through the good and challenging times.

Finally, to the author's friends and family without whom the author would not have been able to achieve their dream of becoming an Educational Psychologist. Their constant support, understanding and encouragement will remain with the author for a lifetime.

List of Contents

List of tables

List of figures

List of graphs

List of Appendices

List of abbreviations and acronyms

AET	Autism Education Trust
ADOS-G	Autism Diagnosis Observation Schedule – Generic Module 1
APA	American Psychiatric Association
ASD	Autistic spectrum disorder
ASSIA	Applied Social Sciences Index and Abstracts
BPS	British Psychological Society
BS	The Belonging Scale
ECPS	Educational and Child Psychology Service
EP	Educational Psychologist
ECM	Every Child Matters
DV	Dependent Variable
DfCSF	Department for Children, Schools & Families
DfE	Department for Education
DfES	Department for Education and Skills
DoE	Department of Education
DSM-V	Diagnostic and Statistical Manual - V
EPPI-Centre	Centre for Evidence Informed Policy and Practice in Education
GARS	Gilliam Autism Rating Scale
HPC	Health Professions Council
IV	Independent Variable
JA	Joint Attention
LI	Language Impairment
NAS	National Autism Standards
NINDS	National Institute of Neurological Disorders and Stroke
OFSTED	Office for Standards in Education
PECS	Picture Exchange Communication System
PLI	Pragmatic Language Impairment
RCI	Reliable Change Index
QEST	Quality and Effectiveness Support Team
RCT	Randomised Control Trial
RQ	Research Question
SCED	Single Case Experimental Design
SCD	Social Communication Disorder

SCI	The Social Competence Inventory
SEN	Special Educational Needs
SENCo	Special Educational Needs Co-ordinator
SLCN	Speech, language and communication needs
SLR	Systematic literature review
SULP	Social Use of Language Programme
TA	Teaching Assistant
TEP	Trainee Educational Psychologist
UK	United Kingdom
UoN	University of Nottingham
USA	United States of America
VABS	Vineland Adaptive Behaviour Scales
WISC–III	Wechsler Intelligence Scale for Children–Third Edition

1. Chapter 1 - INTRODUCTION

1.1. Research focus

This research focuses broadly on the area of social communication skills and school belongingness in children within the UK. More specifically it aims to investigate the effectiveness of the social communication programme, Lego® Therapy, for primary-aged children with social communication difficulties. Lego® Therapy is a "child-led and peer-based intervention that utilizes the natural interest in construction play on the part of children with autistic disorders to elicit a willingness to collaborate and interact while engaging in this activity" (LeGoff, Krauss, & Allen Levin, 2010, pg. 222).

1.2. Researcher personal and professional interest

The researcher has a keen interest in supporting children with social communication difficulties. This is due to their viewpoint that communication is essential in all aspects of human development and that failure to support a child to develop their social communication does not give all children equal opportunity to develop and reach their full potential (I Can, 2012).

The researcher's past experience working within residential schools for children with severe and complex needs gave her the foundation and knowledge of this population of children. The researcher worked closely with other professionals, including Speech and Language Therapists and Specialist Occupational Therapists, to assess and support these children who often had very complex difficulties with communication. Within this role she worked with numerous children with a formal diagnosis of autistic spectrum disorder (ASD) and also those with varying social communication difficulties. From this experience she has become further aware of different social communication interventions, such as Social Stories (Gray, 1991), Video-Self Modeling (Buggey, 2009) and Behaviour Recovery (Rogers, 2004), all of which have different evidence bases and theories behind their practice.

A large number of these interventions have been specifically targeted at those with autism but the researcher feels that targeting a certain population's social communication needs may be restrictive of the benefits an intervention may have. This is due to the range of difficulties children can have which impact upon their social communication abilities, from a stammer to autism (DfCSF, 2008). Also, the Autism

Education Trust (AET, 2012a) highlights the complexity of ASD and how some pupils and their needs may not be as evident, thus leading to them not receiving a formal diagnosis of ASD and potentially not accessing appropriate and beneficial interventions. Children with social communication difficulties are seen as "many of the most vulnerable children, those most in need of effective support to reach their potential" (DfCSF, 2008, pg. 2). The researcher therefore advocates the development of social communication programmes not only for those with a formal diagnosis of autism but also for all children with identified social communication difficulties.

An intervention that the researcher came across whilst working as a trainee Educational Psychologist (EP) within a local authority, was Lego® Therapy (LeGoff et al, 2010). Lego® Therapy is beginning to be implemented widely within the authority due to the authority playing an active part in the national scheme derived by the AET to implement the National Autism Standards (AET, 2012a) across mainstream schools. This led the researcher to question the evidence base for this type of intervention, not only for children with a formal diagnosis of autism but also for those with general social communication difficulties.

1.3. Aims and structure of the thesis

The current research aims to enhance the knowledge base of the effectiveness of Lego® Therapy within the school context for primary-aged children with social communication needs.

Chapter 2 guides the reader through an exploration of relevant literature that informed the rationale and research questions of this research.

Chapter 3 explores and critiques relevant methodology that could have been used to answer the research questions. It then presents and aims to justify the selection of certain approaches and measures, whilst also detailing their implementation.

Chapter 4 presents the findings from the measures and gives some commentary to identify significant data to be discussed.

Chapter 5 provides a discussion of the findings and possible links to the literature explored in Chapter 2. Limitations and implications of this research are then discussed.

Chapter 6 summarises the main findings of the research, unique contributions to the field and conclusions.

2. LITERATURE REVIEW

2.1. Introduction to Chapter 2

This chapter aims to review literature relevant to this study. It starts broadly by discussing typical development of communication and more specifically children's social communication skills. Needs of pupils with social communication difficulties and how this area is affected in pupils with autism are considered. It then explores experiences of pupils with social communication needs, their inclusion into mainstream classrooms, along with their sense of school belonging. The push for supportive and well-researched interventions will then be discussed, followed by a systematic review of social communication interventions that have been evaluated for their effectiveness with this population. The final part of the literature review looks more specifically at the research relating to the social communication intervention, Lego® Therapy (LeGoff et al, 2010). The literature review closes with conclusions drawn from the literature and an introduction to the current study's research aims and questions.

2.2. Communication

"Speech, language and communication underpin everything we do – making our needs known, expressing our likes and dislikes, interacting with others and building relationships"

(I Can, 2012, pg. 1)

These skills are vital for learning, socialising and controlling emotions or feelings (I Can, 2012).

2.2.1. Social communication

Social communication is "the intersection of language and social behaviours observed during peer interactions... that is, the verbal and nonverbal behaviours children display as they approach peers, maintain conversations, and resolve conflicts during peer interactions" (Timler, Olswang, & Coggins, 2005, pg. 171). An interaction can be described as one initiation and response interchange interaction (Kaczmarek, 2002) or a conversational exchange that lasts for around three to four seconds (Davis, Brady, Hamilton, McEvoy & Williams, 1994). Berk (2000) highlights the importance of play as a medium through which children first begin to explore their environment. This is initially through the mouthing and touching of objects and develops into more sophisticated play. Walberg and Craig-Unkefer (2010) push for the significance of play

and the impact it can have on a multitude of skills. These include the development of language, social interaction, awareness and understanding of culture and enabling children to make sense of potentially confusing situations or interactions (Bodrova & Leong, 2003; Goncu, 1999; Alvarez & Philips, 1998). Walberg and Craig-Unkefer (2010) propose that the most important element of play is that it provides opportunity for children to practice their interaction skills with others and build their social communication abilities.

As children develop in their social communication skills they are said to build on their social competence (Stanton-Chapman, Denning & Jamison, 2012). A person is said to be socially competent if they have the ability to initiate, develop and maintain satisfying relationships with both adults and their peers (Odom, McConnell, & Brown, 2008). A number of skills are said to be used in order to support social competence that comes from a branch of linguistics termed pragmatics. Pragmatics are the ways in which speakers and listeners use language in social interactions (Levinson, 1983). Key language skills used within social interactions that develop social competence include using speech to comment and request, as well as having an understanding of the rules that govern turn-taking and topic contributions (Stanton-Chapman & Snell, 2011). Further skills advocated within the literature for successful communication include initiating and maintaining a topic of conversation, semantic and syntactic cohesion, use of eye contact to signal attention to the listener and responsiveness to peer communication attempts (Kaczmarek, 2002; Mentis, 1994; Ninio & Snow, 1999). Kaczmarek (2002) suggests that if these skills are present then children will be able to take on active roles within a social communication as a speaker-initiator, as well as a listener-responder.

For children who are successful in developing these aforementioned skills positive outcomes can be seen. Stanton-Chapman et al (2012) highlight that as children become socially competent they will increase their opportunities to develop a variety of social relationships and thus social experiences. Within these opportunities they are more likely to acquire further knowledge of vital developmental abilities, which include social, language and cognitive competencies. They add that these skill sets become more essential as children transition through their school and social lives. Many factors contribute to the development of social competence, for example the individual characteristics of the child and their family and peer relationships (Stanton-Chapman,

Denning, & Jamison 2008). Children can vary in their development of social communication skills and presentation of possible communication needs vary greatly from child to child (Fujiki, Brinton, McCleave, Anderson & Chamberlain, 2013).

In order to understand the range of children with social communication needs, a brief exploration of the varying speech, language and communication needs children can have will be conducted.

2.2.2. Speech, Language and Communication needs

Children with speech, language and communication needs (SLCN) are often seen as having a hidden difficulty and can present in various different ways including having speech that is difficult to understand, not knowing how to talk and listen to others in conversations or struggle to understand words and instructions (I Can, 2012). Children can present with varying levels of social communication competence, and this can be for a variety of reasons. For some children they may have a Language Impairment (LI). There is a breadth of research proposing that children with LI can experience difficulties with basic communication skills which support their ability to engage in social tasks, such as entering ongoing interactions and managing conflicts (Brinton, Fujiki, & Higbee, 1998; Brinton, Fujiki & McKee, 1998; Brinton, Fujiki, Spencer & Robinson, 1997).

Some children may not have difficulties in the structural aspects of language, such as phonology and syntax, but show disproportionate difficulty with pragmatic aspects of language (Bishop, 2000; Adams, Lockton, Gaile, Earl & Freed, 2012). They may be described as having Pragmatic Language Impairment (PLI) or Social Communication Disorder (SCD). Children with PLI or SCD often present as verbose, who excessively switch topics, dominate verbal interaction and fail to adjust to the listener's prior knowledge (Bishop & Adams 1989; Adams, 2001). Some children may also experience PLI with Specific Language Impairment (SLI) and present with the above features as well as making semantic errors, have difficulties in finding words or with receptive language (Adams et al, 2012). Children may also experience high-level language difficulties through having comprehension difficulties with non-literal language and stories (Botting & Adams, 2005). An overlap of some of the language difficulties of PLI and children with autism can be seen (Adams et al, 2012). This will be discussed further in the next section.

Bishop, Chan, Adams, Hartley and Weir (2000) describe how children with speech, language and communication needs are a heterogeneous group; this is in both pattern and severity. Generally some will present as verbose in conversation and others may be relatively unresponsive in both verbal and non-verbal skills (Bishop et al, 2000). It is suggested that an exploration of the child's needs at an individual level is required to fully understand the complexity and patterns within their social communication skills (Adams et al, 2012). This variation and complexity in social communication skills have also been shown in children with autism (Loveland & Tunali-Kotoski, 2005), this will be introduced and considered in the next section.

2.2.3. Autism Spectrum Disorder: definition, prevalence and impact on social communication abilities

ASD is a neurodevelopmental disorder (Hart, 2011). The Diagnostic Statistical Manual of Mental Disorders–Fifth Edition (DSM-V, American Psychiatric Association (APA), 2013) presents set criteria which children are required to meet in order to be formally diagnosed with the 'disorder'. Within this a child must demonstrate limitations in social interaction, communication, and stereotypical patterns of behaviour, interests, and/or activities (APA, 2013). The Autism Education Trust (AET, 2012a) estimated that there are approximately 1 in 100 children and adults with autism. However, due to the broad range of presentations and severity of needs across the autistic spectrum some children's needs may be unrecognised or they may be seen as having autistic type tendencies, as opposed to receiving a formal diagnosis (NINDS, 2009).

The National Research Council (2001) highlighted how children with ASD often experience difficulties in social conversations due to weaknesses in comprehending both verbal and nonverbal communication and interpreting the emotional states of others. This, they suggest, can often lead to difficulties with forming and maintaining friendships with their peers and engaging with effective and collaborative play. As discussed for children with speech, language and communication difficulties the extent to which a child with autism experiences social communication difficulties will vary from child to child and across the autistic spectrum (Loveland & Tunali-Kotoski, 2005). Research by Lord and Pickles (1996) demonstrated this. Within their study they found that children with autism who used very little language had more pronounced difficulties in play and social behaviours than children with autism who were able to use

some form of language. Key areas which all the children, regardless of language use, had difficulties with included eye gaze, facial expression and attending. Baxendale, Lockton, Adams, & Gaile (2013) highlight that this has been demonstrated across numerous studies of this type.

Kaale, Smith & Sponheim (2012) propose that a deficit in social interaction for all children is a major concern due to the great impact this can have on a child's quality of life. Difficulties within primary school years has been linked to emotional and behaviour difficulties, longer than usual time spent in specialist provisions, as well as specific difficulty in forming adult relationships in later life (Adams et al, 2012; Botting, Crutchley & Conti-Ramsden, 1998; Whitehouse, Watt, Line, & Bishop, 2009). This may become a greater concern due to the rising numbers reported of children who have significant needs in pragmatics and social communication and whom are being identified with ASD (Baird, Simonoff, Pickles, Chandler, Loucas, Meldrum, & Charman, 2006). Due to the growing number of children with autism and varying needs, such as social communication difficulties, being educated in inclusive settings (Hart, 2011) it was deemed necessary to explore the literature around this and any potential impacts this may have on the children, such as their sense of belonging.

2.3. Inclusion of children with social communication difficulties

A focus has been placed upon the inclusion of children with ASD across the UK into mainstream school settings, highlighted by the Department of Education (DoE, 2001, pg. 360), which stated that "a flexible continuum of educational options for pupils with ASD" is required. The researcher's local authority became an active part of a national scheme derived by the AET to implement the National Autism Standards (AET, 2012a) across schools. This aimed to ensure "that all children and young people with autism should receive an education which enables them to reach their individual potential to engage in society as active citizens (and that individuals, families and professionals are informed, supported and equipped to enable this to be achieved)" (AET, 2012b).

A vast amount of research has looked into the effects of inclusion on children with autism, some suggesting that those who are fully included tend to socially interact and engage more than those in segregated environments (Harrower & Dunlap, 2001). However, Evans, Salisbury, Palombaro, Berryman, and Hollowood (1992) suggest that these students tended to be a recipient of the social interaction rather than an initiator in inclusive settings. Simpson, Boer-Ott and Smith-Myles (2003) suggest that due to the nature and complexity of children with ASD's difficulties there are many challenges to implement an inclusive way of thinking. Due to this it is often reported that educators do not feel confident in their capabilities of supporting children with ASD needs (Spears, Tollefson, & Simpson, 2001). Guldberg's (2010) meta-analysis of evidence explores both empirical and anecdotal research into the preconditions for developing inclusive learning environments for children with autism. It highlights the need to not only look at 'within child' factors but also to make adaptations to the learning environment and those around the child in order to develop inclusive practice. Key areas shown to enable this included having specific knowledge of the individual, effective engagement and support for the family, knowledge of the autism spectrum and effective strategies. Guldberg's (2010) paper relies heavily upon expert opinion and so the reliability of the evidence base is not made explicit. Due to this it is therefore unclear whether a balanced perspective of best practice for children with autism is given or a more biased perspective of the author.

Other research, which will be considered in the following section, explores the impact of inclusive practice upon children with social communication needs. This type of

research may support understanding of what might enhance educational provision for children with additional needs and thus was deemed necessary to explore.

2.3.1. School belonging of children with social communication difficulties

As children with social communication difficulties and/or autism are being more included into mainstream primary settings research has begun to explore their sense of school belonging[1], as well as the impact this might have on their engagement and development of their social communication skills (Hart, 2011; Wolfberg, Zercher, Lieber, Capell, Matias, Hanson & Odom, 1999).

Wolfberg et al's (1999) exploratory paper investigated the impact of peers onto inclusive preschool programmes for ten participants aged four to six with varying difficulties, including autism, Attention Deficit Hyperactive Disorder and Down's Syndrome. The main themes drawn from the multi-method approach used was that all the children expressed a need or will to have peer affiliation[2] in order to form an inclusive experience, however the majority of the children faced exclusion from their peer group. The children's desire for inclusion was shown through their social and communicative behaviour, however exclusion was shown by observations of social communicative breakdowns, conflict and rejection. This paper highlights the importance children with a communication difficulty might place upon having peer affiliation, and the importance of addressing this issue through supporting the environment to adapt and meet this need. Although it should be noted, the children within this study were not a homogenous group and therefore the generalisation of the findings onto other children with different needs may be limited.

Children who have the ability to initiate a conversation with a peer, respond appropriately to peer initiations or responses and are able to take turns are more likely to be socially accepted and chosen as preferred communication partners (Black, 1992; Black & Hazen, 1990; Craig & Gallagher, 1986; Gertner, Rice & Hadley, 1994). A study by Rice, Sell and Hadley (1991) also suggests that children with SLI have opportunities to interact with their peers but often preference interactions with adults,

---

[1] School Belonging: defined as "the extent to which pupils' feel accepted, included, respected and supported" (Frederickson & Dunsmuir, 2009, pg. 23)

[2] Affiliation: defined as "repeated contacts between members of a social group, some of which are reciprocal" (Pellegrini & Bartini, 2000, pg. 703)

which can lead to a reduction in peers initiating further interactions with them. Stanton-Chapman et al (2008) highlight how children require a variety of pragmatic skills to support effective peer interactions. These include understanding of the use of language for different purposes, such as requesting, greeting and informing, being adaptable to needs of the listener and understanding conversational rules, such as staying on topic. They may also have to be persistent with these skills in order to be accepted and engaged in peer play (Stanton-Chapman et al, 2008). Dodge, Pettit, Gregory, McClaskey and Brown (1986) demonstrated that before children are accepted within a peer group they are expected to display a minimum of ten verbal and nonverbal behaviours, such as parallel play or positively commenting upon the peer activity.

This literature suggests a potential need for interventions to support the development of the specific pragmatic social skills highlighted. This is in order to support a child to feel more included within their educational system and gain a sense of belonging with their peers. This may lead to better outcomes, positive life goals and enable children to "access and get the most out of education and life" (DfCSF, 2008, pg. 2). The focus on supporting social communication skills within education and the varying interventions that have been advocated will now be discussed.

2.4. School's focus on social communication interventions and support

The focus of children's educational outcomes has developed over the past decade, holding onto the importance of academic achievement but also exploring other outcomes, including social and emotional development. This has been highly influenced by political agendas derived from the Every Child Matters framework (ECM, DfES, 2003). ECM outlined five outcomes for all professionals working with children to aspire towards, including being healthy, staying safe and enjoying and achieving. Due to this shift in focus, a climate of joint approaches and support for children's social and emotional needs has developed, highlighted in the Children Act (2004) and DfES (2005). The DfES (2005) proposed that social and emotional learning should be central to schooling in order to raise school effectiveness. This was based on work suggesting social and emotional abilities could be more influential upon personal and academic success than cognitive abilities (Goleman, 1996).

Stanton-Chapman et al (2012) highlighted how interventions are being advocated in order to support young children's emotional and behavioural needs with the aim that this would develop their social competencies and promote their resiliency for their futures. They add that in order for this to be successful value needs to be placed on the promotion of social-emotional needs by those around children. Specific intervention strategies need to be made in order to target the precise social and emotional skills a child is requiring to develop (Stanton-Chapman et al, 2012). Stanton-Chapman and Snell (2011) stated that a wide variety of interventions are available aiming to support the social skill development of children with a variety of difficulties. McConnell, Missall, Silberglitt, and McEvoy (2002) further suggest that typically these interventions fall into two categories; child-specific (in which adults give instruction, prompting and reinforcing of targeted skills) or peer-mediated approaches (in which the child's peers are encouraged to implement an intervention in the child's natural context).

There have been a number of initiatives and strategies that have been created with the aim of supporting the inclusion of children with autism in mainstream settings (McConnell et al, 2002). Peer-mediated interventions have been shown to lead to gains in academic engagement and peer interaction for students (Kamps, Kravits, Gonzalez Lopez, Kemmerer, Potucek, & Harrel, 1998; Harrower & Dunlap, 2001). However, other studies have suggested that gains in this type of intervention may not be

generalisable to other situations without teacher support (Odom, Hoyson, Jamieson, & Strain, 1985). McConnell (2002) adds that many social skills interventions that are implemented within schools have limited empirical basis and therefore generalisability. In order for an intervention to be successful in developing social communication skills Stanton-Chapman et al (2008) propose that it should provide instruction, rehearsal, feedback, reinforcement and support skill maintenance and generalisation. Intense direct instruction is often used within interventions to explicitly teach social skills (Brown, Odom & Conroy, 2001). It has been argued that this type of instruction is most appropriate for children with SLI and other communication difficulties, as opposed to more naturalistic approaches (Brown, Odom, McConnell & Rathel, 2008). Within other literature naturalistic interventions have been triumphed as they are incorporated into routine classroom activities and thus support the generalisation of skills into the children's social world (Rule, Losardo, Dinnebeil, Kaiser & Rowland, 1998).

Jones and Schwartz (2004) explored the effectiveness of peers, sibling and adults as models for teaching functional skills to children with autism in mainstream schools. A parallel treatments single subject design was employed in which three pre-schoolers (45 to 62 months old) with autism were exposed to different models (peer, sibling or adult). The research suggests that a modelling intervention had a positive influence on the pre-schooler's language development, however a clear preference for one particular model was not established. This may be due to the impact of the diffusion of treatments, which could not be eradicated from the design of this study. Jones & Schwartz (2004) discuss that peer modelling may lead to additional social benefits for the participants, although this was not measured in this study.

Howlin, Gordon, Pasco, Wade and Charman (2007) suggests that the evidence base for psychosocial interventions, particularly for children with ASD, is generally weak. This is due to weaknesses in their design leading to interventions being advocated without extensive and reliable research being developed (Howlin et al, 2007). Within educational and psychological practice a large push towards evidence-based practice can be seen (Frederickson, 2002). Interventions are requiring thorough research that evaluates processes which occur within the intervention, as well as outcomes that are achieved (Frederickson, 2002). There are a growing number of children with social communication difficulties being included within mainstream education, and a focus on social and emotional well-being of children is developing due to the importance placed

on these skills, to give children equal access to education and life (DoE, 2001; Hart, 2011; DfCSF, 2008). This has led to a number of interventions, focusing on social communication skills being promoted (Stanton-Chapman et al, 2012). It was therefore deemed necessary within this literature review to explore the evidence-base of social communication interventions that are being advocated and critique these studies through a systematic review.

2.5. Systematic literature review

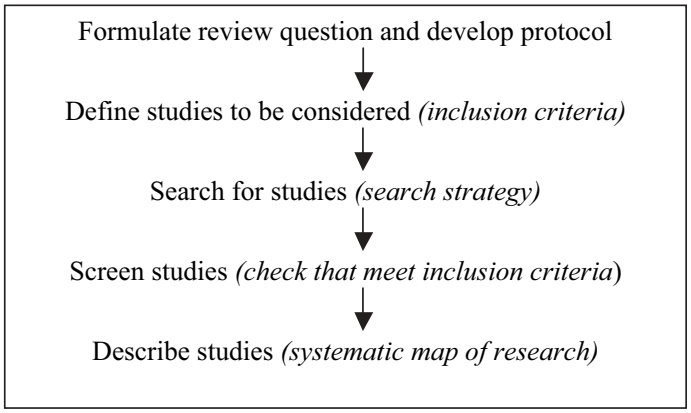
This section presents a systematic literature review (SLR) of research that considers the effectiveness of social communication interventions for primary aged children with social communication difficulties, conducted between 2004 and 2014. Firstly, methods of SLR's, the rationale and aims of this review are explored, followed by the strategies employed to conduct the review (including the inclusion/exclusion criteria, search strategy and in-depth review process). Once this has been established the results of the SLR are presented, firstly with specific detail of the search and selection process outcomes, followed by a synthesis of papers according to their general characteristics, interventions explored, research design, procedural information, outcome measures and results. Each paper's weight of evidence towards the review question is then discussed and the review is concluded with a discussion of potential biases in the review process as well as its original contribution to the literature.

2.5.1. Methods used for the systematic literature review

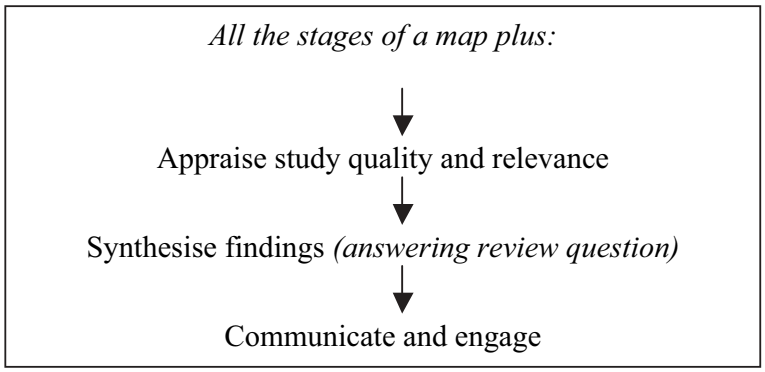
In order to enhance the reliability and validity of reviews the Centre for Evidence Informed Policy and Practice in Education (EPPI-Centre, 2011) proposes quality features of SLRs. This includes that:

- explicit and transparent methods are used;
- a standard set of stages is followed;
- it is accountable, replicable and updateable; and
- there is a requirement of user involvement to ensure reports are relevant and useful.

Stages to SLRs have been outlined by Gough (2007), which are expressed below in Figure 1.



(i) Systematic map of research activity



(ii) Systematic synthesis of research evidence

Figure 1: Stages of review (Gough, 2007)

The stages of review, outlined by Gough (2007) are followed throughout this review process.

2.5.2. Rationale and aims for the systematic literature review

As discussed at the end of *Section 2.4 School's focus on social communication intervention and support* a growing emphasis has been placed upon supporting children with social communication needs within education, which has led to a growing development of interventions in this area (DoE, 2001; Hart, 2011; DfCSF, 2008; Stanton-Chapman et al, 2012). The large push towards evidence-based practice requires these interventions to be thoroughly and reliably evaluated so that processes used and outcomes they achieve can be seen (Frederickson, 2002). As there are limited studies evaluating the effectiveness of the specific social communication intervention to be investigated in the research study, Lego® Therapy, it was felt appropriate to consider a wider range of literature and research in which this intervention fits, namely social communication interventions. The researcher therefore aimed to gain a better understanding of the current evidence base of social communication interventions for primary aged pupils with social communication difficulties by undertaking this systematic literature review.

Davies, Nutley & Smith (2000) highlight the increasing attention on accumulating research findings "into a robust body of knowledge" (pg. 7). SLRs can do this as they involve uncovering relevant studies to a particular review question and assess and synthesise the methodological quality (Davies et al, 2000). This employs tighter protocol and 'agreed standards' enhancing the reliability and validity of the findings, than other techniques such as literature reviews (Boaz, Ashby & Young, 2002).

The use of SLRs however, does not come without criticisms. Pawson (2006) highlights that they often employ arithmetic methods to gather outcome evidence of an intervention, leading to randomised control trials and quantitative research methods being triumphed. This often leads to qualitative methods being ignored, which Pawson (2006) proposes leaves out explanatory ingredients to the effectiveness of an approach and is vital for understanding to be gained. Boez et al (2002) adds that to strengthen this limitation SLRs should incorporate a broader range of studies employing different research methods when reviewing complex interventions and outcomes. Thus developing both understanding of outcomes and processes that occur within an intervention.

2.5.3. Review question & epistemological stance

In order to review an appropriate body of literature the following review question was developed:

How effective are social communication interventions in supporting primary aged children with social communication difficulties, including autism, in mainstream primary schools?

Due to the emphasis upon evaluating the evidence obtained, shown within the review question, a post positivist epistemological stance was adopted to evaluate this evidence. This epistemological stance is detailed further within *Section 3.4.1 The dominant paradigms in psychology and education*. Post positivism aims to establish an objective truth of a phenomenon, for example, what is the evidence of an interventions effectiveness, which often leads to the use of quantitative research methods (Robson, 2011). However, within this paradigm 'truth' is said to be subjective from person to person. Due to this the paradigm advocates quantitative and qualitative methods that might explore perspectives of 'truth' (O'Leary, 2004). Therefore this review evaluates the research studies identified using Gough's (2007) 'Weight of Evidence' framework to assess how much each study answers the review question, discussed further in *Section 2.5.7 In-depth review*.

Following Gough's (2007) stages to SLRs once a review question and the rationale for this is established the next step is to define the studies to be considered. The development of inclusion and exclusion criteria aims to ensure that the selected research answers the review question and the critique is not biased to the author's preferences or motives.

2.5.4. Criteria for considering studies for this review (inclusion/exclusion criteria)

The following criteria for inclusion of studies in this SLR were used:

a) The study described an evaluation of a social communication intervention programme. Other interventions that focused on general communication skills were not included, as they do not explicitly focus on the social aspect of communicating.

b) The study evaluated outcomes of pupils' involvement in the intervention, such as the impact on their social communication skills. Studies that did not have this primary aim would not be included in the review, as these outcomes are the key focus of Lego® Therapy (LeGoff, 2004) and of this research project.

c) The study focused predominantly on social communication interventions for either pre-school or primary-aged pupils. This criterion was due to the key target population of the present study being primary-aged children. Including pre-school studies may also be applicable to primary aged children with additional needs, and so it was felt appropriate to include them and assess how much they could inform this study. Studies that predominantly focused on secondary-aged pupils would therefore not be included in this review.

d) The intervention was delivered by staff from the educational setting. This is in order to maintain some consistency in the type of support given across the studies. Interventions delivered by others, such as parents, would not be included in the review.

e) The study was conducted in the past ten years (since 2004). Studies prior to this would not be included in the review due to the review wishing to incorporate more current research which is likely to be more representative of the educational environment children receive today.

f) The study was published within a peer-reviewed journal. This was due to the rigour and protocol that peer-reviewed journals must go through to become published, in terms of ethical considerations. Unpublished research would be excluded from this SLR.

2.5.5. Search and selection strategy

First, potentially relevant papers were identified through electronic database searching (PsychInfo, ASSIA & Wiley). See Appendix I for a flowchart that visually depicts the search process. As recommended by Fink (2005), search terms inputted as key words

into electronic databases were identified with the support of the thesaurus tool provided by the databases used. See Appendix II for a list of search terms that were used and a detailed description of searching strategies. In order to select the most relevant papers search terms had to be reduced from broader terms, such as social communication and social communication difficulties to more specific terms, such as "social communication" and intervention, and "social communication intervention*". See Table 1, within *Section 2.5.8.1. Results of searching and screening process* for detail of papers identified per search term for each database.

2.5.6. Identifying and describing studies

Once potentially relevant papers were identified, titles and abstracts were screened and studies that did not relate to the review question were excluded. Full copies of the remaining relevant studies were then obtained and considered in relation to the inclusion and exclusion criteria, detailed above. The studies identified as meeting the inclusion criteria were described briefly in relation to their setting (country and location in which the study was located), participant characteristics (number and age), intervention characteristics (what it entailed and number of sessions), study design, measures used and outcomes (see Appendix III for systematic map of the studies).

2.5.7. In-depth review

The systematic map of the studies identified as meeting the inclusion criteria was created in order to aid the in-depth review. According to Gough (2007) the next stage of SLRs is to appraise the quality and relevance of the studies found and synthesise these findings. Gough (2007) outlined an analysis framework in which specific quality and relevance criteria are used to determine the 'Weight of Evidence' that findings from a study hold in answering the review question. Gough (2007) outlines how these judgments are combined to make an overall judgment of what a study contributes to answering a review question. These judgments are detailed below in Figure 2.

Weight of Evidence A: Generic on quality of execution of study
Transparency: clarity of purpose
Accuracy: accurate
Accessibility: understandable
Specificity: method-specific quality

Weight of Evidence B: Review specific on appropriateness of method
Purposivity: fit for purpose method

Weight of Evidence C: Review specific on focus/approach of study to review question
Utility: provides relevant answers
Propriety: legal and ethical research

Figure 2: Weight of evidence framework (Gough, 2007)

These three sets of judgments are then combined to inform an overall assessment, *Weight of Evidence D,* which suggests the extent to which a study contributes evidence to answering the review question. The studies that were obtained through the systematic search and met the outlined inclusion criteria were then considered in greater detail and appraised according to the Weight of Evidence (Gough, 2007) and how well they answer the review question. The outcomes of the results were then synthesised and conclusions drawn.

2.5.8. Results of the systematic literature review

2.5.8.1. Results of searching and screening process

In total, the initial electronic searches identified 7124 potentially relevant studies. The restriction of the search terms from "social communication" to "social communication intervention*" reduced this total to 84. See Table 1.

	Database			
Search Term	**PsychInfo**	**ASSIA**	**Wiley**	**Total**
"Social Communication" (2003–2014, English Language Journal)	1996	259	4869	**7124**
"Social Communication" & Intervention (2003–2014, English Language Journal)	375	76	1773	**2224**
"Social Communication Intervention*" (2003–2014, English Language Journal)	35	13	36	**84**

Table 1: Search terms and results per database

The subsequent screening of the abstracts and titles of these studies excluded 62 studies on the grounds that they were not related to the areas of interest (for example, they explored social communication interventions after Traumatic Brain Injury), were conducted before 2004, were abstracts only or duplicates. This left 22 potential studies. Full copies of the 22 relevant papers were obtained. The identified papers were screened using the inclusion and exclusion criteria described. Twelve papers were excluded from the review as they did not meet the inclusion criteria, for example due to them being review papers as opposed to research studies or interventions being led by parents or within home settings. Ten studies that met the inclusion criteria were subsequently identified for systemic review.

2.5.8.2. Results of the systematic literature review: synthesis of papers and implications for current research

A brief overview of the ten papers identified can be seen in Table 2 below. A full systematic map of the studies can be found in Appendix III.

Study	Research Design	Location	Participants
Howlin et al (2007) UK	Randomised Control Trial (RCT)	School	84 primary school children with autism
Stanton-Chapman et al (2008) America	Multiple baseline Single Case Experimental Design (SCED)	Pre-school	8 pre-school children with disabilities that impacted on their social skills
Walberg & Craig-Unkefer (2010) America	Multiple baseline SCED	School	6 primary aged children with autism
Yoder & Lieberman (2010) America	RCT	University Clinic	30 pre-school children with autism
Stanton-Chapman & Snell (2011) America	Multiple baseline SCED	Pre-school	10 pre-schoolers with disabilities that impacted on their social skills
Adams et al (2012) UK	Single blind RCT	Clinic	88 primary aged children with pragmatic language impairment (PLI) or social communication disorder
Kaale et al (2012) Norway	RCT	Pre-school	61 pre-school children with autism
Stanton-Chapman et al (2012) America	Multiple baseline design	Pre-school classroom in mainstream primary school	8 pre-school children with disabilities that impacted on their social skills
Baxendale et al (2013) UK	Exploratory, Qualitative Interpretive approach	School	8 primary aged children with communication disorders
Fujiki et al (2013) America	SCED	School	4 primary aged children with language impairment

Table 2: A brief overview of studies that met the selection criteria for the systematic literature review

Within the studies that were gathered through the systematic review of the literature, some themes across the studies were identified by the researcher. These will be discussed in terms of their general characteristics, interventions explored, research design, procedural information, outcome measures and results. The weight of evidence, according to Gough's (2007) definitions will then be detailed and summarised within Table 3 at the end of this section.

General characteristics of included studies

The ten studies that met the inclusion criteria were completed between 2007 and 2013. Six of the studies were undertaken in America (Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer, 2010; Yoder & Lieberman, 2010; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012; Fujiki et al, 2013), three in the UK (Howlin et al, 2007; Adams et al, 2012; Baxendale et al, 2013) and one in Norway (Kaale et al, 2012). The studies included pupils of varied ages, five targeted pre-school children (Stanton-Chapman et al, 2008; Yoder & Lieberman, 2010; Stanton-Chapman & Snell, 2011; Kaale et al, 2012; Stanton-Chapman et al, 2012) and five targeted primary aged pupils (Howlin et al, 2007; Walberg & Craig-Unkefer, 2010; Adams et al, 2012; Baxendale et al, 2013; Fujiki et al, 2013). Eight of the studies were based in the school context, with the interventions being ran outside of the main classroom, whilst two studies (Yoder & Lieberman, 2010; Adams et al, 2012) ran the intervention within clinics away from the school context. The studies involved participants with a diagnosis of autism, language impairment and communication disorders.

Intervention

Details of the nature of the social communication intervention varied across studies. Seven evaluated adult-led interventions and three explored peer-based interventions. The adult led interventions typically followed manualised programmes; two explored the Picture Exchange Communication System (PECS) (Howlin et al, 2007; Yoder & Lieberman, 2010); two the Social Communication Intervention Project (SCIP) (Adams et al, 2012; Baxendale et al, 2013) and one a manualised social communication programme (Kaale et al, 2012; Fujiki et al, 2013). Two further adult led interventions were based on an individualized social communication programme (Stanton-Chapman & Snell, 2011). The three peer-based interventions used naturalistic approaches and thematic play (Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer, 2010; Stanton-Chapman et al, 2012).

All of the papers evaluated the effectiveness of one social communication programme, except for one that had a comparison group who had access to another social communication programme (Yoder & Lieberman, 2010).

Research designs

The designs of the studies varied from an exploratory design (one) (Baxendale et al, 2013), SCEDs (five) (Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer**,** 2010; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012; Fujiki et al, 2013) to arguably more rigorous randomised control trials (RCT, four) (Howlin et al, 2007; Yoder & Lieberman, 2010; Adams et al, 2012; Kaale et al (2012).

Within the four RCT studies (Howlin et al, 2007; Yoder & Lieberman, 2010; Adams et al, 2012; Kaale et al, 2012) all of them had control groups. In addition, Yoder and Liberman (2010) used a comparison group which accessed a different social communication intervention. This added strength to their design and ability to suggest any effect was due to the introduction of an intervention. Two of the RCTs (Yoder and Lieberman, 2010; Adams et al, 2012) incorporated 6 months post intervention follow up, which enabled these studies to consider the maintenance of effect. Due to the large amounts of participants in these studies, ranging from 30 to 88, as well as the use of follow up measures, they are often regarded as having a high weight of evidence in answering if an intervention is effective, as well as their ability to generalise these findings to others. However, the weight of evidence for these studies is lowered due to the queried appropriateness of this type of design for the heterogeneity of the children under investigation within this review.

The SCED designs identified employed experimental rigour, as they incorporated a baseline period to act as a control for the intervention (Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer**,** 2010; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012; Fujiki et al, 2013). All the studies added additional phases or withdrawal of the intervention that increased their external validity. Also, four of the five SCED studies employed a multiple baseline (Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer**,** 2010; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012). Within multiple baseline SCEDs the initiation of the intervention is staggered for each participant in the study, thus increasing the validity of the causal inferences made (Kratochwill,

Hitchcock, Horner, Levin, Odom, Rindskopf, & Shadish, 2010). Fujiki et al (2013) were unable to employ a multiple baseline procedure due to pragmatic difficulties and so added a follow-up period in which the intervention was withdrawn but measures continued to be taken, a technique also supported as increasing valid causal inferences (Kratochwill et al, 2010). Limitations of this type of method are still apparent due to the use of a single subject and thus the ability to generalise the findings. Therefore, these designs add a medium weight of evidence in respect of the review question.

Baxendale et al's (2013) exploratory study design explored teacher and parents' perceptions of the impact of the intervention on participants. The design's weight of evidence in general may be seen as weaker due to its reliance upon pre and post perceptions and possible respondent biases which may come with that. However, in answering the review question this study provides a different slant to understanding effectiveness of interventions and allows exploration of the mechanisms that supported effectiveness to be understood.

Procedural information

The majority of the studies used clear inclusion and exclusion criteria for the selection of their sample which makes the target of each study clear and enhances others ability to replicate it. Howlin et al (2007) provided less detail of their participants but did include the participant's scores on the Autism Diagnosis Observation Schedule – Generic Module 1 (ADOS-G: Lord, Risi, Lambrecht, Cook & Leventhal, 2000) as a guide to their level of inclusion. The studies, however, varied in terms of their rigorousness of treatment integrity checks. These checks strengthen the reliability of the independent variable (the intervention) implementation and were conducted for seven of the ten studies (Kaale et al, 2012; Adams et al, 2012; Stanton-Chapman et al, 2008; Walberg & Craig-Unkefer, 2010; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012; Fujiki et al, 2013). Howlin et al (2007), Yoder and Liberman (2010) and Baxendale (2013) did not employ these checks which reduces the reliability of these studies due to the consistency of the intervention implementation being unclear.

Outcome measures

As discussed above, the studies varied in terms of the designs and measures used to explore the effectiveness of the social communication intervention on the target child/children's social communication skills. The precise targeted skills varied from

turn taking skills, positive peer response to more explicit skills, such as eye gazing.

The measures used to assess the impact of the social communication interventions focused both on the impact of the intervention directly on the child as well as the perceptions of teachers and parents. The majority of the studies used pre and post standardised measures whether they followed a SCED, RCT or exploratory design (Howlin et al, 2007; Yoder & Lieberman, 2010; Adams et al, 2012; Kaale et al, 2012; Stanton-Chapman et al, 2012; Fujiki et al, 2013). These measures varied in exploring self-reported qualitative data (from the child, their peers, adult facilitators or parents) and quantitative data (e.g. the number of interactions involving the focus child and peer response).

All the studies, except the exploratory study (Baxendale, 2010) used observation as their key measure of social communication skills. Of the studies that used observation, all bar Adams et al (2012) conducted video observations and then a coding system to analyse the communication seen within the video clips.

Within three of the SCED studies (Stanton-Chapman et al, 2008; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012) the authors own coding system was used; The Peer Language and Behavior Code (Stanton- Chapman, Kaiser, Vijay & Craig-Unkefer, 2003). This coded verbal (such as descriptive and requesting behaviours) and non-verbal (such as physical negative behaviours and child behaviour response) behaviours. Walberg and Craig-Unkefer (2010) also used their own author's coding scheme, the Peer Play Code (Craig-Unkefer et al, 1998). This coded six categories of play: aggression, solitary, onlooker, parallel play, associative play and cooperative play. The other studies did not use explicit coding systems, but coded frequency of pre-defined explicit behaviours they were exploring, such as amount of joint attention[3], use of PECS or validating comments (Howlin et al, 2007; Kaale et al, 2012; Fujiki et al, 2013). The reliability of the observation coding was strengthened for all of the studies as they all were inter-rated. This was further strengthened for five of the studies as the coders were also blind rated to the intentions of the research, the participant's grouping or stage in the research (such as baseline or intervention phase) (Kaale et al, 2012);

[3] Joint Attention: referring to the child's ability to coordinate attention with a social partner towards an object or event, often shown through alternating gaze between an object and a person, pointing, showing or giving (Mundy & Sigman, 2006)

Yoder & Liberman, 2010; Stanton-Chapman et al, 2008; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012). This was weakened for those that did not blind their raters (Howlin et al, 2007; Walberg & Craig-Unkefer, 2010; Fujiki et al, 2013).

Results

Positive outcomes for the participants could be seen within the majority of the studies in this review. Within the RCT's these positive outcomes included significant increases in initiation of communication and use of PECS ($p<.05$, Howlin et al, 2007), significant and large increases in joint attention, use of PECS within different contexts ($p<.001$, d=1.0, Yoder & Lieberman, 2010), significant improvements in parent rated conversational quality and functional pragmatic and social communication skills following the SCIP programme ($p<0.01$, Adams et al, 2012) and significant and moderate increase in frequency of JA ($p<.036$, d=0.44, Kaale et al, 2012). Howlin et al (2007) and Adams et al's (2012) lack of reporting effect sizes decreases our understanding of the impact of the intervention onto the skills measured.

Within the SCED's visual analysis of the graphs showed modest increases in peer-directed requests, based on pre-defined significance criteria (Stanton-Chapman et al, 2008), whilst Walberg and Craig-Unkefer (2010) found increased engagement in peer talk and interactive play and Fujiki et al (2013) showed increases in validating comments. Moderate increases within reciprocal conversations in different contexts and communication initiation were shown, based on percentage of non-overlapping data by Stanton-Chapman and Snell (2011) and Stanton-Chapman et al (2012). Walberg and Craig-Unkefer (2010) and Fujiki et al's (2013) lack of use of explicit criteria to calculate effect size, such as Kratochwill et al's (2010), limits our understanding of the impact of the intervention onto the skills measured. Baxendale et al's (2013) exploratory study suggested increases in initiation and response, academic attainments and self-esteem (Baxendale et al, 2013).

Factors which were associated with positive increases shown within the studies included that effects were more evident for those who entered the intervention with relatively low and stable rates of the focus social communication skills (Stanton-Chapman et al, 2008) and those that made the greatest increases appeared to maintain this level after the intervention had been withdrawn (Baxendale et al, 2013).

Table 3 evaluates the research articles within the SLR in line with Gough's (2007) Weight of Evidence, as detailed in *Section 2.5.7 In-Depth Review*.

Study	**Weight of Evidence A**	**Weight of Evidence B**	**Weight of Evidence C**	**Weight of Evidence D**
Howlin et al (2007)	Medium	Medium	Medium	**Medium**
Stanton-Chapman et al (2008)	Medium	High	High	**High**
Walberg & Craig-Unkefer (2010)	Medium	High	Low	**Medium**
Yoder & Lieberman (2010)	Medium	Medium	Low	**Medium**
Stanton-Chapma & Snell (2011)	Medium	High	High	**High**
Adams et al (2012)	Low	Medium	Low	**Low**
Kaale et al (2012)	Medium	Medium	Medium	**Medium**
Stanton-Chapman et al (2012)	Medium	High	High	**High**
Baxendale et al (2013)	Low	Low	Low	**Low**
Fujiki et al (2013)	Medium	Medium	Medium	**Medium**

Table 3: Evaluation of studies included in the systematic review, in line with Gough's (2007) 'Weight of Evidence'

Table 3 indicates that the majority of the studies that were evaluated provided a medium 'weight of evidence'. The SCED designs gave the highest weight of evidence (Stanton-Chapman et al, 2008; Stanton-Chapman & Snell, 2011; Stanton-Chapman et al, 2012) due to their appropriateness of the research design to the current study's review question and target population. Those offering the lowest weight of evidence were Adams et al (2012) and Baxendale et al (2013) due to limitations in the rigour of their designs and their outcomes being less applicable to the review question.

2.5.9. Potential biases in the review process

Gough (2007) outlines that all research is in a sense biased by its assumptions and methods, but research using explicit rigourous methods attempts to minimise bias. This can make hidden bias explicit and thus provides a basis for assessing the quality and relevance of research findings. The SLR employed Gough's (2007) stages of review in order to follow this requirement and reduce the risk of bias. Higgins and Green (2011) also outlined that in order to reduce bias within SLRs, protocol should be set out firstly as to search strategies, inclusion and exclusion criteria, rather than changing the protocol to fit with the findings. Having the framework set out by Gough (2007) also aided a reduction in bias.

This review also attempted to be open to differing methodologies and designs used within studies exploring social communication interventions in order to not become over-dependent on quantitative data and experimental designs. This was a concern of Andrews (2005). The use of the Weight of Evidence framework (Gough, 2007) ensured that each study was judged in the same way and overall weight towards the research question was assessed. This could have been enhanced by having two reviewers at the different stages of the review process (i.e. paper selection & paper critique) so that independent judgments could be made and discussed, creating an even further objective review of the studies.

2.5.10. Conclusions and implications onto the current research project of the systematic review

Overall the research within this SLR indicates a positive impact that varying social communication programmes can have on children's social communication skills. A range of studies, employing different designs and methodologies highlighted the broad impact these interventions can have. This range of designs supports and enhances our understanding of the review question.

The SLR indicates that research in the area of social communication interventions requires robust research designs. Whilst RCT designs add understanding to this area, the SCED's appear to be more appropriate given the heterogeneous nature of the population which the interventions aim to target. The strength of the studies are extended with treatment fidelity checks and use of blind inter-raters of communication observations. The use of videoing of the observations also appears to be preferable, in order to

enhance accuracy of the coding of the targeted skill. The majority of the studies failed to explore the generalisation and maintenance of the social communication skills, reducing the quality of evidence they provide to the review question. Many of the studies discussed lack of follow up and exploratory data due to accessibility difficulties and research pressures. This type of data would provide additional and pertinent information to explore how effective an approach can be over a sustained period of time and in different contexts. The information highlighted by this SLR will be considered and used to inform the design and methodology of the current research project. Before this can be done it is important to look at the specific research exploring the Lego® Therapy intervention to see what has been done and how the current research project might expand and contribute to this area.

2.6. Lego® Therapy and current evidence base

An approach that aims to reduce some of the criticisms of the social skills programmes outlined within the literature review is Lego® Therapy. This is a "child-led and peer-based intervention that utilises the natural interest in construction play on the part of children with autistic disorders to elicit a willingness to collaborate and interact while engaging in this activity" (LeGoff et al, 2010, pg. 222). Daniel LeGoff (2004), a US Psychologist, developed the approach after observing two of his clients with ASD interacting positively together through the medium of Lego®. The approach has been shown to promote social communication skills, including joint attention, conflict resolution, verbal and non-verbal communication and collaboration (LeGoff, 2004). It is also suggested to build motivation for children to initiate and prolong social interactions (LeGoff, 2004). LeGoff et al (2010) highlights that originally the approach was intended just for children with ASD, however, as it has evolved it has been found to be suitable for many other children with social development and communication difficulties.

The approach aims to be more naturalistic than other social skills programmes, due to its use of natural play equipment and ability to be implemented within the school setting (Andras, 2012). Delprato (2001) propose that using naturalistic approaches should improve generalisation of skills due to learning occurring in real-life situations. Attwood (1998) further adds that the use of natural interest should promote learning further as children should be more motivated to participate.

A limited number of studies have been implemented to evaluate the effectiveness of Lego® Therapy. When initially developing this research project the researcher contacted Daniel LeGoff (to be discussed further in *Section 3.5.7 Stakeholders, Stakeholder requirements: Daniel LeGoff, Lego® Therapy developer*). Within these discussions he highlighted research papers that had been published to date and indicated that an official training manual of the Lego® Therapy intervention was to be published in July 2014 (LeGoff, Gomez De La Cuesta, Krauss & Baron-Cohen, 2014, in press). Further discussions were also held with a Masters student, Miranda Andras, who had recently completed her dissertation and received publication in 2012.

Due to the potential bias of using the creator as a source of advice regarding the Lego® Therapy literature, as it may have guided the researcher to only research which showed

an effect, it was deemed necessary to conduct a structured and systematic search of the literature. To ensure all the current published research was gathered the researcher conducted further database searches using the search term 'Lego® Therapy' (within PsychInfo, ASSIA, Wiley). A total of four research papers relating to Lego® Therapy evaluations were gathered from the searches and discussions outlined above. This research will now be discussed in terms of its general characteristics, research designs, procedural information, outcome measures and results.

General characteristics of Lego Therapy studies

Of the four studies developed, the two initial studies were based within the USA and conducted by the interventions creator (LeGoff, 2004; LeGoff & Sherman, 2006). Later studies were based within the UK (Owens, Granader, Humphrey & Baron-Cohen, 2008; Andras, 2012). It is unclear how much the creator's investment in the intervention might have impacted upon the earlier research. This potential bias is eradicated within the UK based studies due to them being independently developed. All the studies targeted children with a formal diagnosis of autism, with a primary need of social communication difficulties. The sample populations used within the studies were primary aged children, except LeGoff's (2004) study whose participants ranged from six to sixteen years old. The sample size involved in each study varied from eight (Andras, 2012) to sixty (LeGoff & Sherman, 2006).

All the studies evaluated outcomes of the Lego® Therapy intervention conducted in a clinic setting, except for Andras' (2012) study which ran within the school context. Intervention length ranged from ten (Andras, 2012), eighteen (Owens et al, 2008) and twenty-four (LeGoff, 2004) weeks to thirty-six months (LeGoff & Sherman, 2006).

Research designs

The designs varied within each study. LeGoff (2004) employed a waiting list control design. This is regarded as a strong research design as all participants received the intervention, but at different times. This accounts for maturation and history effects, as well as controlling for any other confounding variables. In contrast, LeGoff and Sherman (2006) used a thirty-six month pre- and post- treatment series design to explore the longitudinal impact of Lego® Therapy. The use of a comparison group strengthens this design as it enhances the ability to suggest the intervention impacted on the participants performance. Owens et al (2008) employed a randomised control trial to

compare the impact of Lego® Therapy and the Social Use of Language Programme (SULP, Rinaldi, 2004). They also had a control group that enhanced the overall rigour to their design and ability to advocate that any changes observed were due to the intervention. Andras (2012) used a small-scale within-groups design to explore communication outcomes for eight participants following Lego® Therapy. Although the designs appear robust the heterogeneity of the population evaluated makes comparisons across groups fairly limited and therefore weakens the overall strength of the designs.

Procedural information

All the studies gave broad reasons for inclusion of their participants, predominantly the participants had to have a diagnosis of autism. The detail of the intervention implementation varied, with Owens et al (2008) and Andras (2012) providing very clear and thorough detail. This helps to enhance the reliability of these studies and supports replication. The studies, however, varied in terms of their use of treatment integrity checks. These checks strengthen the reliability of the independent variable (the intervention) implementation but were only evident in the Andras (2012) study. Owens et al (2008) explicitly state a lack of treatment fidelity measures in their study and detail how this limits their ability to know whether the interventions were carried out correctly. This means Owens et al (2008) cannot be certain whether any gains seen after intervention were a result of the intervention or other changes that occurred in the intervention or children's environment. LeGoff (2004) and LeGoff and Sherman (2006) do not give details of treatment integrity checks, however sessions were ran by the creator within both studies, which may have enhanced the reliability and consistency of intervention implementation and the overall fidelity of the approach. This however creates a potential threat of facilitator bias due to the creator's investment into the study and potential impact upon the delivery quality, which may influence any changes that occurred.

Outcome measures

Outcome measures varied for each study. Pre and post measures were used for three of the four studies (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008). LeGoff (2004), LeGoff and Sherman (2006) and Owens et al (2008) all employed the Social Interaction subscale of the Gilliam Autism Rating Scale (GARS-SI, Gilliam, 1995). Further standardised assessment tools were used by LeGoff and Sherman (2006), such

as the Vineland Adaptive Behavior Scales (VABS: Sparrow et al., 1984) and Wechsler Intelligence Scale for Children–Third Edition (WISC–III: Wechsler, 1991), whilst Owens et al (2008) used the VABS (Sparrow et al, 1984). These measures supported understanding of parent views of the participant's adaptive behaviours, socialisation, communication and maladaptive behavior (VABS: Sparrow et al, 1984) and their social interaction (GARS-SI, Gilliam, 1995).

Three of the four studies used observations as a central measure of the participants' social communication development (LeGoff, 2004; Owens et al, 2008; Andras, 2012). LeGoff's (2004) observations focused on the participant's Social Competence[4] skill development within unstructured periods at school through frequency counts of self-initiated social contact and duration of the social interaction at pre- and post-intervention. Owens et al's (2008) observations were taken immediately before the start of intervention and after the intervention. Frequency of self-initiated social contact with peers and the duration of social interactions with peers were measured to gain an overall indication of social functioning. Andras (2012) on the other hand used observations as their sole outcome measure. These were conducted in the playground for 10 minutes on six occasions during the study; at the start and end of an initial ten week control period with no intervention, at the start and end of ten weeks of Lego® Therapy and at the start and end of a further ten weeks with no intervention to assess maintenance over time. Frequency of social interaction, verbal, touch and copying were recorded and presented as mean scores for all the participants. None of the studies employed video observations, which reduces the reliability of the measures as they are threatened by observational bias, discussed within *Section 3.6.4.2. Measuring dependent variable 1& 2: Social communication observations (repeated measures)*. Also, inter-rater agreement was only gathered by LeGoff (2004), which reduces threats to reliability including observer drift and expectancy effects, discussed further in *Section 3.7.4.1 Validity and reliability of structured observation*. The lack of inter-rating within Owens et al's (2008) and Andras' (2012) studies therefore limits the reliability of their observational

[4] Social Competence: defined as "(1) initiation of social contact with peers, reflective of social interest and motivation for social contact; (2) duration of social interaction, which reflects the development of communication and play skills; and (3) decreases in autistic aloofness and rigidity, with development of age-appropriate social and play behaviors (LeGoff, 2004, pg. 562)

measures. None of the raters were blind, which further limits the reliability of the measure used, as observer bias may impact on the coding of communication.

Results

All the studies proposed positive effects of the Lego® Therapy intervention on the participant's measured social communication skills. LeGoff's (2004) study indicated positive gains in the children's social competence ($p<.01$) after twelve weeks of Lego® Therapy and sustained and even larger after twenty-four weeks. The control groups' scores remained around the same level, pre and post, suggesting the social competence gains were due to the Lego® Therapy intervention. LeGoff and Sherman's (2006) study suggested positive effects upon socially adaptive behaviours and a reduction in socially inappropriate behaviours for all the participants (Lego® Therapy and matched controls, $p<.001$) over a three-year treatment period but that those on the Lego® Therapy intervention made greater gains ($p<.001$).

Owens et al (2008) suggested that Lego® Therapy was more effective in decreasing rigidity of children's interaction and increasing social interaction, as opposed to the SULP intervention ($p<.05$). Moreover, Owens et al (2008) linked these benefits to Lego® Therapy's more naturalistic collaborative play approach. However, direct observations were not taken for the control group which limits their ability to state that the small increases in duration of social interactions were due to the Lego® Therapy intervention. In addition, Andras' (2012) observations showed positive impacts upon the participant's social interaction. Increases were shown in the means of the participant's verbal communication and engagement in organised games. Decreases were shown in their use of touch and copying, which Andras (2012) linked to the participant's becoming less reliant on these skills due to their increasing ability to verbally interact with their peers. However, this study's sole use of pre, post and delayed observation measures somewhat limits the strength of the design. It is questionable whether grouping and reporting the mean values for the participants' was the most appropriate way of disseminating the findings. More rigourous repeated measures using a SCED may have added more strength to this design and thus its findings, as shown in the SLR studies.

Table 4 evaluates the Lego® Therapy research in line with Gough's (2007) Weight of Evidence, according to the SLR review question.

Study	Weight of Evidence A	Weight of Evidence B	Weight of Evidence C	Weight of Evidence D
LeGoff (2004)	Low	Medium	Medium	**Medium**
LeGoff & Sherman (2006)	Low	Medium	Medium	**Medium**
Owens et al (2008)	Low	Medium	Medium	**Medium**
Andras (2012)	Low	Low	Medium	**Low**

Table 4: Evaluation of the Lego® Therapy studies, in line with Gough's (2007) 'Weight of Evidence'

Table 4 indicates that the majority of the papers provided a medium 'weight of evidence', due to their appropriateness of the research design and focus of the evidence explored. As discussed within the SLR, the use of group designs have been questioned for their appropriateness to the heterogeneous population of children with social communication difficulties under exploration, however these are considered to be strong research designs when applied to large numbers of participants (Robson, 2011). The methodological quality and integrity of all the research considered was scored low due to them lacking video observations as well as their variability in use of treatment fidelity checks, inter-rating and blind-rating, which were shown in the SLR as strengthening the reliability and validity of a study's design. This review of the Lego® Therapy research gives support for the need to extend understanding of the effectiveness of this intervention as it is growing in its application in the researcher's local authority and nationally. Employing some of the rigour highlighted within stronger methodological designs, as discussed in the SLR, to Lego® Therapy research may enhance the knowledge base for this specific social communication intervention.

2.7. An introduction to this study

2.7.1. Conclusions from the literature and the unique contribution of this research

The literature clearly highlights the importance of social communication for all children and particularly those with social communication difficulties, such as autism (Owens et al 2008). This appears to be more evident as expectations are increasing on schools to support the inclusion of children with social communication difficulties and ensure that they are receiving appropriate and evidence based programmes to achieve 'best outcomes' (AET, 2012a; AET, 2012b). Success of these approaches may be linked to the child's development of social communication skills, which raise their social competency (Stanton-Chapman et al, 2012; Odom et al, 2008), as well as their sense of school belonging (Hart, 2011). The literature suggests a child who is able to initiate a conversation with a peer, respond appropriately to peer initiations or responses and are able to take turns is more likely to be socially accepted and chosen as preferred communication partners (Black, 1992; Black & Hazen, 1990; Craig & Gallagher, 1986; Gertner et al, 1994). Thus highlighting the need for interventions that can develop the social independence and confidence of children with social communication needs as well as their sense of school belonging.

Lego® Therapy is a naturalistic approach which is beginning to be used across schools as part of this inclusive movement (AET, 2012a), however its evidence base is limited and could be enhanced by further rigourous research which is suitable for the population it is targeted towards. The current research therefore aims to enhance the knowledge base of the effectiveness of Lego® Therapy within the school context by employing a design that is most suited to the client group it is aiming to support. A systematic exploration of the literature has highlighted key features of research within the area of social communication intervention, including Lego® Therapy. The review found that research in this area often explored outcomes from the intervention, however the research was limited in exploring the generalisation and maintenance of the outcomes. It also highlighted methodological considerations that enhance the reliability and validity of this type of research, such as using video observation, gaining blind inter-rater reliability and employing suitable designs, such as SCEDs, due to it being more fitting to the population of children these interventions target.

The general literature review, SLR and Lego® Therapy literature review all highlight the need to develop our understanding of the Lego® Therapy intervention and its effectiveness. The researcher feels it is important to learn from past practice developed within the general area of social communication intervention evaluations and use this to extend our understanding of the effectiveness of the Lego® Therapy intervention. This informed the premise of the current study and development of key research questions.

2.7.2. Main research questions

From the exploration of the literature, the following research questions are intended to be addressed;

Principal Research Question:

Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties?

Subsidiary Research Questions:

a) Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties maintain after the intervention ends?

b) Does Lego® Therapy have a positive impact on parent and teacher perceptions of the generalisation (across home/school settings) of social confidence and independence of primary-aged children with social communication difficulties?

c) Does Lego® Therapy have an effect upon the primary-aged children with social communication difficulties self-reported sense of social belonging?

3. CHAPTER 3 - METHODOLOGY

3.1. Introduction to Chapter 3

The following chapter outlines the methodology and design of the study. It aims to provide a clear account, as well as the rationale behind the methodological decisions made and the procedures used in answering the research questions. A broad focus is initially placed upon the concept of "Real World" research and need for evidence based practice in educational settings. The philosophical considerations that underpin the research and the stance that was adopted and its impact upon the practical undertakings within the research are then considered. It then explores the varying research designs and methods that could have been adopted and presents the rationale for the chosen procedures. Detail of the intervention and the measures employed are discussed in terms of their reliability and validity. Comment is then made on the integral ethical considerations that were made throughout the research process.

3.2. Real world research

Mertens (2005) claims that the purpose of research within the 'Real World' is to 'understand, describe, predict or control an educational or psychological phenomenon or to empower individuals in such contexts' (pg. 2). This is through a process of systematic inquiry in which data is collected, analysed and interpreted (Mertens, 2005). Cohen, Manion and Morrison (2011) describe how such research is a means in which people can aim to discover 'truth' and make sense of their experiences and the environment around them, through it being systematic and controlled; empirical (based on experience, observation or experiment) and self-correcting (methodological considerations try to protect the researcher from making errors or identifying incorrect results). Real World research aims to base its findings within the real context of a phenomena in order to avoid generalising findings which have been developed in a laboratory and may not be as applicable within the context (Robson, 2011). This systematic inquiry in research has been summarised by Carter and Little (2007). See Figure 3 below.

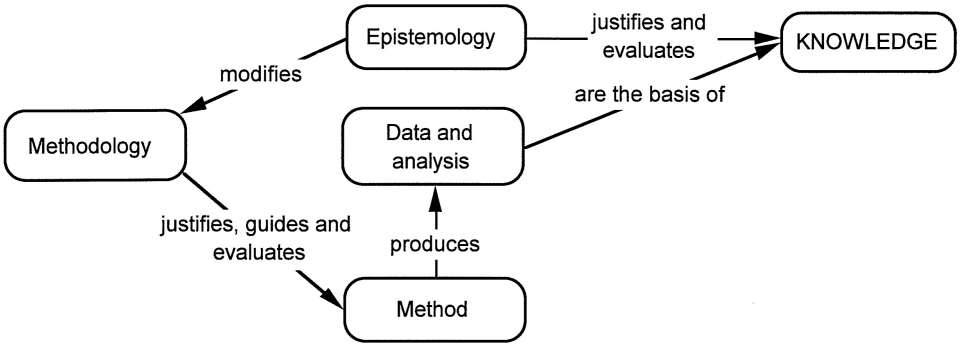


Figure 3: The simple relationship between epistemology, methodology & method (Carter & Little, 2007)

Within Carter and Little's (2007) model it suggests that when conducting research the researcher must approach this from an epistemological stance. This will then inform their views of methodological considerations and how to approach the phenomena under consideration. This in turn guides their selection of method, data collection and analysis procedures leading to understanding or 'knowledge' of the area under exploration. How this research follows this model of systematic inquiry will be detailed within this coming section.

3.3. Need for evidence based practice within 'real world' educational settings

Before the epistemological stance of the study can be explored it is important to understand the "Real World" context in which the current study took place. Fox (2002) highlights that a political push for evidence-based practice in the past decade can be seen in order to improve service and provision for all. More specifically, within the EP profession, its role in investigating what works within schools and for whom is advocated greatly (Stobier & Waas, 2002). The overall aim of the current study was for the opportunity to contribute to the evidence based practice in educational settings.

A hierarchy of the quality of evidence for studies in evidence-based practice has been developed (Roth & Fonagy, 1996). Within this hierarchy, randomised controlled trials are triumphed as the most reliable and valid. Whilst case studies, cohort studies and expert consensus opinion are seen as the least favoured (Scott, Shaw & Joughin, 2001). The appropriateness of this hierarchy for educational research has been questioned due to it being more applicable to efficacy studies that answer 'Can it work?' questions which are often conducted in controlled environments in order to gain control over additional factors (Frederickson, 2002). When exploring the effectiveness of an approach or intervention in a specific context, 'Does it work?' questions might be more appropriate and applicable to the real world context of the environment (Frederickson, 2002). Therefore, Frederickson (2002) argues that the type of research question should inform the design of the studies rather than following the research hierarchy.

To understand evidence-based practice within the real world context of a school system, Taylor and Burden (2000) highlight the need to consider the context and circumstances within it, due to its impact upon the intervention and potential outcomes. Thus adding further to the notion of the need for different perspectives, research questions and designs within EP research to gain reliable and valid understanding of a phenomenon.

3.4. Paradigms within psychological and educational research

Mertens (2005) describes how 'researchers should be aware of their basic beliefs, their view of the world (i.e. their functional paradigm) and the way these influence their approach to research' (pg. 39). This will impact on the type of research questions developed which in turn informs the design of the study. This is explained further in *Sections 3.2 Real World Research* and *3.3 Need for Evidence Based Practice in Real World Educational Settings*. There are various paradigms within psychology and education research.

Each paradigm or 'way of looking at the world', is underpinned by three key questions:

- an **Ontological** question – "what is the nature of reality?"
- an **Epistemological** question – "what is the nature of knowledge and the relationship between the knower and the would-be known?"
- a **Methodological** question – "how can the knower go about obtaining the desired knowledge and understanding?"

(Lincoln & Guba, 2000, as cited in Mertens, 2005, pg. 8)

The central paradigms within psychological and educational research will now be explored in relation to these key questions.

3.4.1. The dominant paradigms in psychology and education

Within psychological and educational research two dominant paradigms exist; constructivism (which suggests knowledge is personal and subjective) and positivism (which suggests knowledge exists in one objective form) (Cohen et al 2011). Criticisms of positivism have lead to the development of post-positivist views. This holds onto the positivist view of knowledge but acknowledges the biases in research and seeks ways to reduce these to establish reliability and validity of findings (Robson, 2011).

Table 5 outlines the ontology, epistemology and methodology for these two dominant paradigms.

Basic Beliefs	Positivism/ Post-positivism	Constructivist
Ontology (nature of reality)	One reality; knowable within probability	Multiple, socially constructed realities
Epistemology (nature of knowledge; relation between knower and would-be known)	Objectivity is important; the researcher manipulates and observes in a dispassionate, objective manner	Interactive link between researcher and participants; values are made explicit; created findings
Methodology (approach to systematic inquiry)	Quantitative (primarily) interventionist; decontextualized	Qualitative (primarily); hermeneutical; dialectical; contextual factors are described

Table 5: Basic beliefs associated within major paradigms (adapted from Mertens, 2005, pg. 9)

Positivism

The Positivist paradigm believes that an objective knowledge can be developed through direct experience and observation (Robson, 2011). It sees the researcher's role as discovering this reality by finding causal explanations for a phenomena (Mertens, 2005). This paradigm has been widely criticised due to it suggesting research exploration is 'value free' and the notion that every observer will observe the same (Robson, 2011).

Constructivism

In contrast to the positivist paradigm the constructivist paradigm suggests that no objective reality exists, instead proposing a social construction of reality occurs (Mertens, 2005). Due to this, constructivists do not usually begin with a theory (as with positivists) and instead "generate or inductively develop a theory or pattern of meanings" (Creswell, 2003, p.9). A focus upon the participants' views of the phenomena being explored is often sought in order to explore potential varying social constructions.

Post positivism

Due to the criticisms of the positivist paradigm after World War II it became replaced by post positivism (Mertens, 2005). This still maintains a commitment to seeking

objectivity of the truth whilst also acknowledging that the hypotheses, knowledge and values of the researcher and others will influence how the phenomenon is observed (Robson, 2011). It holds onto a scientific approach through starting with a theory, testing this and depending upon the data collected, the theory is either supported or negated (Robson, 2011). It believes objectivity can be enhanced through defining and following rigourous procedures, leading to the development of an imperfect truth which will be increasingly more likely as other studies support the developed view (Mertens, 2005, Robson, 2011). Khun (1962) suggests that theories can only be held as provisional and new understanding may be brought which challenges an existing theoretical framework. A further perspective on this paradigm aligns itself somewhat closer to constructivism, in that it suggests that 'what might be the truth for one person or cultural group may not be the "truth" for another' (O'Leary, 2004, pg. 6). Thus adding to the need for triangulation of data in order to support a researcher's ability to gain an objective truth.

3.4.2. The rationale for the philosophical basis of this study

As discussed, the overall aim of this study was to add to evidence based practice within the real world educational context. Particularly evaluating the impact of the Lego® therapy intervention on children with social communication difficulties in primary schools. Due to this focus on establishing a cause and effect relationship in this area it appeared logical to adopt an epistemological stance that deems knowledge to be objective, tangible and measurable through an application of a rigorous scientific method (Cohen et al, 2011). Whilst also being aware of the 'real world' aspects of the research and the need for understanding and consideration of potential biases and extraneous variables which might impact upon the internal and external validity and reliability of the research. These considerations led the researcher to adopt a post-positivist standpoint for this study.

3.5. Methodological considerations and designs

The dominant paradigms historical allegiances with methodological designs were shown in Table 5. However, an exploration of different types of designs was needed in order to ensure the most appropriate design for the purpose and epistemological stance of the study was employed. This section will broadly focus on the dominant research designs and provide rationale for the chosen design for the study, linking to the real world context and purpose of the study.

3.5.1. Fixed and flexible designs

Robson (2011) described two key types of research designs, fixed and flexible.

Fixed designs are driven by a theory, which informs the variables to be measured, how they will be measured and analysed (Robson, 2011). It aligns itself with realist views, suggesting that if this set out procedure delivers the expected relationships then evidence builds supporting the link between the theoretical mechanisms and their operation within the study. If a relationship cannot be seen then other mechanisms that have not been explored would be said to be in operation. Within this overall design approaches are said to be experimental, where the researcher manipulates a variable (independent variable) and measure any change in another variable(s) (dependent variable) or non-experimental, in which no manipulation of variables occur (Robson, 2011). This design presents a clear link between research and theory, however it's focus on controlling extraneous variables and seeking a causal relationship has been criticised for limiting its ability to capture the complexities and subtleties of human behaviour (Robson, 2011).

Flexible designs, in contrast, have an evolving design which sees the 'researcher-as-instrument' and often places a focus on participants' views (Robson, 2011). This design begins with an idea or problem that the researcher aims to understand, however it does not seek to gain causal relationships between variables, instead relationships or comparisons may evolve within the research process through analysing using multiple levels of abstraction (Robson, 2011).

3.5.2. Designs for particular purposes

Robson (2011) describes that within real world research, phenomenon are often being evaluated with the purpose of making a positive difference to those involved in the

study. A type of research design often used specifically within real world contexts is evaluation research.

3.5.2.1. Evaluation research

Robson (2011) describes the purpose of evaluation as assessing "the effects and effectiveness of something, typically some innovation, intervention, policy, practice or service" (pg. 176). This type of research lends itself to fixed, flexible or multi-strategy designs. However, it is argued that it is most applicable to realist approaches which are theory driven and seek to answer 'how' and 'why' questions around a programmes effectiveness (Robson, 2011).

Two key types of evaluation research exist; process and outcome. Process evaluation answers 'how' or 'what is going on' questions and so focuses upon processes that occur within an intervention. Due to this it is more likely to fit well with a flexible design in order to explore the mechanisms that support particular outcomes of a programme. Outcome evaluation is more concerned with examining the consequences and outcomes of an intervention. Fixed designs are preferenced within this framework as they support the researcher in answering questions related to the relationship between an intervention and goals or outcome variables (Robson, 2011).

3.5.3. Application to the current research

This research focuses upon a specific intervention, Lego® Therapy, and its effectiveness, and therefore adopts an outcome evaluation research approach. A fixed design strategy was employed due to the post-positivist stance of the research and the focus on outcome evaluation. A fixed evaluation design therefore required the identification of outcome variables and suitable methods prior to data collection based upon a thorough analysis of the literature.

Within *Section 2, Literature Review,* methodologies evaluating Lego® Therapy have been reviewed and critiqued for their lack of application to the real world context and for their use of group designs, which may ignore the individual differences between participants that could influence the effects of the intervention (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008 & Andras, 2012). The current research aimed to address this by placing itself in the real world context in order to add to the evidence based practice which is being advocated as essential to the EP role (Fox, 2002; Stobier

& Waas, 2002). Within the hierarchy of the quality of evidence, randomised control trials are supported greatly, although Frederickson (2002) negates their applicability to 'Does it work?' questions inherent in evaluation studies for certain populations. An alternative to RCT's that allow for individual differences but maintains scientific rigour, adhering to flexible and outcome research designs, are SCEDs. Horner, Carr, Halle, McGee, Odom, and Wolery (2005) support the use of this design in investigating the effectiveness of an intervention, and will now be discussed in detail.

3.5.4. Single Case Experimental Design (SCED)

Single-subject research derived from the work of Skinner (1974) and is seen as "a rigorous, scientific methodology used to define basic principles of behaviour and establish evidence-based practices" (Horner et al 2005, pg. 165). The push for experimental control and scientific rigour within SCED's arguably gives more weight to the approach than traditional case studies (Horner et al, 2005). Shavelson and Towne (2002) equate it to RCT designs for its ability to establish evidence-based practice, but at the individual level. Reason and Morfidi (2001) further highlight that the purpose of SCEDs is to establish if an intervention is effective for an individual. It aims to explore interventions at an individual level due to the criticisms of traditional group designs in that they may not take into account important factors that may impact on the success of an intervention and their appropriateness for heterogeneous populations (Winter, 1997).
SCEDs aim to develop "meaningful, reliable data at the level of the individual" (Robson, 2011, pg. 118) and aim to establish causal relationships between dependent and independent variables through using repeated measures over time and across phases (Kazdin, 2003). The participant is therefore seen as their own 'control' whilst their behaviour (dependent variable) is repeatedly measured throughout the process and the independent variable is manipulated across phases (baseline to intervention) (Kratochwill et al, 2010). Key characteristics of SCEDs support inferences to be made as to the effects of an intervention, these are shown in Table 6.

Characteristic	Definition	Purpose
Continuous assessment	Observation on multiple occasions over time prior to and during the period in which the intervention is administered	To provide continuous data to support decisions as to whether an intervention is effective (i.e. when a change is seen between phases) & when to change phases in the design
Baseline assessment	Assessment for a period of time prior to implementation of the intervention	To describe current performance and to predict what performance is likely in the immediate future
Stability of performance	Stable performance is one in which there is relatively little variability over time	To permit projections of performance to the immediate future and to evaluate the impact of a subsequent intervention. Highly variable performance (large fluctuations) and a trend (slope) during baseline that is in the same direction as one hopes for with the intervention can interfere with the evaluation
Use of different phases	Phases are periods of time (several days weeks) in which a particular condition (baseline or intervention) is implemented and data is collected	To test whether performance continued in the predicted pattern from a prior phase or changed as the intervention or other conditions were altered. Inferences about the effects are drawn from the pattern of the data across phases

Table 6: Key characteristics of single-case experimental design (adapted from Kazdin, 2003)

Kratochwill et al (2010) highlight that there are many variations of SCEDs. The selection of the specific SCED is said to be informed by the research question(s) and objectives(s) whilst also being aware of aspects of the independent variable, the participant(s) setting(s) and dependent variables being explored. The variations within SCEDs impacts on their internal validity and their ability to establish a causal relationship. SCED variations include;

AB design

In AB designs repeated measurement of the target behaviour are taken throughout the baseline (A) and intervention (B) phases of experimentation. This has been celebrated for its ability to show stability within the baseline phase, through its repeated assessment of the DV, as opposed to standard pre and post measures. Thus enabling

some attribution of change within the B phase to the intervention (Barlow, Nock & Hersen, 2009). However, it is also argued that this attribution must be "with some major reservations" (Barlow et al 2009, pg. 137). These reservations included, that it relies heavily on generating an accurate forecast (measure) of the behaviour within phase A and any changes in the B phase may have occurred as a natural course of the behaviour anyway (Risley & Wolf, 1972).

ABA/ABAB design

In ABA/ABAB design a treatment variable is introduced and then withdrawn (ABA), with a possible reintroduction later (ABAB). This aims to increase the reliability and validity of any causal relationship seen between the variables (Barlow et al, 2009). Unless the dependent variable was to naturally fluctuate in similar trends it is "most probable that observed changes would be due to any influence other than the treatment variable that is systematically changed" (Barlow et al, 2009, pg. 145). Barlow et al (2009) add that replicating this design within different subjects would strengthen any relationship seen in terms of the power and controlling forces of the intervention. The main critique of this approach comes from an ethical standpoint, in that it leads to the removal of a potentially effective intervention (Barlow & Hersen, 1973).

Multiple baseline design

Multiple baseline design introduces the intervention at different points in time (whilst the baseline measures are taken), either across subjects or behaviours, aiming to demonstrate the causal relationship between variables (Kazdin, 2003). This takes away the ethical dilemma in ABA/ABAB designs, however has practical implications for the research process, such as requiring time to stagger the intervention implementation (Kazdin, 2003).

3.5.5. The rationale for the design used in this study

Single case experimental designs (SCED) were selected for this study, due to it being relevant for evaluating educational practices at an individual level (Horner et al, 2005). Exploration of Lego® Therapy at an individual level was required due to limitations of past research and the heterogeneous population involved in the intervention, as discussed in *2.7 Introduction to this study*. The use of the participants as their own control through the collection of baseline data and repeated measures throughout the intervention supports valid data and inferences to be made as to its impact (Kazdin,

2003; Neuman & McCormick, 1995). This adds scientific rigour to the approach, as opposed to case studies that provide insight by describing phenomena (Neuman & McCormick, 1995). However, the focus at an individual level leads to criticisms of the generality of its findings (Barlow et al, 2009). This will be discussed further in *Section 3.7 Issue of data quality: Validity & Reliability.*

The ABA SCED design was chosen for this study. Although this approach has been somewhat critcised from an ethical standpoint (Robson, 2011), removing a potentially effective intervention, the researcher believes this can be justified as Lego® Therapy is intended to be a short-term intensive intervention. Also, the researcher intended to ensure that the intervention could be available to the participants on completion of the study, allowing any child to continue to access it if it was shown to be beneficial. This was deemed more appropriate than other designs, such as the traditional AB design. Although an AB design would reduce the ethical dilemma of removing a potentially effective intervention, it is difficult to draw conclusions that changes are entirely due to the intervention and not other coincidental factors (Robson, 2011). Multiple-baseline designs across participants reduces the confounding variables associated with AB designs and removes the ethical issues involved with ABA designs (Robson, 2011), however, due to the researchers real world time restrictions this option was ruled out.

3.5.6. Application of the design in this study

3.5.6.1. ABA Design

Kratochwill et al (2010) outlined design standards that are intended to guide researcher's application of SCEDs. This process is depicted in Figure 4. How this study met the design standards will be discussed. The 'Criteria for Demonstrating Evidence of Relation between an IV & DV' through visual analysis will be discussed further in *Section 4, Results*.

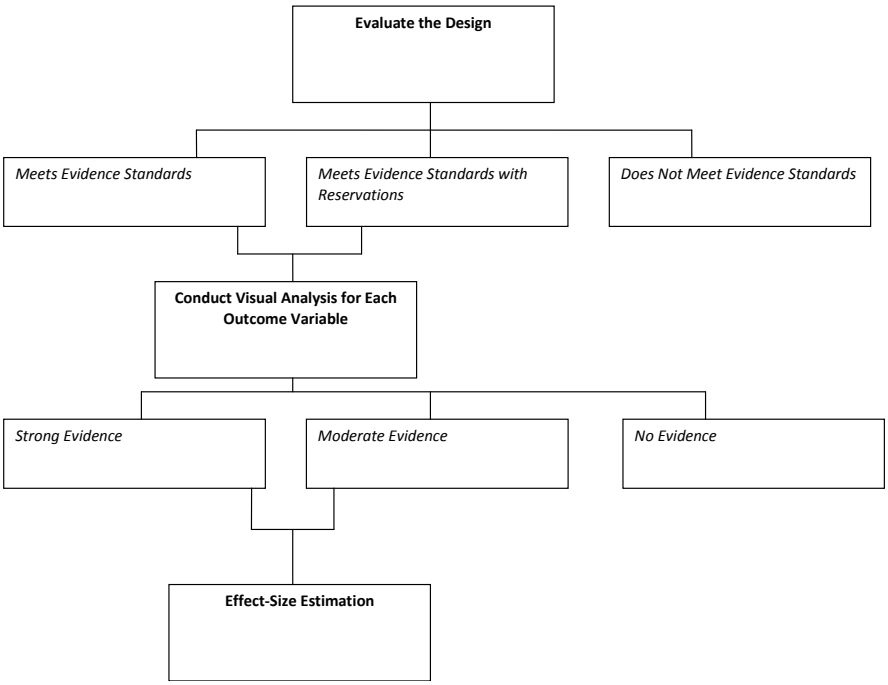


Figure 4: Procedure for applying SCED standards: first evaluate design, then if applicable evaluate evidence (Kratochwill et al, 2010)

The criteria for designs that 'meet evidence standards' developed by Kratochwill et al (2010) includes that

- the IV is systematically manipulated, in that the researcher determines when and how conditions change.
- the study includes at least three attempts to demonstrate an intervention effect at three different points in time or with three different phase repetitions.
- a phase must have a minimum of three data points.

How this study attempts to adhere to these standards will be discussed below.

The length of phase A (baseline)

When planning phase A the researcher was aware of the importance of gathering at least three data points, ensuring measures were stable, and from an ethical standpoint, ensuring the baseline was not longer than necessary (Barlow & Hersen, 1984). Practical restrictions, in terms of the researcher's timescale and length of the school terms were also considered. With this is mind baseline data was collected for three weeks (for five cases) or four weeks (for one case).

The length of phase B (intervention)

When planning phase B the researcher was aware of previous evaluations of the Lego® Therapy intervention, as well as the school's feasibility of implementation and the researcher's time scale. Within previous clinical trials treatment time ranged from 18 weeks to 36 months (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008) and a previous school-based evaluation was for 10 weeks (Andras, 2012). However, in practical discussions with schools regarding the intervention length it was agreed that a six week intervention period of Lego® Therapy would be possible due to staffing commitments and school holidays. This may limit the overall impact the Lego® Therapy could have for the participants, which will be considered in *Section 5 Discussion*, however fitted with the realistic demands upon schools.

The length of phase A (return to baseline)

When planning phase A (return to baseline) the researcher was aware of the importance of gathering at least three data points. With this is mind return to baseline data was collected for three weeks (for three cases) and four weeks (for three cases).

3.5.6.2. Additional triangulation data

In addition to the SCED repeated measures, which were taken within phase A, B and return to phase A, further measures were taken to triangulate this data and gain views of other stakeholders, including parents and teachers, on the participants social communication. The researcher recognises the potential threats to validity and reliability of measures that are taken 'pre' (before the intervention) 'post' (after the intervention' and 'delayed post' (one month after the intervention). These threats will be discussed in *Section 3.7 Issue of data quality: Validity & Reliability* (Kazdin, 2003). The data collected at the three points in time, therefore, only aimed to provide further information in respect to any changes shown within the repeated measures.

3.5.7. Stakeholders

In planning the research, the following stakeholders were considered:

- The University of Nottingham.
- The Educational and Child Psychology Service (ECPS) in which the researcher was placed on a bursary contract at the time of the study.
- The Quality and Assurance Teaching Service which developed the intervention

within the researcher's local authority.

- The schools that participated in the study.
- The researcher – a trainee EP on placement and doctoral student.
- The developer of the Lego® Therapy intervention, Daniel LeGoff.
- The wider community of educational and psychological research.

During the planning phase of the research, careful discussion with the University of Nottingham and the researcher's Psychology Service were made to ensure that the research met expectations set out by both parties.

Stakeholder requirements: The University of Nottingham

The University of Nottingham's training has focused upon evaluations of interventions to support the need for evidence-based practice in education. It has historically participated in The Development and Research Collaborative Programme in Educational Psychology that required thesis studies to take the form of intervention-based research that focused on outcomes for young people. This is not a necessity for research now but has been used to inform the basis of this study.

Stakeholder requirements: The local authority

The ECPS were keen for the researcher to complete a piece of work that was relevant to the service. The researcher's local authority became an active part of a national scheme derived by the Autism Education Trust to implement the National Autism Standards (AET, 2012a) across schools. This aims to ensure "that all children and young people with autism should receive an education which enables them to reach their individual potential to engage in society as active citizens (and that individuals, families and professionals are informed, supported and equipped to enable this to be achieved)" (AET, 2012b). As part of this the social communication intervention, Lego® Therapy, was beginning to be advocated by the Quality and Effectiveness Support Team (QEST) within the authority. Many primary schools within the authority were beginning to be trained and implemented the approach with their pupils. To help ensure the researcher's ECPS were promoting evidence-based interventions this research was felt relevant to the service and local authority development.

Stakeholder requirements: Daniel LeGoff, Lego® Therapy developer

Daniel LeGoff created the intervention Lego® Therapy in 2004 and since it's development had been building research into its effectiveness (as discussed in *Section 2.6. Lego® Therapy and current evidence base*). It was therefore felt appropriate to inform LeGoff of the intended research, so that he was aware of the researcher's intentions and for the researcher to ensure they had all the up-to-date information on the intervention and previous research.

Stakeholders and time scale

The time frame for the research was determined by the researcher working to complete a doctorate over three years. The research was undertaken during the second and third year of study while the researcher was working for a local authority as a trainee EP. In discussion with staff at the Psychology Service, it was agreed that the data collection would be completed during the summer term of the researcher's second year of study. Due to one of the school's requirements, to be discussed later, data collection for one of the schools was completed during the winter term.

3.6. Specific Methods used

The next section will outline the specific methods and measures used in this study whilst also considering the validity and reliability of the research and potential ethical issues.

3.6.1. Selection of Schools and Participants

Schools

Schools were selected and approached following consultation with EP's within the researchers ECPS. It was decided that three primary schools known to the researcher would be asked whether they would wish to be a part of the research, through a letter (see Appendix IV) and follow up phone call. Two of the schools agreed to take part in the research project. A further school, selected opportunistically by another EP within the researchers ECPS, was then asked to volunteer and agreed to take part.

Pupils

A purposive sampling approach was used in which participants were identified and selected in order to satisfy the specific needs of the study (Robson, 2011). The purpose of the research was not to make generalisations but to investigate the interaction between the intervention under investigation and the unique characteristics of the participants being studied.

The participants were identified by the school Special Educational Needs Co-ordinator (SENCo) who had been given specific criteria for inclusion. The criteria were based on identified criteria developed in previous evaluation research of Lego® Therapy (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008 & Andras, 2012).

Criteria for inclusion in this study were that the pupil must;

- Be a primary-aged child in full time mainstream education.
- Have social communication difficulties as a primary need, which may or may not include a diagnosis of ASD.
- Not be receiving other additional interventions focusing on social communication needs at the time of the study.
- Have an interest in using or playing with Lego®.

An additional criteria for inclusion within this study was that the participant was able to participate in the intervention and staff were able to conduct weekly measures. If the

participant was unable to participate in the majority of the intervention or weekly measures they would be excluded from the study. A total of 9 children were identified across the schools, four in Key Stage 1 and five in Key Stage 2.

Informed parental consent was sought through sending a letter (Appendix V) detailing the research and outline of what the Lego® Therapy sessions would entail. The children's consent to participate was then sought. A set paragraph was read to each child by the school SENCo. The research activities were explained and they were asked if they were happy to take part. At this stage, they were also informed that if for any reason they changed their mind and decided they did not want to take part, they could ask to stop at any point and this would not be a problem. The SENCo ticked and dated to indicate the child agreed, and the children were asked to write their name on the paper (see Appendix VI). All children completed the consent letter.

Description of schools

All the primary schools were based within a large borough on the outskirts of a large city in the North West of England.

School 1: a large primary school (274 pupils) within the centre of the town. This area experiences significant high levels of socio-economic disadvantage. A majority of pupils were from minority ethnic groups, with many speaking English as an additional language and with multiple home languages spoken.

School 2: a large primary (290 pupils) on the outskirts of the borough. This area experiences moderate social-economic levels. A majority of pupils were from White British backgrounds with English as a first language.

School 3: an average sized primary (195 pupils) towards the adjacent city. This area experiences significant high levels of socio-economic disadvantage. A majority of pupils were from White British backgrounds with English as a first language.

Description of participants

The participants were nine pupils (three from each school) ranging from Year one to Year five, three from each school. There were seven boys and two girls, three pupils from Asian origin and six pupils from White British. All spoke English as their first

language although three spoke additional languages at home. All participants were selected by the school SENCo using the guidance above to support them in identifying pupils with difficulties in social communication and as being likely to benefit from participating in Lego® Therapy. More details of the participants are included in their individual case studies in *Section 4: Results.* Table 7 shows a summary of key participant information. Pseudonyms have been given to maintain the participants anonymity.

School	Child	Gender	Year group	Ethnicity	Age (at start of baseline phase)	SENCo reported social communication difficulties	ASD diagnosis
1	**1 – Ali**	M	2	British Asian	7:6	✓	ASD tendencies
	2 – Faisal	M	2	British Asian	7:4	✓	ASD tendencies
	3 – Taimoor	M	2	British Asian	6:10	✓	ASD tendencies
2	**4 - Chloe**	F	4	White British	8:11	✓	✗
	5 - William	M	4	White British	8:6	✓	✗
	6 - James	M	4	White British	8:4	✓	✗
3	**7 - Mark**	M	1	White British	6:5	✓	✓
	8 – Tom	M	3	White British	7:10	✓	✗
	9 - Carly	F	5	White British	10:6	✓	✗

Table 7: Key participant information

Three out of the nine participants, detailed above (School 3; Participants 7, 8 & 9), were excluded from analysis in this study, as their data did not meet the criteria for inclusion set. This included limitations in the quality and quantity of the weekly measures.

3.6.2. Intervention

Lego® Therapy is a small-group social development programme designed predominantly for children with ASD (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008 & Andras, 2012). The Lego® Therapy intervention consists of weekly thirty-minute sessions in which groups of three children are supported to develop a 'Lego® Club' in which they collaboratively build Lego® sets. A Lego® Club name is developed, along with agreed rules to help them build the sets. Each child is given a role of 'Engineer' who reads the instructions, 'Supplier' who gathers the bricks or 'Builder' who builds the model. Sessions are facilitated by a trained Teaching Assistant (TA, see Appendix VII for Training Slides) who supports the group to take ownership of the builds, develop their own rules and language to describe the Lego® pieces. There are three levels of Lego® Therapy, Level 2 (collaborative building) was used within the selected groups. The TA was trained by the researcher who had been on official training ran by the QEST who had developed the Autism Standards within the local authority (AET, 2012a).

3.6.3. Procedure

Initial phase

In the initial phase of the research the researcher spent time in discussions with potential stakeholders within the local authority whom she was on placement with. These included the Lead Psychologist, ECPS, QEST and members of the Autism Education Trust. Once the focus of the research upon Lego® Therapy was established the researcher observed different sessions of Lego® Therapy within known primary schools in the area to gather practical understanding of the application of the approach. The researcher was also trained in the approach by the QEST who had developed a training package based on the Autism Education Trust training of Lego® Therapy.

Following this the researcher spent time engaging with potential stakeholders, the schools, from which participants were selected and consent gained, as discussed in section *3.6.1 Selection of School and Participants.*

In order to measure the dependent variable of social confidence and independence of the participants video observations were gathered (discussed further in *Section 3.6.4 Measures*). Consent was gained for the participants and facilitating staff to be filmed within the parent, child and school consent letters (se Appendix V, VI, IV). Additional

consent was also gained at this stage, where required, for incidental filming of pupils and staff within the classroom at the time of filming. Consent for incidental filming was required from an ethical perspective, due to observations being filmed within the participant's classroom, therefore potentially leading to incidental filming of other pupils and staff within the classroom. This was detailed within a consent letter for parents of pupils (Appendix VIII) and teaching staff (Appendix IX) in the same classes as the participants.

Once all the consent was gathered the researcher trained the School SENCo and a TA in the use of the questionnaires and video observations (repeated measures). Due to staffing availability within School 1 and 3 the TA's conducted the repeated measures, whilst in School 2 the researcher conducted the repeated measures.

A customisation period for the filming then occurred at various times over two weeks, in which the TA/researcher spent time in the participants' classrooms holding the iPad used to take the video observations. This aimed to reduce any impact being filmed might have on the children's naturalistic behaviour.

Baseline phase (two - three weeks)

To begin this phase each school's SENCo conducted the pre-test measures with the participants, class teachers and parents. Following this the trained TA/researcher filmed the weekly video observations using an iPad within the participants classroom for approximately three weeks (>3 data points) or until a stable baseline of amount of social communication attempts were found.

During this collection of baseline data the school SENCo and the TA were trained in the Lego® Therapy intervention (see Appendix VII for training slides) for each school.

Intervention phase (six to eight weeks)

During this phase the video observations continued to be gathered and the weekly thirty minute Lego® Therapy intervention was introduced. This continued for a minimum of six weeks in order to fit within a normal school half-term length.

The professional role of the facilitator of the intervention varied in each school as follows;

- School 1: TA
- School 2: SENCo

- School 3: Two TA's

None of the facilitators had previously conducted Lego® Therapy interventions.

The SENCo then employed the questionnaires (post-test measures) with the participants, class teachers and parents.

Return to baseline phase (four weeks)

During the return to baseline phase the intervention was removed and the classroom observations (repeated measures) continued to be taken by the TA/researcher. After the return to baseline phase the SENCo conducted the questionnaires (delayed post-tests) with the participants, parents and teacher.

Final phase

The researcher closed the sessions with the TA and participants by thanking them for their time and commitment to the project and by presenting the participant with a reward certificate. Debrief procedures then took place with staff/parents (Appendix X).

A summary of the overall procedure can be found in Figure 5 below and specific details of the procedure (dates & time frames) for each participant is described in Figure 6 below.

Initial Phase	Baseline Phase	Intervention Phase	Return to Baseline Phase	Final Phase
	3 weeks	6 weeks	4 weeks	
• Discussion with stakeholders (ECPS, QEST, University) • Researcher training in Lego® Therapy by QEST • Discussion with schools. School consent obtained • Identification of participants • Parent/child informed consent gained • Additional consent for incidental filming of staff & pupils gathered • Measures training for SENCo & TA • Customisation period for Ipad in the classroom	• SENCo conducted pre-test measures with participants, class teachers and parents • Weekly repeated measures taken • Researcher trained SENCo & TA in the Lego® Therapy intervention	• Weekly repeated measures continued • Weekly thirty minute Lego® Therapy sessions began • SENCo conducted post-test measures with participants, class teachers and parents after the final intervetnion session	• Intervention removed • Weekly repeated measures continued • SENCo conducted delayed post-test measures with participants, class teachers and parents after the final film was made	• Sessions closed, presentation of child certificate • Debrief procedures with staff and parents conducted

Figure 5: Summary of the procedure within this study

Participant	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	14/05/2013 Guided Read Book Discuss	21/05/2013 Numeracy Discussion	04/06/2013 Literacy Discussion	11/06/2013 Guided Read Book Discuss	18/06/2013 Topic Story Writing	25/06/2013 Topic Building	02/07/2013 Literacy Guided Read	09/07/2013 Numeracy Dominoes	16/07/2013 Literacy Phonics	Summer Holidays	03/09/2013 Numeracy Graphing	10/09/2013 Numeracy Counting	17/09/2013 Topic Building	
2	14/05/2013 Guided Read Book Discuss	21/05/2013 Numeracy Discussion	04/06/2013 Literacy Discussion	11/06/2013 Guided Read Book Discuss	18/06/2013 Topic Story Writing	25/06/2013 Topic Building	02/07/2013 Literacy Guided Read	09/07/2013 Numeracy Dominoes	16/07/2013 Literacy Phonics	Summer Holidays	03/09/2013 Numeracy Graphing	10/09/2013 Numeracy Counting	17/09/2013 Topic Building	
3	14/05/2013 Guided Read Book Discuss	21/05/2013 Numeracy Discussion	04/06/2013 Literacy Discussion	11/06/2013 Guided Read Book Discuss	18/06/2013 Topic Story Writing	25/06/2013 Topic Building	02/07/2013 Literacy Guided Read	09/07/2013 Numeracy Dominoes	16/07/2013 Literacy Phonics	Summer Holidays	03/09/2013 Numeracy Graphing	10/09/2013 Numeracy Counting	17/09/2013 Topic Building	
4	26/09/2013 History Letter discuss	04/10/2013 Literacy Comprehens	10/10/2013 Science Discussion	05/11/2013 RE Discussion	12/11/2013 RE Discussion	19/11/2013 English Discussion	26/11/2013 Science Discussion	05/12/2013 Geography Discussion	11/12/2013 Liteacy Discussion	17/12/2013 Science Disucssion	09/01/2014 Literacy Discussion	16/01/2014 Literacy Discussion	30/01/2014 RE Discussion	07/02/2014 Literacy Discussion
5	26/09/2013 History Letter discuss	04/10/2013 Literacy Comprehens	10/10/2013 Science Discussion	05/11/2013 RE Discussion	12/11/2013 RE Discussion	19/11/2013 English Discussion	26/11/2013 Science Discussion	05/12/2013 Geography Discussion	11/12/2013 Liteacy Discussion	17/12/2013 Science Disucssion	09/01/2013 Literacy Discussion	16/01/2013 Literacy Discussion	30/01/2014 RE Discussion	07/02/2014 Literacy Discussion
6	26/09/2013 music Designing sol	04/10/2013 Golden Time Building	10/10/2013 Art Info gatherin	No Intervent No Measure Illness	14/11/2013 Literacy Spellings	21/11/2013 IPC Info gatherin	28/11/2013 Literacy Spellings	05/12/2013 Literacy Spellings	12/12/2013 Geography Info gatherin	17/12/2013 Numeracy Probem Solv	09/01/2014 Music Discussion	16/01/2013 Literacy Discussion	30/01/2014 Literacy Disucssion	07/02/2014 Literacy Discussion

Figure 6: Summary of procedure per participant

Key:
Baseline
Intervention
Return to Baseline

3.6.4. Measures

Measures were required which tapped into the research questions that were drawn from the literature, see *Section 2.7.2 Research Questions.* These research questions informed the epistemological stance undertaken, which in turn informed the overall design and selection of multiple ABA SCEDs.

Within this section the independent and dependent variables derived from the research questions will firstly be outlined. This will be followed by detail of each measure associated with the specific DV being assessed, including rationale for their use, reliability and validity. It will also discuss the piloting phase that was undertaken prior to the baseline data collection in which the observation schedules were adapted. The procedures undertaken by the researcher to ensure measures were correctly and reliably implemented will then be discussed.

3.6.4.1. Study variables

For this study the independent variable was the Lego® Therapy intervention. The dependent variables (DV) were:

- **DV 1:** The social confidence and independence of the focus children
- **DV 2:** The maintenance of the social confidence and independence of the focus child after the intervention ends
- **DV 3:** The perceived generalisation (by parent & teachers) of the social confidence and independence of the focus child into home and schools settings
- **DV 4:** The focus child's sense of school belonging

3.6.4.2. Measuring dependent variable 1 & 2: Social communication observations (repeated measures)

Horner et al (2005) highlight that DV's within SCEDs are often observable behaviours that can be operationally defined, measured repeatedly and assessed for consistency (gaining inter-observer agreement). This enhances the reliability and validity of the measure. Observations have been triumphed for their directness and ability to "get at 'real life' in the real world" (Robson, 2011, pg. 316).

Robson (2011), however, adds that they do come with some criticisms including the potential for reactivity (the impact of an observer onto the situation under observation) and observational biases including;

- *selective attention* – the impact of the observer's interests, experience and expectations on what is attended to.
- *selective encoding* – the impact of expectations upon what is observed and how this is interpreted and encoded.
- *selective memory* – the impact of time between observation and encoding upon the accuracy and completeness of the observation.

To reduce the impact of these criticisms the current study followed similar procedures based on Thunberg et al 's (2007) study that explored activity based communication for children with autism. This was by following the set procedures for coding of the observations, as discussed in the following section *Observation coding and piloting* and detailed in Appendix XII.

Within the present study the participants were filmed on a weekly basis (using an Ipad) for ten minutes, whilst they were engaged in a group-based activity (involving 2/3 children) within their natural classrooms/groups. The recordings were made by either a trained TA or the researcher, depending upon the school's capacity. The observations aimed to be as naturalistic as possible and were taken within the participants' classrooms during a natural group task that the class were engaged in. Before the measure began, a customisation period was used, in which the TA or researcher spent time within the participants' classrooms with the Ipad. This aimed to reduce the potential for reactivity to occur when the measures were introduced.

The weekly measures were taken throughout each of the Baseline, Intervention and Return to Baseline phase. This therefore enabled measurement of DV 1, as well as DV 2, once the intervention was removed and any maintenance of skill could be explored within the Return to Baseline phase. Observation logs were made which detailed the lesson, activity engaged in and any extraneous variables (illness etc) that might have impacted upon the participant's engagement in the task (see Appendix XI).

Observation coding and piloting

Within Thunberg et al's (2007) study they piloted Romski & Sevcik's (1996) Communication Coding Scheme and produced an expanded coding scheme and a detailed manual with operational definitions. Within this the coder watched every observation in its entirety and then looked at each participant's contribution and coded this within the dimensions of role in turn-taking, mode, communicative function, and effectiveness (ability to make oneself understood). To ensure this measure was appropriate within school based contexts and for the population used within the present study the adapted coding scheme developed by Thunberg et al (2007) was piloted. The pilot was not only to check the reliability and validity of the observational measures but also to evaluate any practical issues that might occur.

The pilot took place in a different school away from those involved in the main study. The measure was piloted on a Year 5 pupil with a formal diagnosis of autism and who had particular difficulties with social communication. The pilot school already ran a Lego® Therapy club that this pupil accessed. Consent was obtained prior to the pilot from the participant, parents and all parents of the children within the classroom for incidental filming of peers. Within the pilot, classroom based video observations were taken by the participant's allocated TA and analysed using Thunberg et al's (2007) coding system. Based upon this pilot a number of adaptations were made to ensure it was suitable for the population of the study. This included the removal of some of the codes due to them not meeting the needs of the target population. For example, the use of Speech-Generating Devices and Physical Manipulation. A full list of the original and revised coding scheme used within this study can be found in Appendix XII. For further discussion of this measures validity and reliability see *Section 3.7.4.1. Validity & Reliability of structured observation*.

To increase the validity and reliability of the repeated measures, triangulated data was sought. This strategy has been supported by Robson (2011), although Kazdin (2003) warns that data collected at single points within SCEDs (pre, post & delayed) have numerous threats to their validity and reliability and require careful reporting. The measures selected aimed to explore parent and teacher perceptions of the participant's social communication.

3.6.4.3. Measuring dependent variable 3: The Social Competence Inventory (SCI, Rydell et al, 1997) (pre, post, delayed)

The SCI measure was used with both parents and teachers of all the participants as a pre, post and delayed-post test. This enabled understanding of the parent and teacher perceptions of the participant's social communication skills, before and after the intervention. This gave some understanding of the participant's social communication both within the school and home setting and therefore allowed for some understanding of any effects of the interventions generalisation across these settings.

The SCI is a paper and pencil questionnaire designed to be completed by a parent or adult who knows the child well in a classroom or a group situation. It is intended for children between 5 and 11 years of age (see Appendix XIII). It consists of 25 items, exploring the perceived quality of the child's social interactions with both peers and adults. Each statement, such as "Is withdrawn with peers", is rated on a scale from (1) Does not apply, to (5) Applies very well. Each item is allocated a score of 1 (indicating a weak presence of socially competent behaviour) and 5 (indicating a strong presence of socially competent behaviour). Items 3, 5, 6, 8, 10 and 22 are reversed.

The scale has two subscales, Pro-social Orientation (co-operative behaviours, such as empathy, helpfulness and handling conflict) and Social Initiative (behaviours that indicate a willingness and ability to participate, such as suggesting activities and being a leader in play). This scale has been standardized for children aged 9-10 in the USA, with a higher score indicating more social initiative. The authors have established test-retest reliability, validity including inter-rater agreement and it has a Chronbach's alpha of 0.91 and 0.94, which suggest the scale has a high degree of internal consistency.

3.6.4.4. Measuring dependent variable 4: The Belonging Scale (Goodenow, 1993, adapted by Frederickson, Simmonds, Evans, & Soulsby, 2007) (pre, post, delayed)

In order to explore any impact Lego® Therapy could have had on the participant's sense of school belonging, a pre-, post- and delayed-post test measure was employed. The Belonging Scale is an adapted version of the Psychological Sense of School Membership Scale and is designed for use with children as young as 8 years of age,

including those with special educational needs (Frederickson et al, 2007) (see Appendix XIV).

It assesses children's sense of belonging in terms of if they feel accepted, included, respected and supported within school. It is a self-rated scale of 12 items. Children are asked to rate statements such as 'I feel really happy at my school' on a three-point scale: (1) 'No not true', (2) 'Not sure' and (3)' Yes true'. Each item is scored, with a higher score indicating a more positive view of social inclusion. Some items (3, 5, 8, 9 & 10) have been phrased so that disagreement, and hence a low item score indicates a stronger sense of belonging. These items are reversed. A number of positive tests for reliability and validity have been carried, including high internal consistency reliability (Chronbach Alpha of .87).

These measures were taken by the School SENCo in each participant's school, following the instructions written within the questionnaire. The SENCo read the items to each child and was asked to check the child's understanding (by using the example in the questionnaire) prior to the child's completion of the questionnaire. The SENCo recorded the child's responses.

3.6.5. Intervention and measure integrity & fidelity

Intervention integrity

Dane and Schneider (1998) propose that program integrity (the degree to which specified procedures within an intervention are implemented) is an integral part of any evaluation research. Without this, they add, any attributions of the IV's impact upon the measured DV's will be weakened.

Within their research, Dane and Schneider (1998) highlight ways that studies can promote integrity of a program or intervention. These included:

- following a training manual
- supervision and training of the implementer
- a systematic documentation of the program integrity
- documentation of participant dosage (i.e. attendance at sessions)
- dosage data used to determine subject eligibility for outcome analyses

The present study aimed to follow these guidelines to enhance the programme integrity and ability to attribute changes in the DV's to the IV. LeGoff et al (2014, in press) are due to publish an official training manual of Lego® Therapy in July 2014. Detail of the intervention procedure and training used within this study can be seen in *Section 3.6.2. Intervention.* In addition, a session log was kept which detailed the participant's attendance, length of session, content (i.e. Lego® model built) and any extraneous variables that might impact upon the participant's engagement within the session (i.e. illness) (see Appendix XV).

The training and session logs helped the researcher to monitor and evaluate specific aspects of the program integrity, as outlined by Dane and Schneider (1998). This included:

- *Participant exposure*: the number, length and frequency with which the program was implemented
- *Participant responsiveness*: indicators of the participant's involvement and enthusiasm in the session

Further procedures were used, including the researcher attending the initial 'set up' Lego® Therapy session and at least every other session to observe treatment fidelity and evaluate the session using a checklist based on the Lego® Therapy training (see Appendix XVI). These procedures aimed to check further aspects of program integrity outlined by Dane and Schneider (1998) including:

- *Adherence*: the extent to which specified program components were delivered as shown in the intervention training
- *Quality of delivery*: additional factors to the delivery, including implementer enthusiasm, preparedness and attitudes toward program

These treatment fidelity checks showed that the intervention was followed as detailed within *Section 3.6.2. Intervention* on every occasion.

Measure integrity

In order to enhance the integrity of the measures used, where possible, the repeated measures were conducted at the same time each week. The measures were taken by a designated person within each school (TA/researcher) to support the consistency of the

procedure. The school SENCo in each school implemented the pre, post and delayed measures with the teachers, participants and parents to support the consistency of the procedure used. Specific detail of the measures integrity will be detailed within *Section 3.7 Issue of data quality: Validity & Reliability.*

3.7. Issues of data quality: validity and reliability

3.7.1. Validity and reliability definitions

A study is said to be valid depending on "whether the findings are 'really' about what they appear to be about" (Robson, 2011, pg. 77). Whether a study is also deemed as reliable is dependent upon the consistency and stability of a measure (Robson, 2011). Eliminating all possible threats to the validity and reliability of research is not possible, however, it is necessary to be aware of them to ensure the research is worthwhile and its limitations are understood (Cohen et al, 2011).

Horner et al (2005) described the defining features of SCEDs in relation to validity and reliability. These quality indicators of SCEDs and how the present research aimed to meet them are detailed in Table 8 below.

Reliability (R)/Validity (V)	**Quality indicator:**	**How this research aimed to meet them:**
R	**Description of Participants and Settings**	Description provided of the participants, setting and selection process to ensure precise replication could occur.
V	**Dependent Variable (DV)**	DV defined, measured with replicable precision and were socially significant for the participant.
V	**Independent Variable (IV)**	IV defined to allow valid interpretation of results and accurate replication of procedures.
R	**Baseline**	Baseline phase involved repeated measurement of the DV until a stable pattern of responding was established. Description provided to enable replication.
V	**Experimental Control/Internal Validity**	Design aimed to demonstrate experimental effect at different points in time (Baseline/Intervention/Return to Baseline).
V	**External Validity**	Weakness of study, this would be strengthened if findings were replicated across participants employing multiple-baselines. To be discussed below.
V	**Social Validity**	The DV and magnitude of change was socially important, due to the need for evidence based practice and increase of Lego® Therapy's implementation within the authority due to it being a part of the national Autism Standards.

		The study's social validity is made higher due to the implementation of IV being deemed as practical and cost effective.

Table 8: How the study meets the quality indicators for SCEDs (Horner et al, 2005)

As highlighted in Table 8 there are various types of validity. The study's internal and external validity will be discussed in more depth.

3.7.2. Internal validity

Internal validity refers to confidence in the causal relationship between variables. Key threats to this study's internal validity (Cook & Campbell, 1979, Cohen et al, 2011) and how this research attempted to control them will be discussed.

History

Changes within the participant's environment not related to the enquiry

To reduce this threat, as part of the criteria for inclusion, participants were requested to not be receiving any other intervention focusing upon social communication skills before or during the study period. Due to the ABA design of the study it is not possible to control all aspects of this threat, and therefore must be considered as a limitation within the discussion of results. Observation and session record logs (see Appendix XI, XV) were kept in order to ensure the researcher was aware of any major events that may impact on the participants.

Testing

Changes occurring as a result of practice or experience on pre-tests

Prior to any measurement being conducted a customisation period of the TA/researcher filming within the participant's classroom occurred. This aimed to reduce any impact being filmed might have on the children's naturalistic behaviour. Pre, post and delayed measures support the triangulation of the data, which should reduce this threat to validity.

Instrumentation

Changes to aspects of the way participants are measured between pre- and post- tests

All the measures were conducted by the same designated person (TA/researcher) within each setting to reduce this threat. The TA's were trained by the researcher in the

implementation of the repeated measures (filming). Measure logs were also obtained in order to monitor the frequency and integrity of this measure (see Appendix XI). The pre/post measures came with explicit instructions on how to deliver them (see Appendix XIII, XIV), this aimed to ensure consistency in measurement for each participant.

Maturation

Changes due to growth, change or development in participant unrelated to the IV

This risk was minimised due to the study taking place over a relatively short period of time (thirteen weeks, excluding holidays). This threat was also somewhat minimised due to the study involving multiples cases and gathering stable baselines before the intervention was introduced. This threat cannot be completely eliminated and so will be considered as a limitation within the discussion

Statistical regression

Extreme scores at pre-test likely to regress towards the mean at subsequent testing

Threat to validity of repeated measures reduced due to multiple measures over time (gathering a stable baseline pre intervention). This threat remains to pre, post and delayed measures but this data is subsidiary to the study.

Hawthorn effect

Participant's behaviour changing due to participation in an intervention

To reduce this effect prior to any measurement being conducted a customisation period of the TA/researcher filming within the participant's classroom occurred, over. This aimed to reduce any impact being filmed might have on the children's naturalistic behaviour. However, due to blinding of the participants being unable, due to ethical grounds (to be discussed) this threat remains and will be a limitation to be discussed.

3.7.3. External validity/generalisability

Generalisability (or external validity) refers to the extent to which the findings of the enquiry are more generally applicable outside the specifics of the situation studied (Robson, 2011). McCormick (1995) suggests that external validity is the most controversial for single-case designs. Horner et al (2005) also highlight the questioning around how a single case design can hold relevance for any participant, context and behaviour outside of the study. They add key features of SCEDs that give strength to

their external validity include having operational definitions of the participants, the study context and factors influencing a participant's behaviour prior to intervention. External validity is enhanced through "replication of the effects across different participants, different conditions and/or different measures of the dependent variable" (Horner et al, 2005, pg. 171). The current study aimed to enhance its external validity by following the guidelines set out by Horner et al (2005).

3.7.4. Threats to reliability

As previously defined, reliability is defined as *'the stability or consistency with which we measure something'* (Robson, 2011, pg. 85). Robson (2011) adds that a number of threats to reliability need to be carefully considered to increase the reliability of the data. How this research attempts to control for these will be discussed.

Participant error

Random performance fluctuation due to extraneous variables

To reduce this threat the repeated measures, where possible, were taken on the same day and around the same time each week. Due to the school's timetables this what not possible all the time. As discussed in threats to internal validity, observation and intervention logs were also kept in order for the researcher to be aware of any extraneous variables that might impact upon the participant's performance.

Participant bias

Participant changing behaviour to fit with view of programmes purpose

Due to ethical reasons, to be discussed, the participant's were made aware of being filmed for the repeated measures. It was explained that the researcher was looking at how children learn and interact within their classroom. A customisation period, where the designated person (TA/researcher) spent time within the classroom with the iPad was used to reduce this bias. Within the pre, post and delayed measures the TA's were instructed to emphasise to the participant that there were no right or wrong answers.

Observer error

Random errors made by observer, due to tiredness & being overstretched

This was attempted to be reduced through the researcher engaging with stakeholders before the project, to ensure they were aware of the time scales and expectations of the research (see Appendix XVII for an example), conducting the repeated measures (for

School 2) due to capacity of staff at the time of the study and the repeated measure being videoed and rated, as opposed to rating during the observation. Inter-rater reliability was also gathered to enhance the video observations reliability further.

Observer bias

Observer biasing rating in line with ideological commitment

The controls highlighted in Observer Error are also applicable to reduce the observer bias. The triangulated pre, post and delayed measures should also help reveal any bias if this occurred.

3.7.4.1. Validity and reliability of structured observation

Robson (2011, pg. 316) highlights key advantages to using observations, as it enables the researcher "to watch what they do and listen to what they say" allowing understanding of what people actually do as opposed to what they or others might say they do. In order to decrease the possibility of the Hawthorn effect occurring, in which the participants behaviour change was due to being observed, the facilitator spent time in a customistation phase (Cohen et al, 2011). Before the study began the designated person (TA/researcher) spent time within the participant's classrooms with the iPad in order to accustom the participants to the filming before it commenced. A habituation strategy supported by Robson (2011) in minimising observer effects. Once video filming within the study commenced the observer attempted to be unobtrusive to the participants, where possible, by entering the classrooms after the group task began, avoiding eye contact and keeping at a distance.

In order to enhance the reliability of observations, Robson (2011) suggests that inter-observer agreement should be gathered. This refers to the similarity in the observation results of two or more observers when measuring the same behaviour and using the same coding system (Robson, 2011). Within this study the criteria for designs that meet evidence standards for SCEDs developed by Kratochwill et al (2010) was aimed to be employed, in which inter-observer agreement was collected for twenty percent of the data within each phase. Cohen's kappa (Cohen, 1960) was then aimed to be used to give a statistical measure of agreement. All the observations were recorded and then coded in order to enhance the reliability of the observational data.

Gathering inter-rater agreement and the use of video observations supported the reduction of other threats to the reliability and validity of observations, including:

- *Observer drift* - the observers familiarity with the coding schedule influencing how it is used (Robson, 2011)
- *Expectancy effects* - the observer's investment or expectancy of a positive change between pre- and post- intervention (Robson, 2011). Observations within each phase were randomly coded by the second rater in order to enhance the reliability of the inter-rating.

A further strategy used to increase the reliability of the coding was in the pilot study. Within this the observer was able to become accustomed to the coding schedule procedure prior to the study beginning. This aimed to also reduce the possibility of observer error.

3.7.5. Ethical considerations

During the planning and implementation of this research the researcher was aware of and ensured that the study adhered to the professional and ethical standards set out for practicing EPs and researchers. To support this the following published guidelines were considered:

- British Psychological Society (BPS, 2009) *Code of Ethics and Conduct*
- Health Professions Council (HPC, 2008) *Standards of Conduct, Performance and Ethics*
- University of Nottingham (UoN, 2013) *Code of Research Conduct and Research Ethics*

Approval from the University of Nottingham Ethics Committee was obtained on the 9th February 2013 (see Appendix XVIII). A summary of the specific ethical considerations which relate to this study and how the research considers them are discussed below.

Respect / good communication

The research was approached from a respectful standpoint, valuing individual differences within the participant and stakeholders (BPS, 2009). To support this the researcher met regularly with school staff at the start of the project to make practical arrangements related to administering questionnaires and setting up of the Lego®

Therapy. Staff were provided with the researcher's contact details and a summary of the research process which incorporated the expectations of staff involved in the research, such as completing the single-point questionnaires, distributing and collecting questionnaires from parents (see Appendix XVII).

The researcher liaised with school staff, through email/telephone contact, as well as conducting Treatment Fidelity checks every other week. The researcher visited school staff at the end of the project to collect completed questionnaires and to thank those involved in the study for their participation. Parents involved in the study were provided with the researcher's contact details and informed that they were able speak to the researcher should they have any questions or concerns at any point during the study.

Privacy & confidentiality

Within all letters to school staff and parents the researcher assured that all data collection and reporting would be anonymous and confidential. The storage of the data, within a locked cabinet, was also guaranteed (see Appendices IV, V, VIII & IX).

Informed consent

Informed consent was gained from all direct participants, school staff (Head Teacher, SENCo, Class Teacher & Intervention facilitator), focus child's parents and focus child. This was through letters detailing the nature of the Lego® Therapy intervention and measures to be used (adapted according to the focus child's age & understanding), as well as the researcher's contact details should anyone have wished to discuss the project further (see Appendices IV, V & VI). Additional consent was gained for incidental filming of staff and pupils within the focus child's classroom from additional teaching staff and the parent's of classmates (if not already gained by school), see Appendix VIII and IX. Details of informed consent procedures can be seen in *Section 3.6.3 Procedure* and the relevant appendices detailed.

Self-determination

When consent was gained all parents and participants were informed of their right to withdraw from the study. Adults working with the focus children were reminded to allow participants to withdraw from the study at any time (see Appendices IV, V & VI).

Protection of research participants

The researcher aimed to eliminate any potential risks to psychological well-being, physical health, personal values, or dignity of participants. All the pupils who were identified as benefiting from the intervention received the intervention and potentially harmful scenarios were actively avoided, such as asking participants about personal experiences. The researcher was also aware of the risks associated with the intervention and measures, to be discussed below.

Risk associated with the Lego® Therapy intervention

The researcher recognised the weekly Lego® Therapy sessions would provide a different context within the participant's social environment. The participants were therefore invited to attend the session and informed that they were able to leave the sessions at any time. Sessions were also run by familiar members of school staff. The researcher recognised the potential for distress associated with a different social situation. Therefore, within the first session, and repeated at the start of each session, the participants developed Lego® Club rules to support their ownership of the club rules and feeling of security during the intervention. This included developing procedures for disagreements, taking turns within the session and being helpful to other participants.

Risk associated with the measures used

The researcher recognised the potential for distress associated with participants being filmed within their classroom. The participants were directly asked if they were happy for the trained TA/researcher to record them within their classroom (for set periods of time per week) as well as being informed of their right to withdraw this consent (see Appendix VI).

A customisation period was used to reduce any potential distress, in which the TA/researcher spent time within participants' classrooms with the iPad. Other classmates were informed that filming would be taking place in the classroom over the coming weeks as part of an educational project.

Deception

Participants were not deceived at any point in the study. The children and their parents received information about the project, intervention and measures to be used and were offered opportunities to ask any further questions about the research.

Debriefing

The researcher aimed to ensure that the findings are disseminated to all relevant stakeholders. See Appendix X for more detail.

4. CHAPTER 4 – RESULTS

4.1. Introduction to Chapter 4

The current research examined the impact of Lego® Therapy on six focus children with identified social communication difficulties. Specifically focusing on their social confidence and independence within and across settings, as well as their sense of school belonging. Following an exploration of the literature in this area, four key research questions were developed, see *Section 2.7.2 Main research questions.* Four specific research hypotheses were then developed from these as follows:

Hypothesis 1: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence within small group tasks in their classroom.*
Hypothesis 2: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence, which will be maintained once the intervention is withdrawn.*
Hypothesis 3: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence across home and school settings, as shown by positive changes in parent and teacher perceptions.*
Hypothesis 4: Participation in the Lego® *Therapy intervention will result in an increase in the focus children's self-reported sense of school belonging.*

The following chapter presents the main findings of this study. Firstly, the analysis of SCED data and the strengths and limitations of visual and statistical analysis procedures are discussed. Comment is made on suitable methods of analysing single point, pre, post and delayed data. Following this a detailed rationale for the analysis approach chosen for this research is given. Measure and analysis reliability data are presented followed by the findings for each case. The chapter closes with a summary of all the findings (across the six cases) associated with each research question.

4.2. Analysis of results

There is some debate regarding the most appropriate ways of analysing SCED data, with some suggesting statistical analysis triumphs for its reliability and validity over the more traditional approach of systematic visual comparison of responses within and across phases (Todman & Dugard, 2001; Parsonson & Baer, 1978; Horner et al, 2005). Aspects of this will be considered here.

4.2.1. Statistical analysis of SCED data

It has been argued that statistical analysis may add further elements to the evaluation of SCED studies than visual analysis techniques (Barlow et al, 2009). Parker, Hagan-Burke and Vannest (2007) suggest the emphasis on including statistical tests in SCEDs is increasing due to the need for objective and statistically significant outcomes within intervention outcome research. However, Barlow et al (2009) further add that this does not come without difficulties, particularly in the selection of the most appropriate statistical test. This is due to the amount of available tests and varying research questions SCED's can answer which lead to varying outcomes (Barlow et al, 2009). A number of statistical procedures were explored in order to determine their appropriateness to this study.

Conventional t and f tests

T and f tests are predominantly used to assess the reliability of any difference found between groups (Barlow et al, 2009). Due to n=1 within SCEDs these tests involve comparing within-phase variance across the experiment as opposed to across participants (Barlow et al, 2009). Application of these tests to SCEDs "should be reserved for only rare instance" due to their violation of key assumptions within the test, including the independence of data and normal distribution of data (Barlow et al, 2009, pg. 280). Therefore, these tests were deemed unsuitable for the present study.

Randomisation tests

Randomisation tests were developed for when the population sample cannot meet the traditional parametric assumptions required for t and f tests. They assume that treatment intervention (IV) is randomly assigned to measurement occasions and this randomisation aims to reduce threats to internal validity (Barlow et al, 2009).

Participants were not randomly assigned to treatment interventions or measurement occasions, so this test was also deemed as not appropriate for the present study.

Interrupted time-series analysis (ITSA)

A number of ITSA tests have been developed which are also not reliant upon parametric assumptions (Barlow et al, 2009). These tests attempt to control for a variety of potential types of autocorrelation before they assess change between phases (Barlow et al, 2009). Due to these types of tests requiring at least 50 data points they were deemed unsuitable for this study (Barlow et al, 2009).

Effect size

Due to the criticisms highlighted above, a move away from *p* values and towards measurement of the magnitude–of–effect (effect size) has been recommended (Brossart et al, 2006). Ross (2012) identified three main types of calculating effect size;

- regression methods (e.g. n^2 and R^2),
- percentage of non-overlap
- standardized mean difference (e.g. Cohen's d, Hedge's g)

However, Manolov and Solanas (2008) suggest that these tests cannot account for threats by autocorrelation. Cohen et al (2011) further add that interpretation of the significance of outcomes can be difficult and dependent upon the analytic technique used. This approach was therefore deemed as inappropriate for this study.

4.2.2. Visual analysis of SCED data

As highlighted in *Section 3.5.6.1 ABA Design* Kratochwill et al (2010) have developed a technical document for SCED standards. Figure 4, in *Section 3.5.6.1 ABA Design* highlighted that once a design has been evaluated and it meets the evidence standards then the traditional model of demonstrating evidence of a relation between an IV and DV, and the strength of that relation, would be to conduct a visual analysis of the data (Kratochwill et al, 2010).

The aim of visual inspection is to "identify if the effects are consistent, reliable and unlikely to have resulted from chance fluctuations between conditions" (Kazdin, 2003, pg. 291). This type of analysis has been critiqued within the literature for going against

approaches that are often deemed as more objective, such as the use of statistical tests. With some suggesting that visual analysis is more open to subjective judgment when deciding the significance or not of findings (Kazdin, 2003). Kazdin (2003) suggests this concern is reasonable, due to the explicit significance criteria (such as $p < .05$) that statistical evaluation requires, and for the more consistent approach it provides across settings and investigators.

Kazdin (2003) argues that the repeated measurements of behaviour across phases (without and with the intervention) in SCEDs lend themselves to visual inspection. Due to the consecutive nature of the data, if the pattern of data is seen to change once an intervention is introduced then it is likely to be visually clearer than when inspecting pre and post data (Kazdin, 2003). Many advantages of visual analysis have been reported, including the compact and detailed data via graphic displays that enable effectiveness of an intervention to be viewed along a course of a study (Richards, Taylor & Ramasamy, 1997). Statistical techniques are thus critiqued for their inability to explore trend magnitude and level changes which are calculated under visual analysis, to be detailed in Table 10 below (Parker, Cryer & Byrns, 2006).

Studies have explored the reliability of visual analysis for SCED data, with a number of studies suggesting low inter-rater agreement is achieved (Deprospero & Cohen, 1981; Ottenbacher, 1986). Steps that have been taken to enhance inter-rater agreement in visual analysis will be discussed below. Although some studies have highlighted low levels of inter-rater agreement, Brossart, Parker, Olson and Mahadevan (2006) argue that visual analysis judgments tend to be conservative which enhances their accuracy for suggesting an effect has occurred when it has. It has been argued that visual analysis is more likely to identify large treatment effects with more obvious significance (Baer, 1977). Baer (1977) proposes that visual analysis reduces the probability of Type 1 errors below 0.05%, as seen in statistical testing, however this increases the probability of Type 2 errors. Visual analysis is therefore said to support researchers to 'learn about fewer variables, but these variables are typically more powerful, general, dependable, and – very important – sometimes actionable' (Baer, 1977, pg.171).

The steps that have been developed to enhance the inter-rater reliability of visual analysis can be seen in Table 9 below.

Steps	Description
1	*Identify* a predictable baseline pattern of data
2	*Examine* each phase to assess any within-phase pattern(s) Is there sufficient data with sufficient consistency to demonstrate a predictable pattern?
3	*Compare* data from each adjacent phase to assess if IV manipulation led to an "effect" Did the manipulation of the IV make a predicted change in the pattern of the DV?
4	*Integrate* data from all phases to determine if at least three demonstrations of an effect can be seen at different points in time

Table 9: Steps of visual analysis (Kratochwill et al, 2010)

Six features are used when following these steps, see Table 10, to examine within and between data patterns and to determine if the study provides *Strong, Moderate or No Evidence* (Kratochwill, et al, 2010).

- *Strong Evidence:* at least three demonstrations of the intervention effects and no non-effects.
- *Moderate Evidence:* if a study provides three demonstrations of an effect and also includes at least one demonstration of a non-effect
- *No Evidence:* does not provide three demonstrations of an effect

Kratochwill et al (2010) propose that at least two reviewers are required to verify that a causal relation can be seen.

Feature	Definition
Level	Mean score for the data within a phase
Trend	Slope of the best-fitting straight line for the data within a phase
Variability	Range (Standard Deviation) of data about the best-fitting straight line
Immediacy of effect	Change in level between the last three data points in one phase and the first three data points of the next *The more rapid (or immediate) the effect, the more convincing the inference that change in the outcome measure was due to manipulation of the IV.*
Overlap	Proportion of data from one phase that overlaps with data from the previous phase. *The smaller the proportion of overlapping data points the more*

	compelling the demonstration of an effect.
Consistency of data patterns across similar phases	Extent to which there is consistency in the data patterns from phases with the same conditions. *The greater the consistency, the more likely the data represent a causal relation.*

Table 10: Features of visual analysis of SCED graphs (Kratochwill et al, 2010)

4.2.3. Analysis of pre, post and delayed measures

Pre, post and delayed measures were used to assess the generalisation of social communication skills and each participant's sense of school belonging. Due to the small number of participants group statistical analysis could not be used for three single points of measurement for one participant. Jacobson and Follette (1984) propose the need to determine that any change in pre to post data for an individual is "real" and should be able to rule out the chance of a plausible competing explanation by considering its clinical significant. Their reliable change index (RCI) aims to do this through statistical analysis. This analysis would have been chosen, however the components for the RCI formula (such as standard deviation & test-retest reliability) were not available for the Social Competence Inventory and Belonging Scale for the ages of the participants in the present study. Therefore, results are discussed descriptively and not statistically tested.

4.3. Data Analysis method in current study

After exploring and reviewing the potential analysis techniques for both the SCED data and single point (pre/post/delayed) data it was deemed that visual analysis techniques (for SCED data) and descriptive analysis (for single point data) would be the most appropriate. How this was done and presented, within each case, will now be detailed for each Research Question. Research Questions 1 and 2 will be presented together as data collected from the repeated measures relates to both questions.

Research Question 1 & 2

Research Question 1: Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties?

Research Question 2: Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties maintain after the intervention ends?

SCED graphs

In response to these research questions the data from the repeated observational measures will be presented in a graphical format based upon the key areas evaluated in the video coding scheme;

- **Total communication attempts**
- **Role in turn taking: initiation & response**
- **Effectiveness: effective & not clearly effective**

A graph will be presented to support the visual analysis, based on Kratochwill et al's (2010) features of visual analysis of SCED graphs, as presented in Table 10.

On all the graphs the x-axis presents the weeks of data collection. Where there is no data point in the week it indicates that data was not collected either due to school holidays or participant illness. Data points were still joined together where this is the case in order to support the researcher to explore the overall patterns within the data visually.

SCED analysis summary

Following analysis of the graphs for each key area, a summary of the findings will be provided. This involves the researcher highlighting key observations and describing the findings in relation to the research questions in preparation for further discussion in the final chapter. As discussed in *Section 4.2.2. Visual Analysis of SCED data,* Kratochwill,

et al (2010) outlined criteria by which a result is said to provide, strong, moderate or no evidence to a research question. This will be detailed within each participant's summary.

Descriptive Data

Due to the amount of graphical data an aspect of the video coding system, **mode of communication**, will be presented as descriptive data. This means the data cannot be visually analysed but aims to add detail to the visual analysis of other aspects. The mean and percentage of the mode of communication will be detailed for each phase of the study along with a summary of the key modes of communication used within the phases.

Research Question 3

Research Question 3: Does Lego® Therapy have a positive impact on parent and teacher perceptions of the generalisation (across home/school settings) of social confidence and independence of primary-aged children with social communication difficulties?

Two tables will be presented for each case. The first will show the participant's score on each scale of the Social Competence (Prosocial Orientation and Social Initiative), as well as their overall score for social competence, as rated by the class teacher before and after the intervention and after a withdrawal period. The difference between the scores obtained at the three points in time is also presented. The second table will also show all the scores highlighted above, but as rated by the participant's parent. Interpretations of the ratings provided by the class teacher and parent are then summarised and considered in relation to question three.

Research Question 4

Research Question 4: Does Lego® Therapy have an effect upon the primary-aged children with social communication difficulties self-reported sense of social belonging?

The participant's score on the Belonging Scale before the intervention, as well as after the intervention and withdrawal period will be presented in a table. The difference between the scores obtained at the three points in time will also be presented. Interpretation of the scores in relation to question four will then be provided.

4.4. Inter-observer agreement for repeated observational measures

As discussed in *Section 3.7.4.1 Validity and Reliability of structured observation* inter-observer agreement was established for the video observational data in order to enhance the reliability of the observations. Kratochwill et al (2010) propose the gold standard for inter-rating is for twenty percent of the data to be co-rated followed by a Cohen's Kappa (Cohen, 1960) to control for chance agreement. However, Thunberg et al (2007) argue that ten percent of video data should be co-rated due to practical and time limitations of analysing video footage. A Cohen's Kappa (Cohen, 1960) was not possible due to data being scaled, as opposed to nominal (Gisev et al, 2013). Therefore a random selection of ten percent of the data from each phase (Baseline, Intervention and Return to Baseline) of the study for each participant was rated by a student on a postgraduate certificate in education course whom had no knowledge of the aims of the study. Consent for a co-rater to watch the video data was gathered from the participant's parents within the initial informed consent letter (see Appendix V). The co-rater watched the anonymised footage in a private room and was given a script (see Appendix XIX) to rate the participant's communication independently. They were blind to the purpose of the study, as well as the order/phase of the video clips.

Following Thunberg et al's (2007) inter-observer agreement procedures the level of agreement was checked for every common communicative contribution according to the four different dimensions within the coding scheme outlined previously (total communication attempts, role in turn-taking, mode of communication and effectiveness of the communication). Following Stanton-Chapman and Snell's (2011) guidance inter-rater reliability was assessed using an agreement formula in which total number of agreements was divided by the total number of agreements plus disagreements and multiplied by 100. Stanton-Chapman and Snell's (2011) criterion for inter-observer agreement was 80%, however Thunberg et al (2007) suggested that due to the possibility of more than one feature being coded within the communicative mode dimension, at least 50% of the coded features in analysis of video observation had to be identical in order for it to be judged as concordant.

Within this study the inter-observer agreement was 100% for total communication attempts and role in turn taking, 76.9% for communicative mode and 98.8% for communicative effectiveness. Thus indicating a high level of inter-observer agreement, enhancing the reliability of the measure used.

4.5. Inter-rater agreement for SCED graph analysis

In an attempt to reduce the subjective bias in visual analysis as highlighted by Deprospero and Cohen (1981) and Ottenbacher (1986) it was deemed important to obtain a level of inter-rater agreement between two analysts, as suggested by Kratochwill et al (2010). The graphs were therefore analysed using the visual analysis guidance, described in Table 10, by the researcher and a fellow Trainee Educational Psychologist who was familiar with visual analysis. See Appendix XX for the script given to both raters.

They both independently examined the graphs and rated them on a scale of 1 – 5 (1=not at all, 2=unsure, 3= it is possible, 4=reasonably certain, 5=very certain) for the following question;

"How certain or convinced are you that the child's x underwent a practical and notable improvement during each of the phases?"

x was replaced by amount of communication, initiation communication, response communication, effective communication or not clearly effective communication dependent upon the graph focus.

A Cohen's Kappa (Cohen, 1960) was deemed as the most appropriate statistical test to establish inter-rater agreement levels of visual analysis due to its suitability with nominal data (Gisev al, 2013). Gisev et al (2013) report that a Cohen's Kappa of 0.4 - 0.6 indicates moderate agreement, 0.6 – 0.8 indicates substantial agreement and 0.8 or above indicates an almost perfect agreement. The level of agreement between the two raters using Cohen's Kappa was 0.76, which according to Gisev et al (2013) indicates substantial agreement. This level of agreement further supports the reliability of the visual analysis judgments made by the researcher presented below.

4.6. Data Analysis – Ali

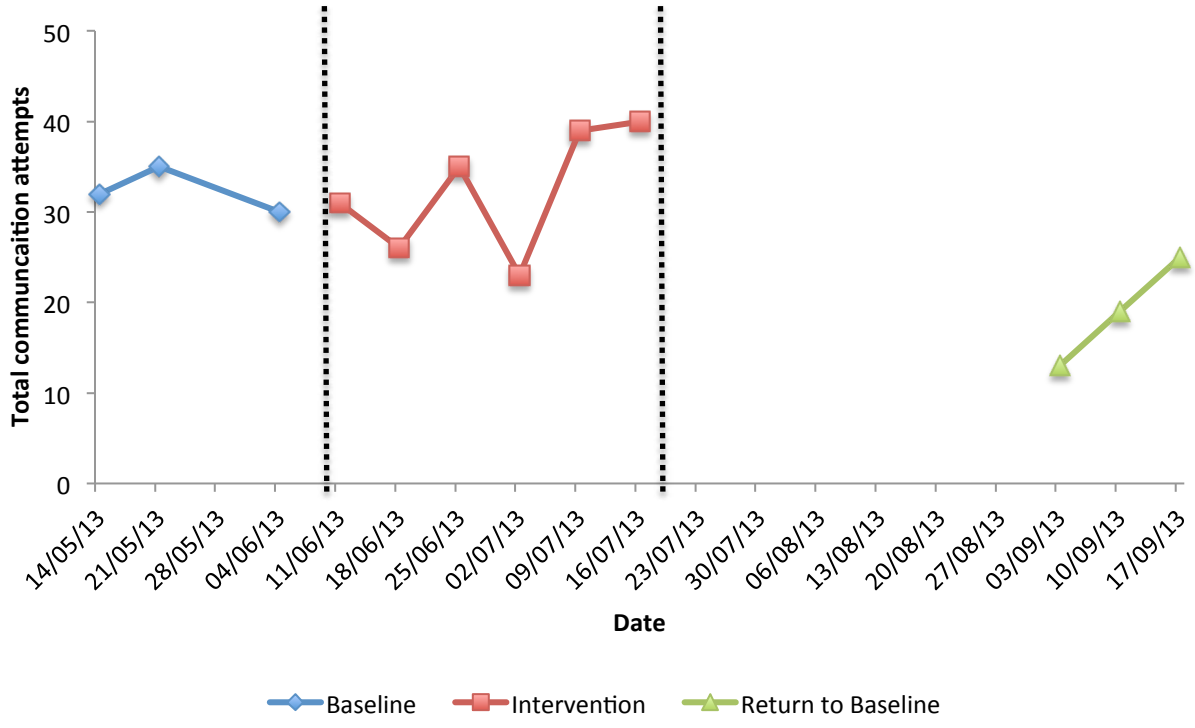
4.6.1. Ali's profile

Gender: Male **Age (at start of study):** 7 years 6 months

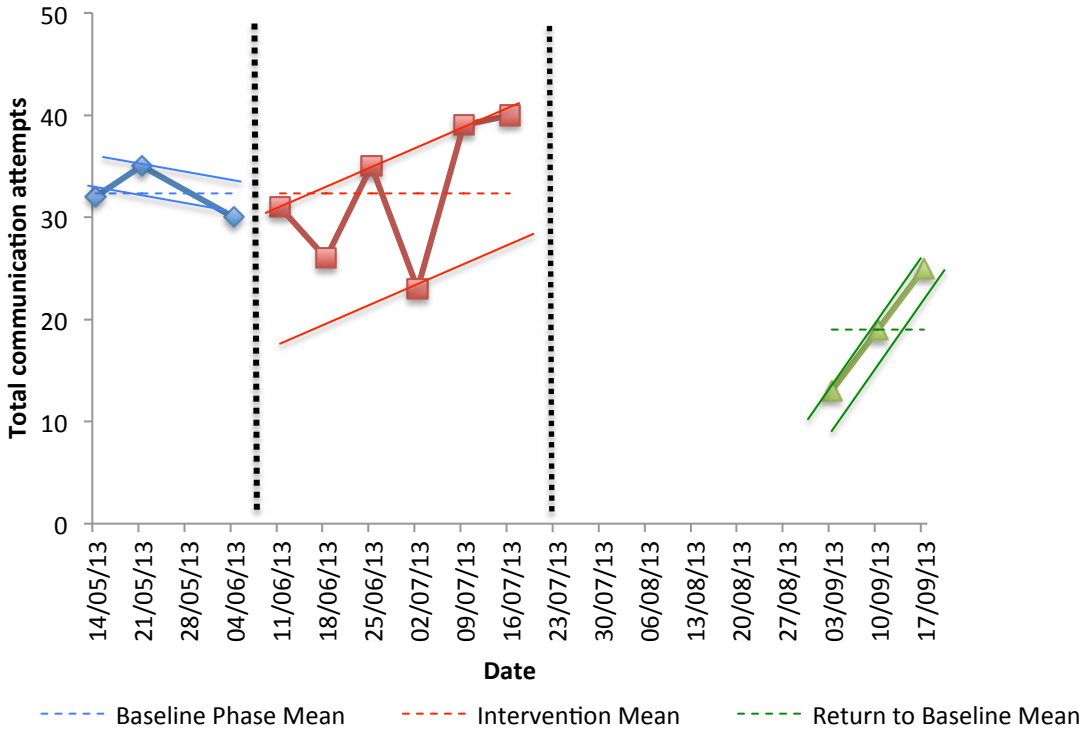
The school SENCo described Ali as having tendencies that are related to ASD. They reported that Ali has difficulty with his social skills and social interaction and can be quite 'dominating' with his peers. He also has language and communication difficulties, with immature expressive and receptive language difficulties. During the baseline and intervention phases of the study Ali attended a nurture base class within a primary school that caters for pupils with additional learning and social needs. Within the Return to Baseline phase Ali was in the mainstream classroom.

4.6.2. SCED graphs

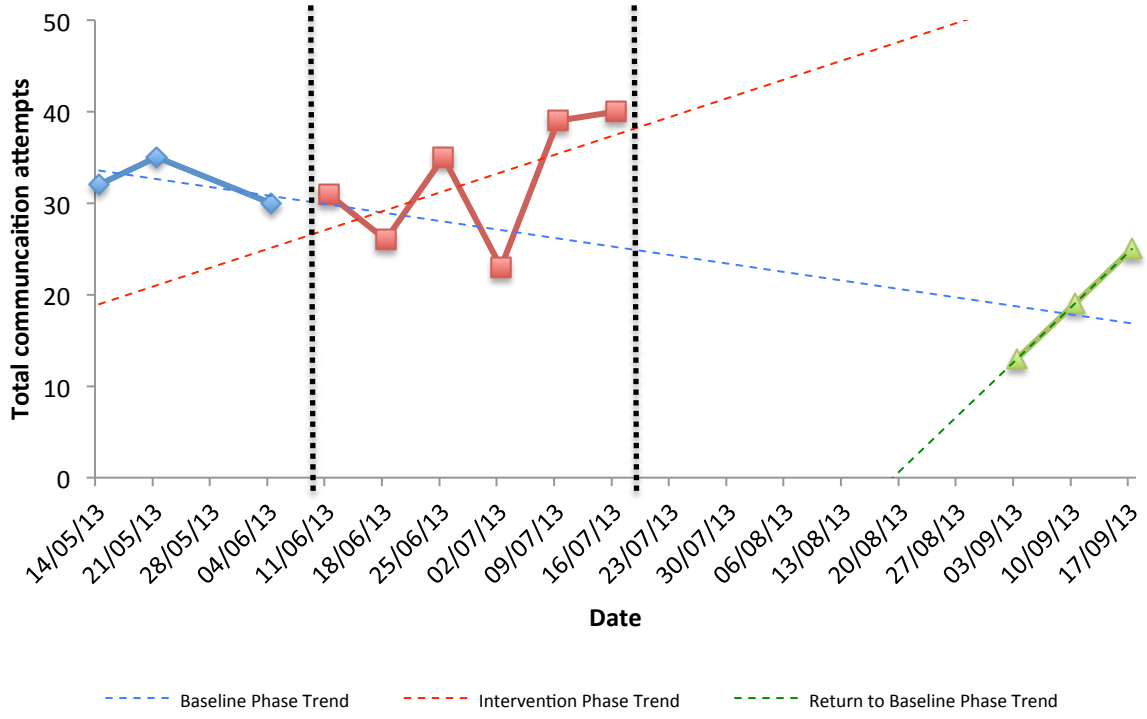
4.6.2.1. Total communication attempts



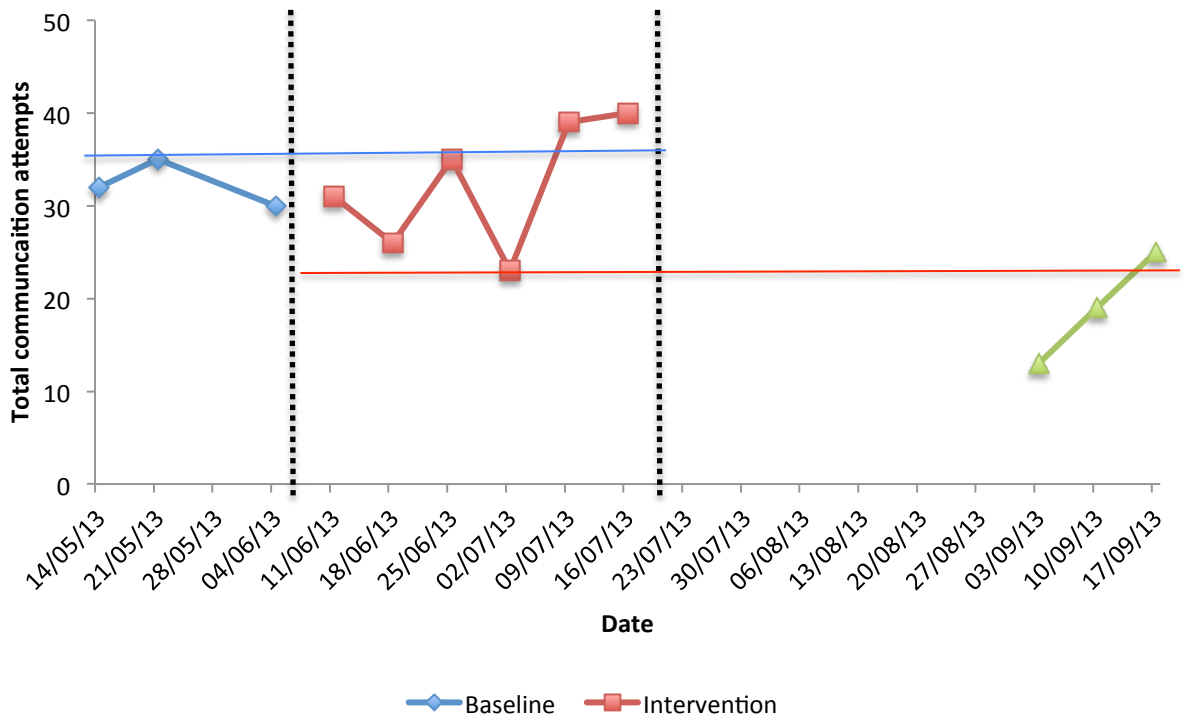
Graph 1: A line graph showing Ali's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 2: A line graph with **mean and variance lines** showing Ali's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 3: A line graph with **trend lines** showing Ali's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 4: A line graph with **overlap lines** showing Ali's total communication attempts across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	Graph 2 shows that the mean level remained the same (32.33) between Baseline and Intervention. It also shows a decrease in the return to Baseline (19). This is a -13.33 shift of amount of communication between the Intervention and Return to Baseline.
Trend	Graph 3 shows that the Baseline trend line had a relatively steep decline, whilst the Intervention had a relatively steep incline. The incline within the Return to Baseline was greater than that in the Intervention.
Variability	Graph 2 shows the Baseline (Standard Deviation, SD: 2) had a fairly stable range of data around the line of best fit. The Intervention (SD: 6.9) and Return to Baseline (SD: 6) had fairly large variations of data from the best fitting line.
Immediacy of effect	Graph 1 shows little difference in level between the three data points in Baseline and the first three data points in the Intervention. It also shows a substantial negative change between Intervention and Return to Baseline.
Overlap	Graph 4 shows that all the Baseline data points overlapped with the Intervention and only one data point in the Return to Baseline overlapped

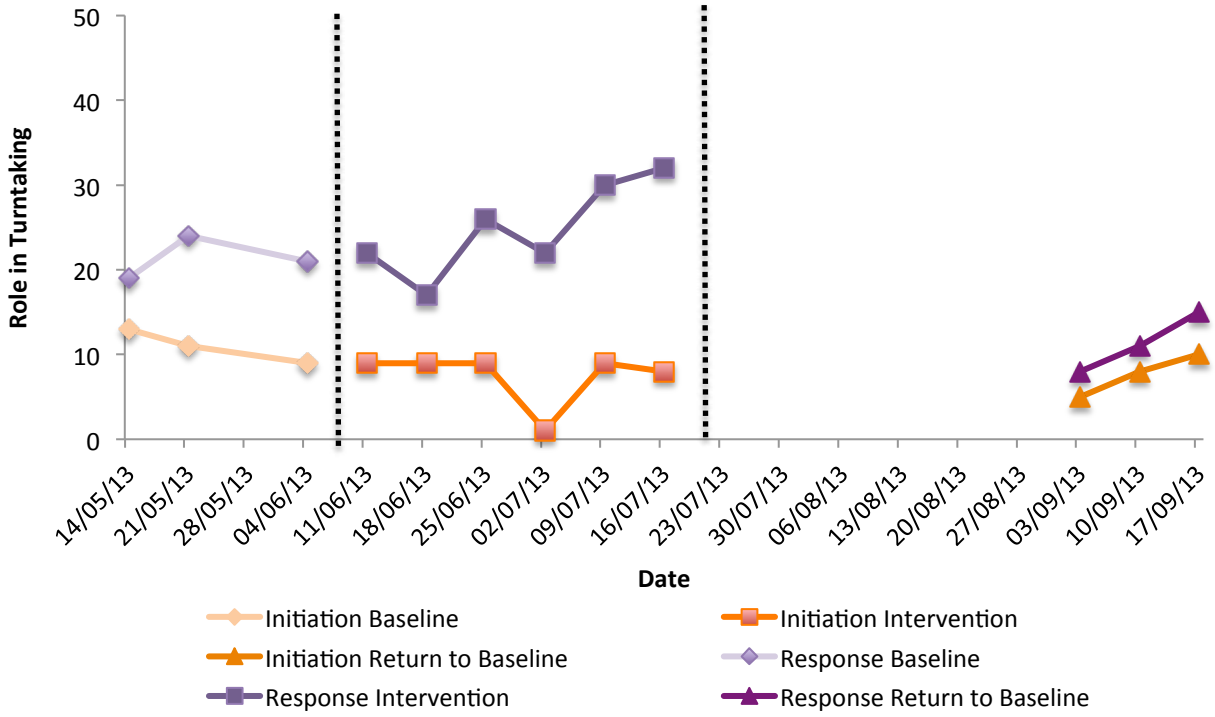
	with the Intervention.
Consistency	Graph 1 shows little consistency of data patterns in the Baseline and Return to Baseline. Graph 2 shows the mean within the Baseline was higher in Baseline than Return to Baseline.

Table 11: A summary of the outcome of the visual analysis of Ali's total communication attempts graphs

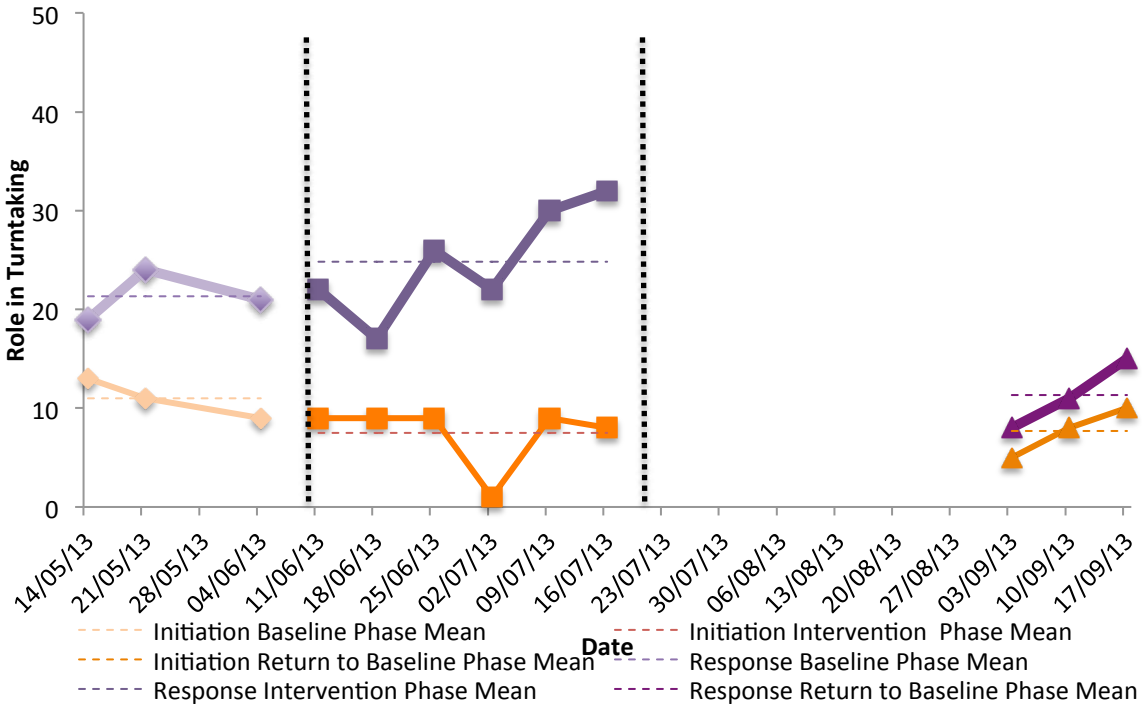
4.6.2.2. Ali's total communication attempts: summary

The visual analysis of Ali's total communication attempts suggests that the intervention had a small positive effect. Although the mean lines show that the mean amount of communication has stayed the same between Baseline and Intervention, the trend lines show that potentially without the introduction of the intervention this should have declined. The introduction of the intervention appears to have changed Ali's total communication to a positive incline trend. This positive trend and the pattern of the overlap in data (less overlap towards the end of the intervention) suggest that this positive incline may have continued if the intervention had been implemented longer. The large difference in mean and low overlap of data shows the negative impact of the summer holidays and withdrawal of the intervention on Ali's total communication. This large difference indicates that the possible positive effect on trend that the intervention had has not been maintained. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Total communication attempts) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

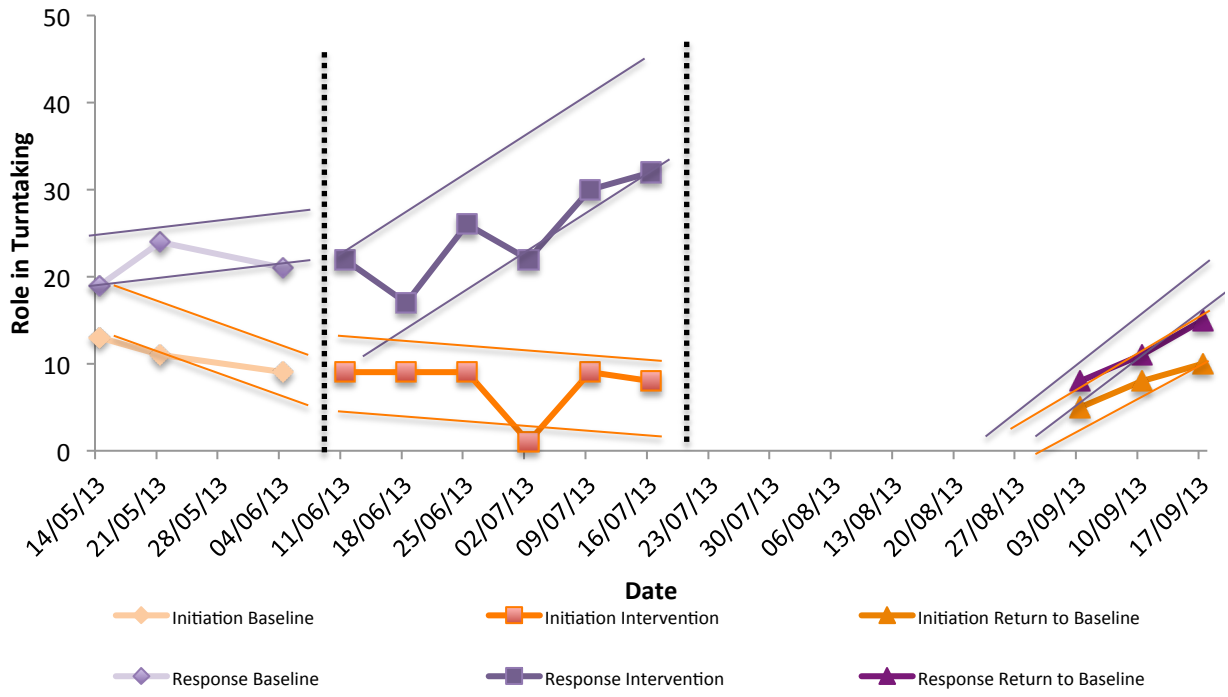
4.6.2.3. Role in turn taking: initiation & response



Graph 5: A line graph showing Ali's role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

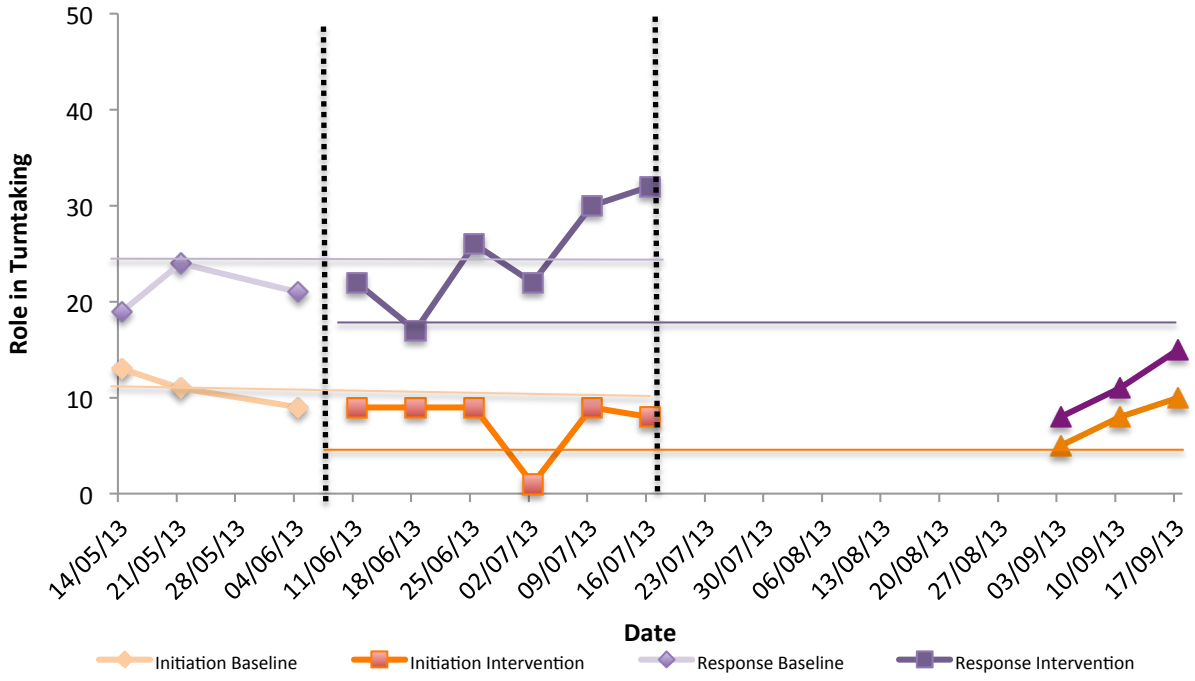


Graph 6: A line graph with **mean lines** showing Ali's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 7: A line graph with **variance lines** showing Ali's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Graph 8: A line graph with trend lines showing Ali's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 9: A line graph with **overlap lines** showing Ali's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 6 shows a slight decrease from Baseline (11) to Intervention (7.5). This score remained around the same as the Intervention in the Return to Baseline (7.6). *Response:* Graph 6 shows a slight increase from Baseline (21.3) to Intervention (24.8). There was a larger decline within Return to Baseline (11.3).
Trend	*Initiation:* Graph 8 shows a negative trend line within both Baseline and Intervention. The intervention trend line was less negative than in the Baseline. A positive trend can be seen within the Return to Baseline. *Response:* Graph 8 shows a positive trend line in both Baseline and Intervention. This incline was far steeper within the Intervention. This steepness in incline trend can also be seen within Return to Baseline.
Variability	*Initiation:* Graph 7 shows that within all phases the variation in the data was low, Baseline (SD: 2), Intervention (SD: 3.2) and Return to Baseline (SD: 2.5). *Response:* Graph 7 shows that within Baseline (SD: 2.5) and Return to

	Baseline (SD: 3.5) variation in data was low. The variation within the Intervention (SD: 5.6) was slightly higher.
Immediacy of effect	*Initiation:* Graph 5 shows a decrease in initiation which remained stable from Baseline to Intervention. The final three data points in the Intervention were variable and the data points in Return to Baseline remained within this variation. *Response:* Graph 5 shows the data points in Baseline and the first three points in the Intervention remain around the same level. An increase in the data in the last three data points in Intervention is contrasted with a large decrease in responses in the Return to Baseline.
Overlap	*Initiation:* Graph 9 shows that a third of the Baseline overlapped with the Intervention and that the majority of the Intervention overlapped with the Return to Baseline. *Response:* Graph 9 shows that all the Baseline data overlapped with the first half of the Intervention data. No other data overlapped.
Consistency	*Initiation:* Graph 5 shows that Ali's initiation attempts were slightly higher within Baseline than Return to Baseline. *Response:* Graph 5 shows that Ali's response attempts were a lot higher in the Baseline than Return to Baseline.

Table 12: A summary of the outcome of the visual analysis of Ali's turn taking (initiation & response) graphs

4.6.2.4. Ali's role in turn taking: summary

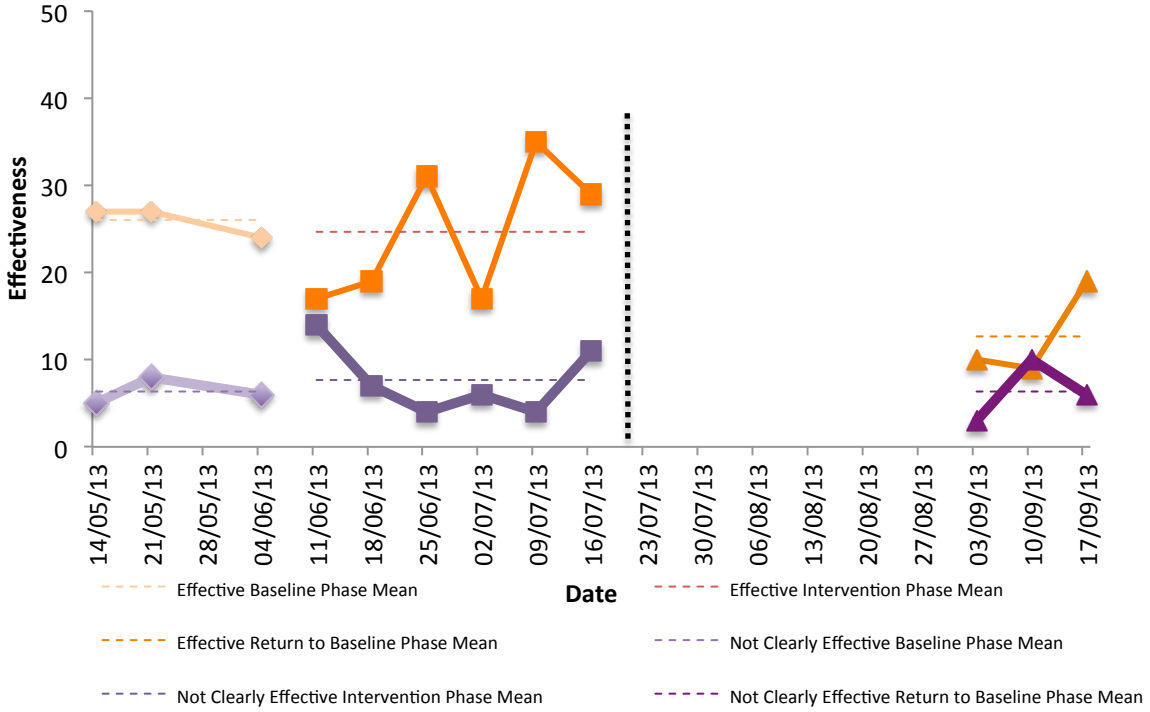
The visual analysis showed that across all the phases in the study Ali's response to communication attempts were higher than his initiation of communication attempts.

It suggests that the intervention did not have a positive effect upon his initiation of communication, the mean suggesting that this actually declined within the Intervention and this level maintained after the summer holidays and Return to Baseline phase. The trend lines indicate that the Intervention raised the general declining trend line slightly, however this does not appear to be too large. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (role in turn taking: initiation) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

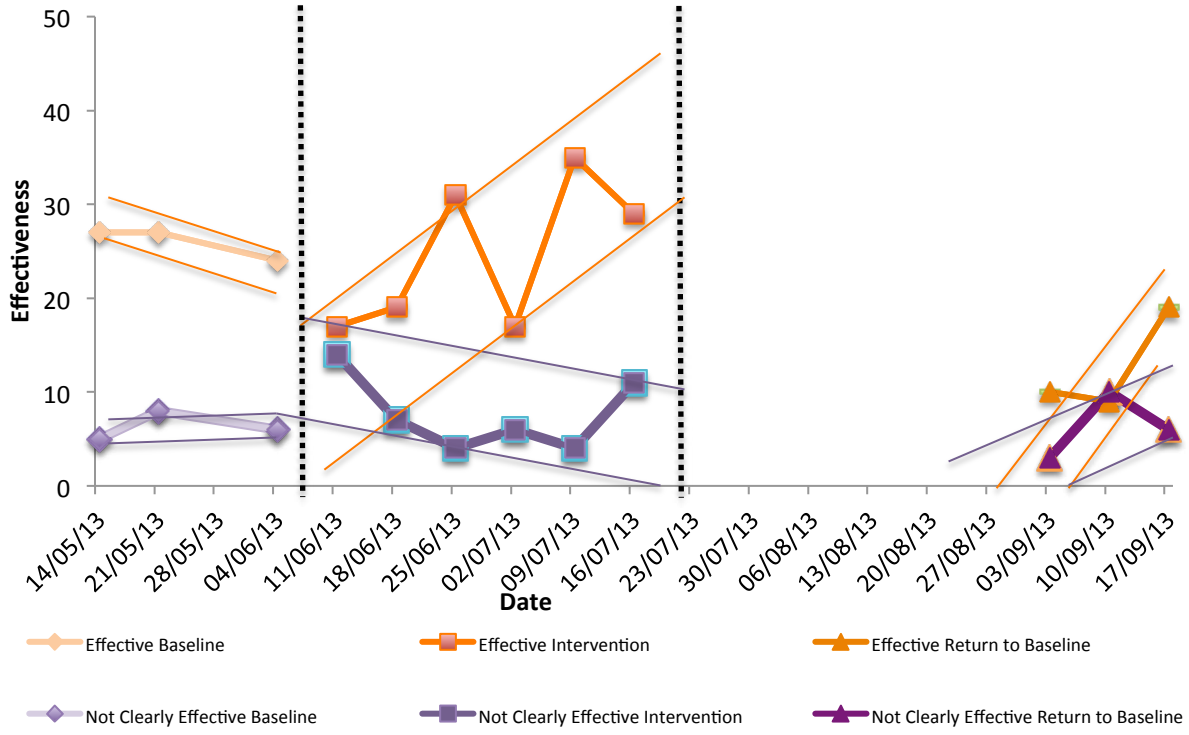
It suggests that the intervention had a positive impact upon his response attempts, shown by the increase in both the mean and trend lines from Baseline to Intervention. This does not appear to have maintained after the summer holidays or within the Return to Baseline phase, although the trend lines suggest his response attempts were increasing in this phase. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 (role in turn taking: response) as three demonstrations of an effect (level, trend, overlap) and at least one demonstration of a non-effect can be seen. *No Evidence* is shown for Research Question 2.

4.6.2.5. Effectiveness: effective & not clearly effective

Graph 10: A line graph showing Ali's communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

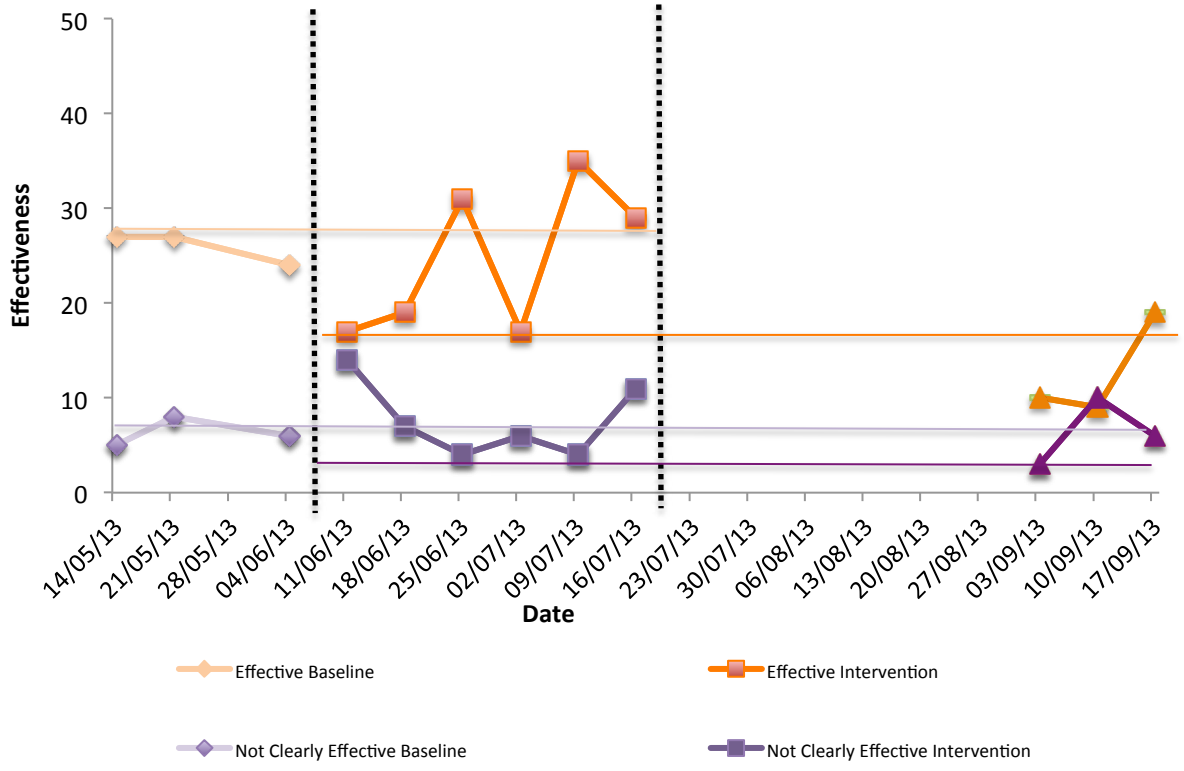


Graph 11: A line graph with **mean lines** showing Ali's effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 12: A line graph with **variance lines** showing Ali's turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Graph 13: A line graph with **trend lines** showing Ali's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 14: A line graph with **overlap lines** showing Ali's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Effective:* Graph 11 shows a slight decline between Baseline (26) and Intervention (24). This substantially declined after the Summer holidays and within the Return to Baseline (12). *Not Clearly Effective:* Graph 11 shows the mean increased from Baseline (6.3) to Intervention (7.6). This resumed to the same mean level for Baseline within the Return to Baseline (6.3).
Trend	*Effective:* Graph 13 shows a change in trend from Baseline in which a steep declining slope can be seen, whilst within the Intervention a steep positive trend can be seen. This positive trend remains within the Return to Baseline. *Not Clearly Effective:* Graph 13 shows the Baseline trend had a slight incline, which can also be seen in the Return to Baseline. Within the Intervention this trend became negative.
Variability	*Effective:* Graph 12 shows the small variation in data in Ali's Baseline (SD: 1.7). Whilst a large variation can be seen in both Intervention (SD: 7.9) and Return to Baseline (SD: 5.5). *Not Clearly Effective:* Graph 12 shows a small variation in Baseline (SD: 1.7) whilst a slightly higher variation in Intervention (SD: 4) and Return to Baseline (SD: 3.5).
Immediacy of effect	*Effective:* Graph 10 shows an initial reduction within the first two data points in the Intervention, as opposed to the Baseline, followed by a sharp incline. It also shows a large reduction from the final three data points in the Intervention to Return to Baseline. *Not Clearly Effective:* Graph 10 shows an initial increase in the first two data points in the Intervention, as opposed to the Baseline, followed by a decline. The last three data points in the Intervention and data points in the Return to Baseline were similarly unstable.
Overlap	*Effective:* Graph 14 shows that all the Baseline data overlapped the Intervention data points. Only one data point in the Return to Baseline overlapped the Intervention data. *Not Clearly Effective:* Graph 14 shows that all the data within all the phases

	overlapped, besides one data point within the Intervention phase.
Consistency	*Effective:* Graph 14 shows that the data within Baseline and Return to Baseline are largely different. With the amount of effective communication in the Baseline being far greater than that in the Return to Baseline. *Not Clearly Effective:* Graph 14 shows that data within Baseline and Return to Baseline is fairly similar.

Table 13: A summary of the outcome of the visual analysis of Ali's effectiveness (effective & not clearly effective) graphs

4.6.2.6. Ali's effectiveness: summary

The visual analysis shows that overall Ali 's effective communication was higher than his not clearly effective communication.

The intervention does not appear to have had a positive impact on his effective communication, with the mean scores and overlap of data suggesting this has stayed within the same data ranges across the phases, and made a large decrease following the Summer holidays. The trend lines suggest that the intervention may have had some positive effect, which with further implementation may have continued to increase. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (effectiveness: effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

The intervention does not appear to have impacted upon Ali's not clearly effective communication, with scores only altering slightly amongst the phases. The trend lines suggest that a decline in his not clearly effective communication attempts may have continued to reduce if the intervention was implemented for longer. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (effectiveness: no clearly effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

4.6.3. Descriptive data – mode of communication

	Baseline		Intervention		Return to Baseline	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	27.33	35.34	24.50	33.87	13.33	33.33
Gesture	8.33	10.78	11.33	15.67	8.33	20.83
Graphic	10.33	13.36	7.33	10.14	0.67	1.67
Vocalisation	3.33	4.31	5.17	7.14	2.67	6.67
Speech: one word utterance	4.33	5.60	4.67	6.45	2.33	5.83
Speech: 2/3 words	10.33	13.36	9.67	13.36	2.00	5.00
Speech: flowing speech	13.33	17.24	9.67	13.36	10.67	26.67

Table 14: Descriptive data of Ali's mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data suggests that Ali's main mode of communication within the Baseline phase was eye contact, graphic and speech (flowing speech or 2/3 words). His eye contact remained around the same percentage throughout all phases, whilst his use of graphics greatly reduced. His use of short (2/3 word) speech remained the same in his Baseline to Intervention and reduced within the Return to Baseline phase. Ali's flowing speech reduced in the Intervention, but increased greatly in the Return to Baseline phase. His use of gestures increased within both the Intervention and Return to Baseline phases.

4.6.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	1.5	2.7	+ 1.2	2.7	2.7	0
Social Initiative	5.1	5.4	+ 0.3	5.4	3.2	- 2.2
Overall	2.5	3.4	+ 0.9	3.4	2.7	- 0.7

Table 15: Ali's class teacher's scores on the Social Competency Inventory pre, post and delayed

Home perceptions (Mother);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	3	2.4	- 0.6	2.4	2.6	0
Social Initiative	5.6	5.4	- 0.2	5.4	3.2	- 2.2
Overall	3.6	3.2	- 0.4	3.2	2.7	- 0.7

Table 16: Ali's parent's scores on the Social Competency Inventory pre, post and delayed

4.6.4.1. Ali's SCI scores: summary

Table 15 shows that Ali's teacher's perceptions of both his pro-social orientation and social initiative behaviour increased after the intervention was introduced and this was maintained at the same level after the intervention was withdrawn. A larger increase in perceptions of his pro-social orientation (co-operative behaviours, such as empathy, helpfulness and handling conflict) was shown.

Table 16 shows that Ali's parent's perceptions of both his prosocial orientation and social initiative behavior reduced slightly after the intervention. They remained at the same level for his prosocial orientation skills after the intervention was removed, but decreased further for his social initiative skills.

4.6.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*	Post	Delayed	*Difference*
Belonging Scale	2.8	2.4	- 0.4	2.4	2.75	+ 0.35

Table 17: Ali's self-reported scores on the Belonging Scale pre, post and delayed

4.6.5.1. Ali's BS scores: summary

Table 17 shows a small decrease in Ali's self-reported sense of school belonging after the intervention. This returned to the same level as in the pre-intervention after the intervention was withdrawn.

4.7. Data Analysis – Faisal

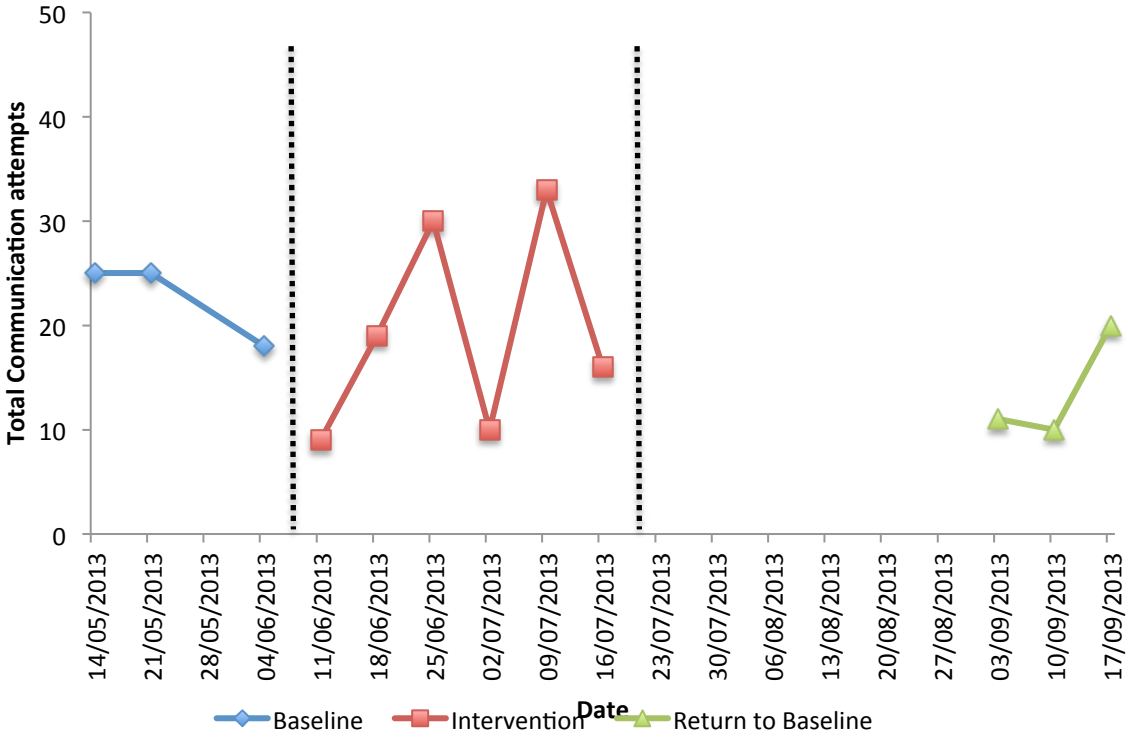
4.7.1. Faisal's profile

Gender: Male **Age (at start of study):** 7 years 4 months

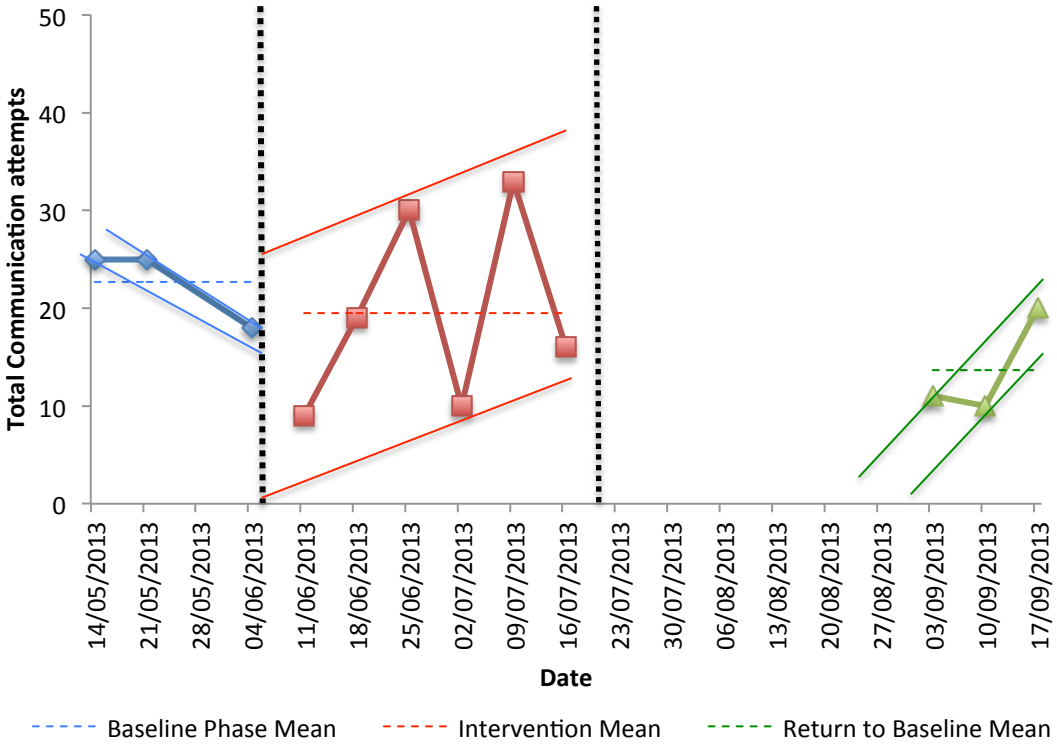
The school SENCo described Faisal as having tendencies that are related to ASD. They reported that Faisal had difficulty with his social skills and social interaction and can be quite passive with his peers. He is very gently spoken and often allows his peers to dominate his work or play, leading to 'bullying'. The school SENCo reported that he had very low self-esteem along with his poor social skills. During the baseline and intervention phases of the study Faisal attended a nurture base class within a primary school which caters for pupils with additional learning and social needs. Within the Return to Baseline phase Faisal was in a mainstream classroom.

4.7.2. SCED graphs

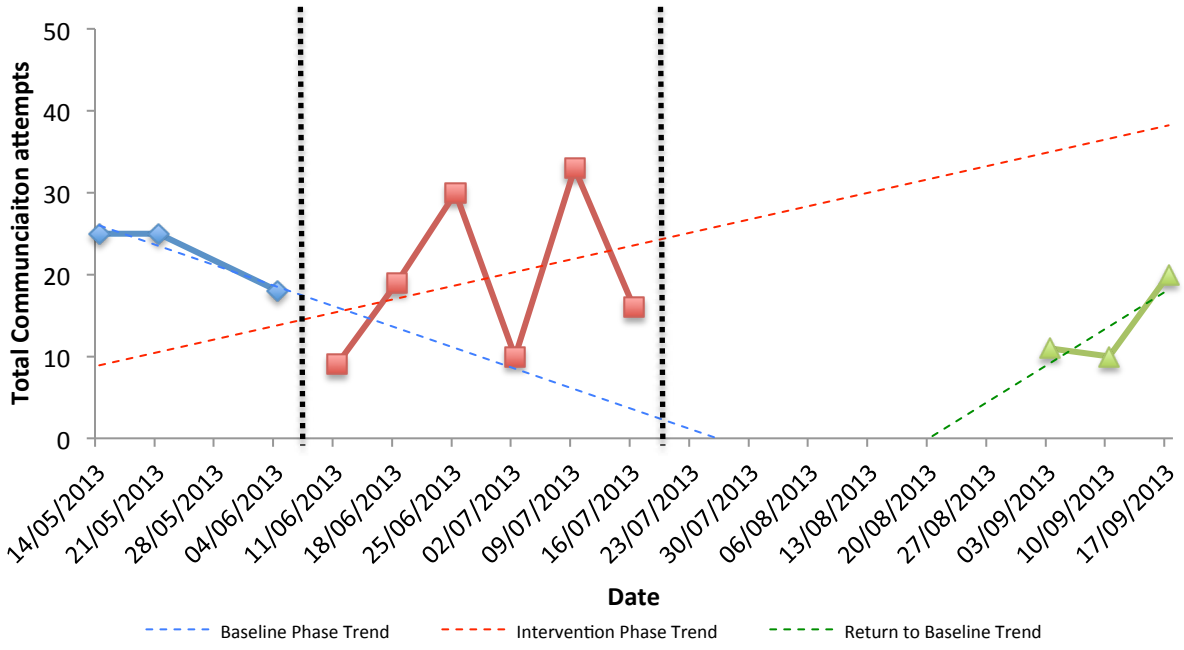
4.7.2.1. Total communication attempts



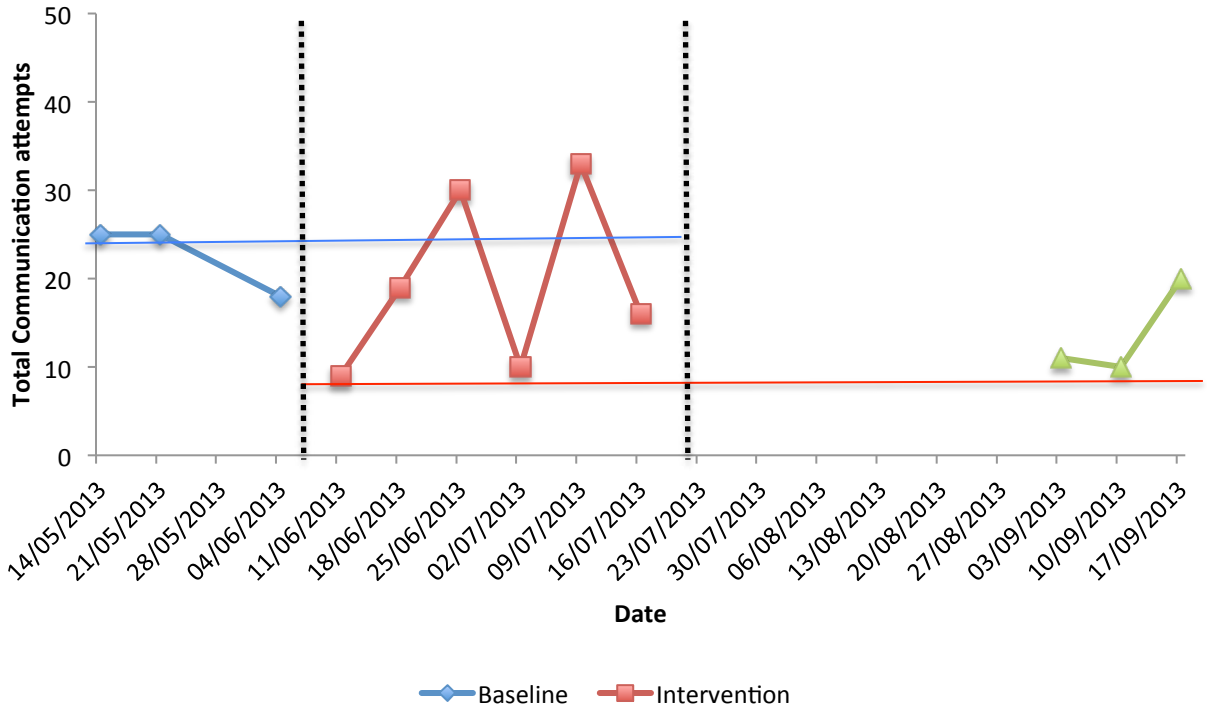
Graph 15: A line graph showing Faisal's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 16: A line graph with mean and variance lines showing Faisal's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 17: A line graph with **trend lines** showing Faisal's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 18: A line graph with **overlap lines** showing Faisal's total communication attempts across Baseline, Intervention and Return to Baseline

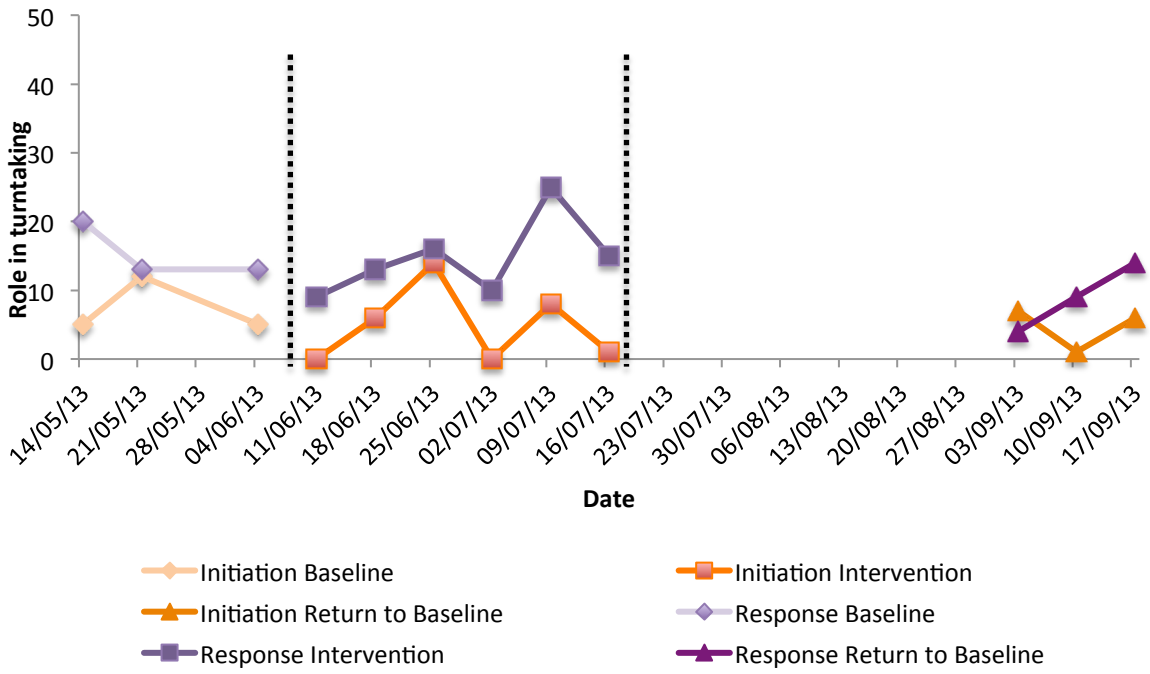
Characteristic	Visual Analysis
Level	Graph 16 shows that the mean reduced from Baseline (22.6) to Intervention (19.5) and further still in Return to Baseline (13.6).
Trend	Graph 17 shows the positive change in trend from Baseline to Intervention. With the Intervention phase having a steep positive trend line. This steep positive trend can also be seen in the Return to Baseline trend.
Variability	Graph 16 shows the somewhat small variability amongst data in Baseline (SD: 4) and Return to Baseline (SD: 5.5). The variability in the Intervention (SD: 10) was large.
Immediacy of effect	Graph 15 shows an immediate decrease from Baseline to Intervention, followed by a sharp increase. The final three data points in the Intervention and Return to Baseline are largely within the same range.
Overlap	Graph 18 shows that the majority of data within all the phases overlapped, bar two extreme high points in the Intervention.
Consistency	Graph 15 shows that data within the Baseline and Return to Baseline are somewhat different, with Faisal's total communication being lower in the Return to Baseline phase.

Table 18: A summary of the outcome of the visual analysis of Faisal's total communication attempts graphs

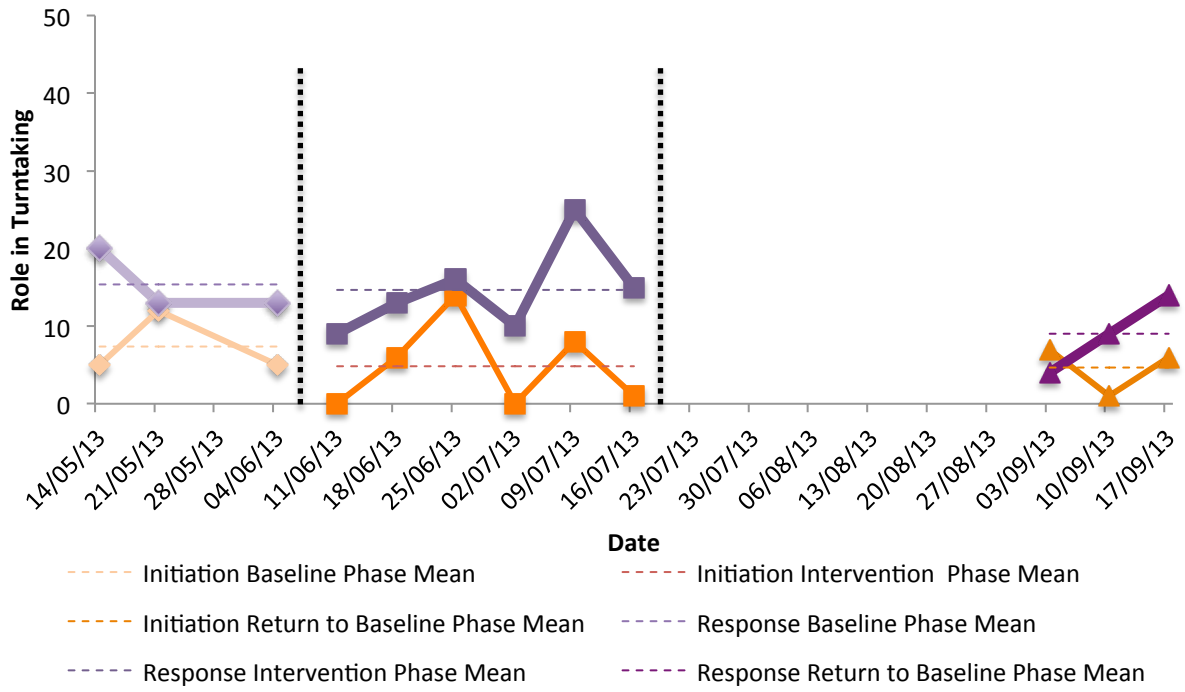
4.7.2.2. Faisal's total communication attempts: summary

The visual analysis suggests that Faisal's total communication was somewhat unstable amongst all the phases in the study. The intervention does not appear to have had a positive effect on his overall communication attempts. The changes in the trend lines suggest that some positive impact may have occurred. The researcher speculates that this change in trend line may indicate that if the intervention had been implemented for longer, and without a summer holiday, Faisal's overall communication may have increased. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (total communication attempts) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

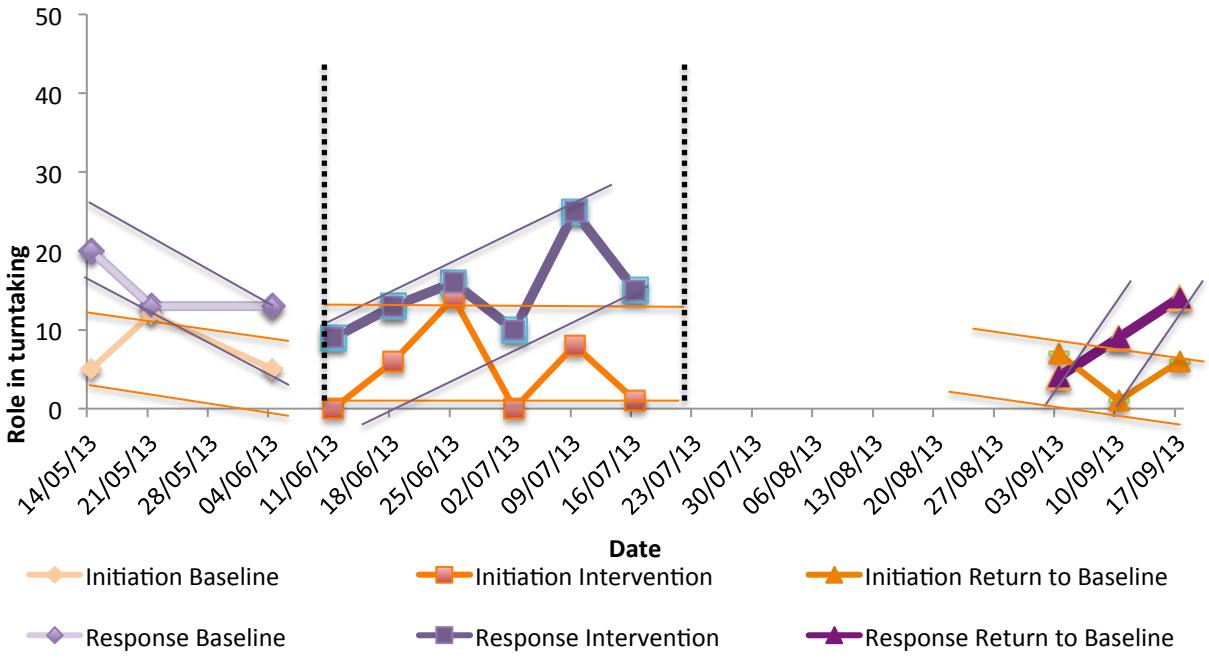
4.7.2.3. Role in turn taking: initiation & response



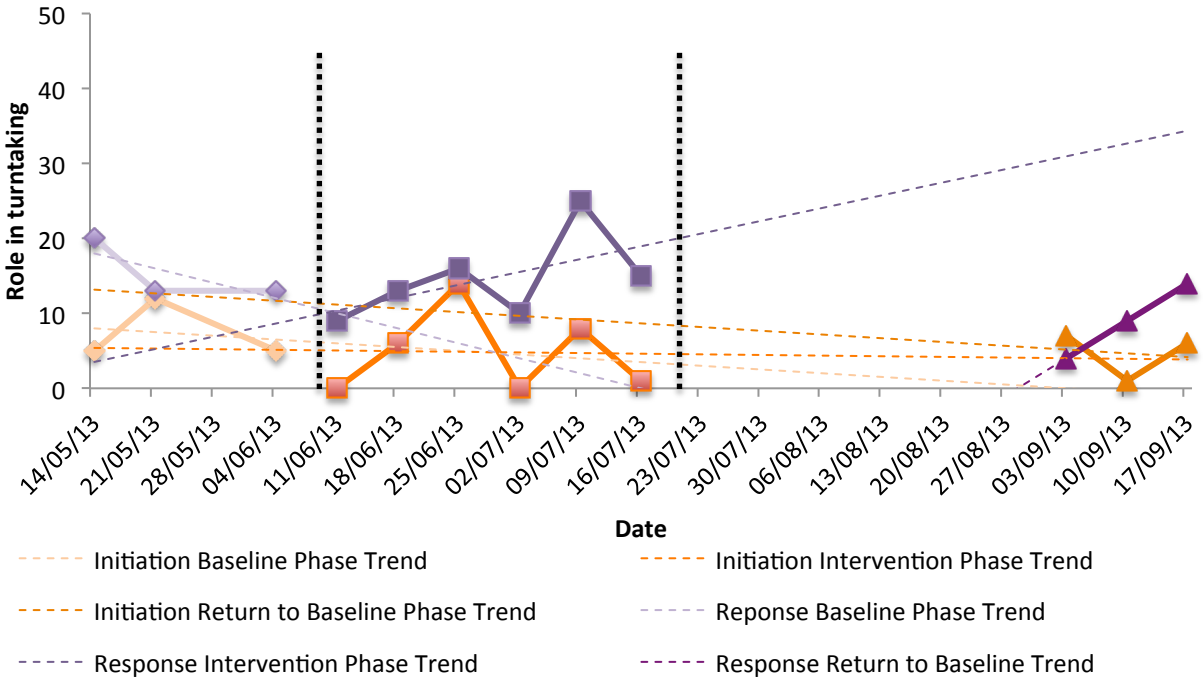
Graph 19: A line graph showing Faisal's role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



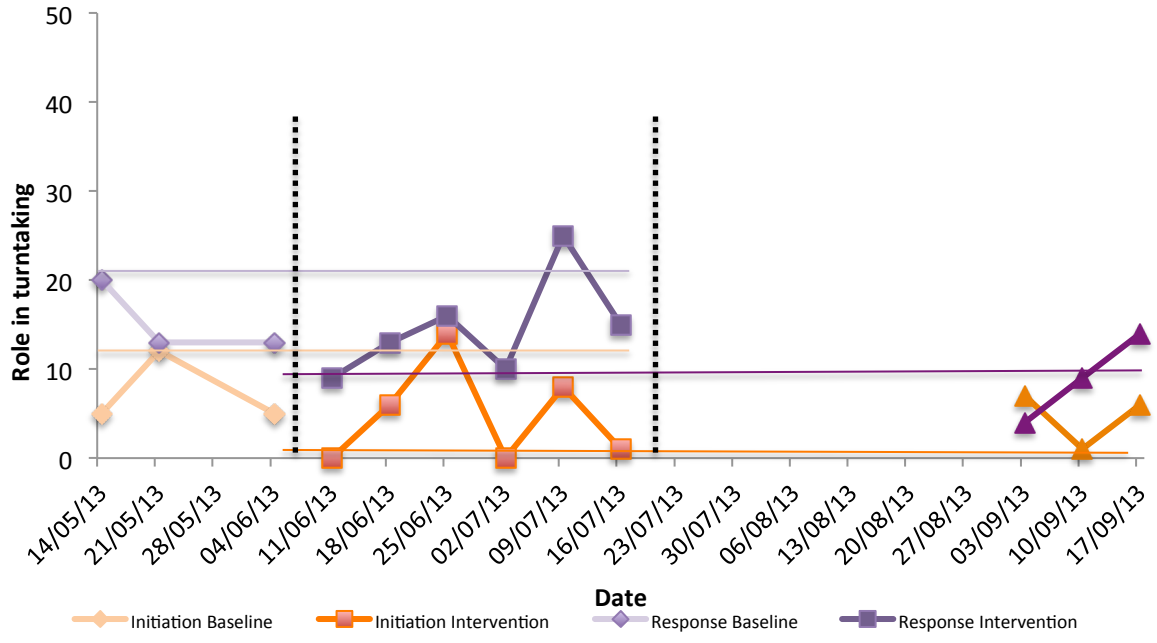
Graph 20: A line graph **mean lines** showing Faisal's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 21: A line graph with **variance lines** showing Faisal's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 22: A line graph with **trend lines** showing Faisal's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 23: A line graph with **overlap lines** showing Faisal's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 20 shows a reduction in mean from Baseline (7.3) to Intervention (4.8) and remained around the same level in Return to Baseline (4.6). *Response:* Graph 20 shows the means remained around the same level for Baseline (15.3) and Intervention (14.6). This reduced within the Return to Baseline (9).
Trend	*Initiation:* Graph 22 shows trend lines declined for all three phases. *Response:* Graph 22 shows trend lines declined within the Baseline and inclined within the Intervention and Return to Baseline.
Variability	*Initiation:* Graph 21 shows some variability within all the phases; Baseline (SD: 4), Intervention (SD: 5.6) and Return to Baseline (SD: 3.2). *Response:* Graph 21 shows some variability within all the phases; Baseline (SD: 4), Intervention (SD: 5.7) and Return to Baseline (SD: 5).
Immediacy of effect	*Initiation:* Graph 20 shows Baseline data and the first three points in the Intervention remained around the same level. This was also the case between the last three Intervention points and Return to Baseline. *Response:* Graph 20 shows Baseline data and the first three points in the Intervention phase remained around the same level. This was also the case between the last three Intervention data points and Return to Baseline.
Overlap	*Initiation:* Graph 23 shows that the majority of the data overlapped across all the phases, bar one high point in the Intervention phase. *Response:* Graph 23 shows that the majority of the data overlapped across all the phases, bar one high point in the Intervention and low point in the Return to Baseline.
Consistency	*Initiation:* Graph 19 shows some consistency between data in the Baseline and Return to Baseline, in that they are all variable within the low range. *Response:* Graph 19 shows Faisal's response attempts were higher within the Baseline than Return to Baseline phase.

Table 19: A summary of the outcome of the visual analysis of Faisal's turn taking (initiation & response) graphs

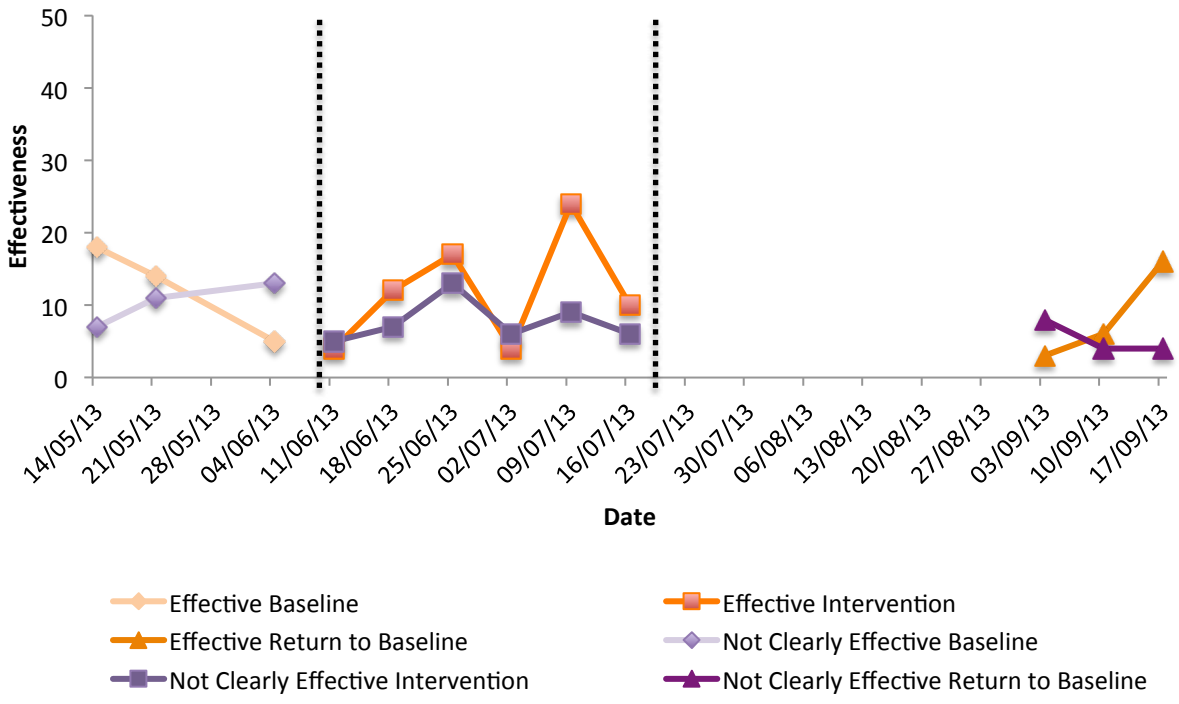
4.7.2.4. Faisal's role in turn taking: summary

The visual analysis indicates that overall Faisal made more response to communication attempts than initiation attempts across the study.

His initiation attempts do not appear to have been impacted upon by the intervention and remain low along all the phases, shown in both the mean and trend lines. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Initiation) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

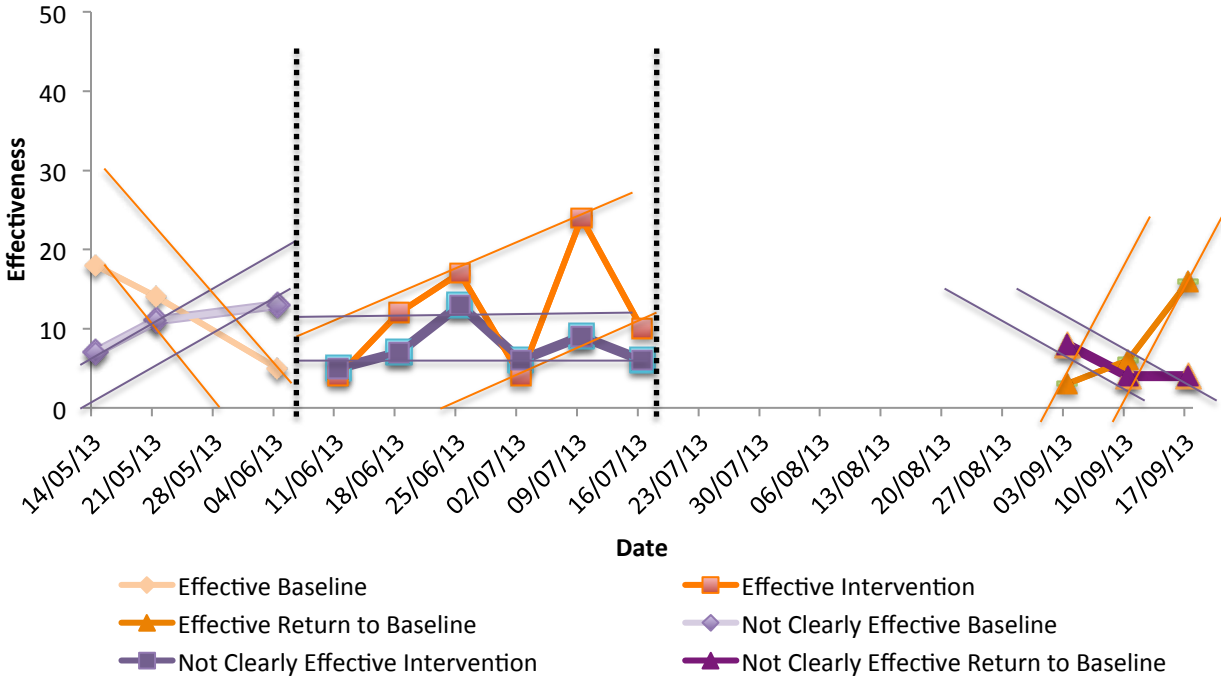
Faisal's response to communication attempts do not appear to have been greatly impacted upon by the intervention, as shown by the mean. The trend lines suggest an incline in his responses that may have continued if the intervention had been implemented for longer. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Response) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

4.7.2.5. Effectiveness: effective & not clearly effective

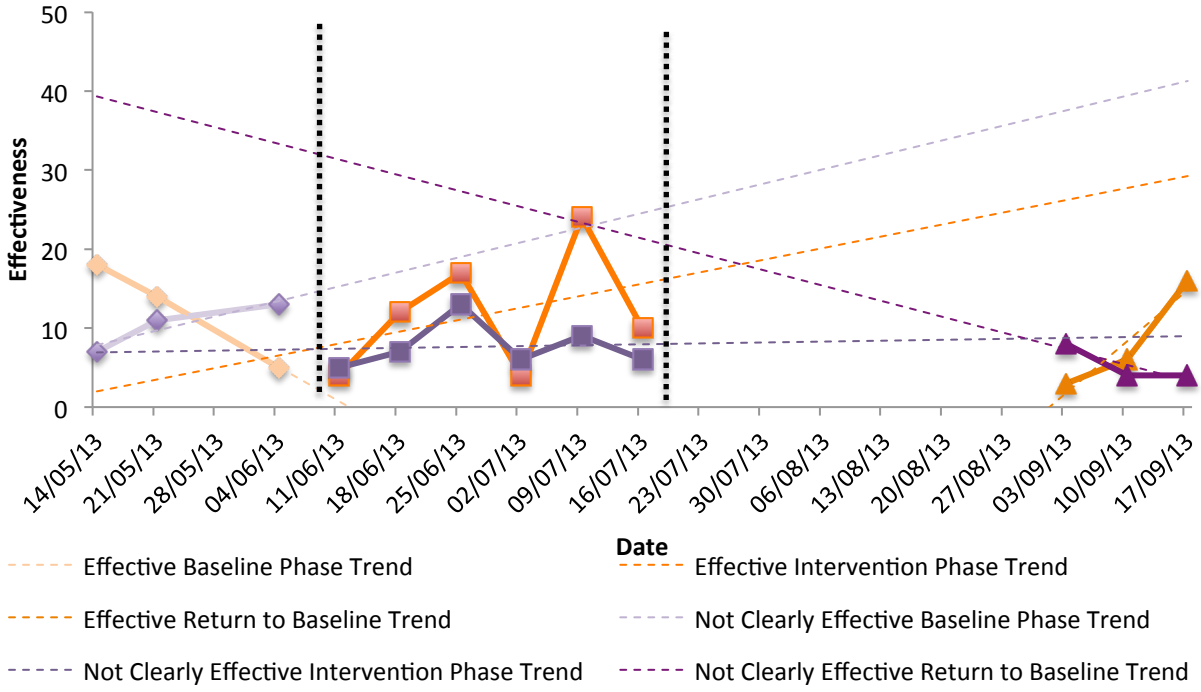


Graph 24: A line graph showing Faisal's communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

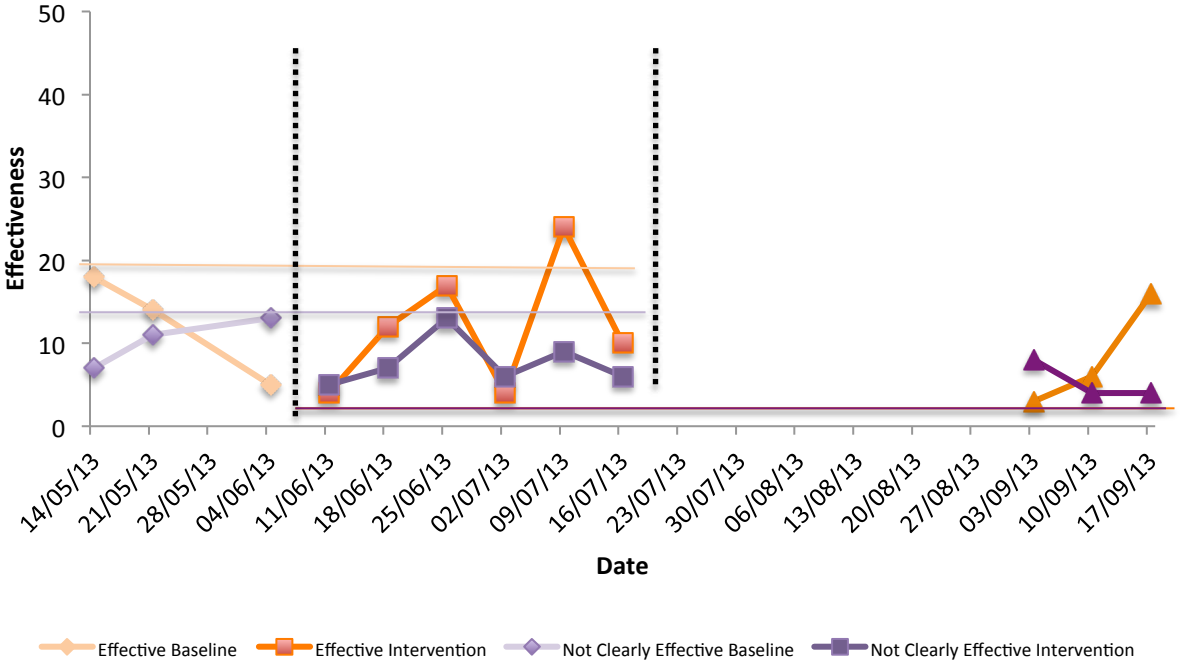
Graph 25: A line graph with **mean lines** showing Faisal's effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 26: A line graph with **variance lines** showing Faisal's turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 27: A line graph with **trend lines** showing Faisal's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 28: A line graph with **overlap lines** showing Faisal's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Effective:* Graph 25 shows the mean remained around the same level from Baseline (12.3) and Intervention (11.8) and reduced in Return to Baseline (8.3). *Not Clearly Effective:* Graph 25 shows the mean reduced from the Baseline (10.3) to Intervention (7.6) and then Return to Intervention (5.3) phases.
Trend	*Effective:* Graph 27 shows the trend was on a decline within Baseline, which changed to a positive incline within the Intervention and Return to Baseline. *Not Clearly Effective:* Graph 27 shows the trend line was on a steep positive incline in the Baseline and this became horizontal in the Intervention and a steep decline in the Return to Baseline phase.
Variability	*Effective:* Graph 26 shows fairly large variability within all the phases, Baseline (SD: 6.6), Intervention (SD: 7.7) and Return to Baseline (SD: 6.8). *Not Clearly Effective:* Graph 26 shows small variability across all phases, Baseline (SD: 3), Intervention (SD: 2.9) and Return to Baseline (SD: 2.3).
Immediacy of effect	*Effective:* Graph 24 shows limited change in level between Baseline and the first three data points in the Intervention. The level somewhat reduced between the last three points in Intervention and Return to Baseline. *Not Clearly Effective:* Graph 24 shows some decrease in level between Baseline and the first three data points in the Intervention. This reduced slightly between the last three data points and Return to Baseline.
Overlap	*Effective:* Graph 28 shows that the majority of data overlapped within all three phases, bar one high data point in the Intervention phase. *Not Clearly Effective:* Graph 28 shows all data overlapped across all phases.
Consistency	*Effective:* Graph 24 shows some consistency between Baseline and Return to Baseline, although variability was fairly large within both data sets. *Not Clearly Effective:* Graph 24 shows little consistency between the Baseline and Return to Baseline phase. With not clearly effective communication being higher in the Baseline phase.

Table 20: A summary of the outcome of the visual analysis of Faisal's effectiveness (effective & not clearly effective) graphs

4.7.2.6. Faisal's effectiveness: summary

The visual analysis shows that overall Faisal had more effective than not clearly effective communication within all the phases.

The intervention does not appear to have greatly affected the effectiveness of Faisal's communication, although changes in trend lines suggest that if the intervention had been implemented for longer and without the school holidays then a positive effect may have occurred. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Effectiveness: Effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

The intervention appears to have had a small positive effect on his not clearly effective communication, as this appears to reduce from Baseline to Intervention and Return to Baseline, shown by the mean and trend lines. Although the amount of overlapping data suggests this effect is only small. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* to Research Question 1 and 2 (Effectiveness: Effective) as three demonstrations of an effect (level, trend, immediacy of effect) and at least one demonstration of a non-effect can be seen.

4.7.3. Descriptive data – mode of communication

	Baseline		**Intervention**		**Return to Baseline**	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	13.33	29.41	13.33	30.42	8.00	31.58
Gesture	4.00	8.82	8.33	19.01	6.00	23.68
Graphic	7.67	16.91	6.33	14.45	0.00	0.00
Vocalisation	0.00	0.00	2.50	5.70	0.67	2.63
Speech: one word utterance	3.00	6.62	4.00	9.13	2.33	9.21
Speech: 2/3 words	6.67	14.71	3.83	8.75	3.33	13.16
Speech: flowing speech	10.67	23.53	5.50	12.55	5.00	19.74

Table 21: Descriptive data of Faisal's mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data above suggests that Faisal's main mode of communication within the Baseline phase was eye contact, graphic and flowing speech. His eye contact remained around the same percentage throughout all phases. His use of graphics also remained around the same percentage within Baseline and Intervention but reduced completely within the Return to Baseline phase. Faisal's flowing speech reduced in the

Intervention, but increased greatly in the Return to Baseline phase. His use of gestures increased within both the Intervention and Return to Baseline phases.

4.7.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	2.6	3.9	+ 1.5	3.9	3.8	- 0.1
Social Initiative	2.7	3.5	+ 0.8	3.5	2.8	- 0.7
Overall	2.6	3.7	+ 1.1	3.7	3.4	- 0. 3

Table 22: Faisal's class teacher's scores on the Social Competency Inventory pre, post and delayed

Home perceptions (Mother);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	2.8	3.7	+ 0.9	3.7	3.7	0
Social Initiative	3.4	3.3	- 0.1	3.3	3.2	- 0.1
Overall	2.8	3.5	+ 0.7	3.5	3.4	- 0.1

Table 23: Faisal's parent's scores on the Social Competency Inventory pre, post and delayed

4.7.4.1. Faisal's SCI scores: summary

Table 22 shows that Faisal's teacher's perceptions of his pro-social orientation and social initiative behaviour increased after the intervention was introduced. This positive change was larger for his pro-social orientation skills than his social initiative behaviours. Positive perceptions reduced slightly for his pro-social orientation after the intervention was withdrawn and returned to the same level as before the intervention for his social initiative skills.

Table 23 shows that Faisal's parent's perceptions of his pro-social orientation skills increased and remained at the same level after the intervention was withdrawn. A slight decline in perceptions of his social initiative skills was shown when the intervention was introduced and remained at this same level after the intervention was withdrawn.

4.7.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*	Post	Delayed	*Difference*
Belonging Scale	3	2.5	- 0.5	2.5	2.8	+ 0.3

Table 24: Faisal's self-reported scores on the Belonging Scale pre, post and delayed

4.7.5.1. Faisal's BS scores: summary

Table 24 shows a small decrease in Faisal's self-reported sense of school belonging after the intervention. This increased after the intervention was withdrawn and surpassed his self-reported measure before the intervention was introduced.

4.8. Data Analysis – Taimoor

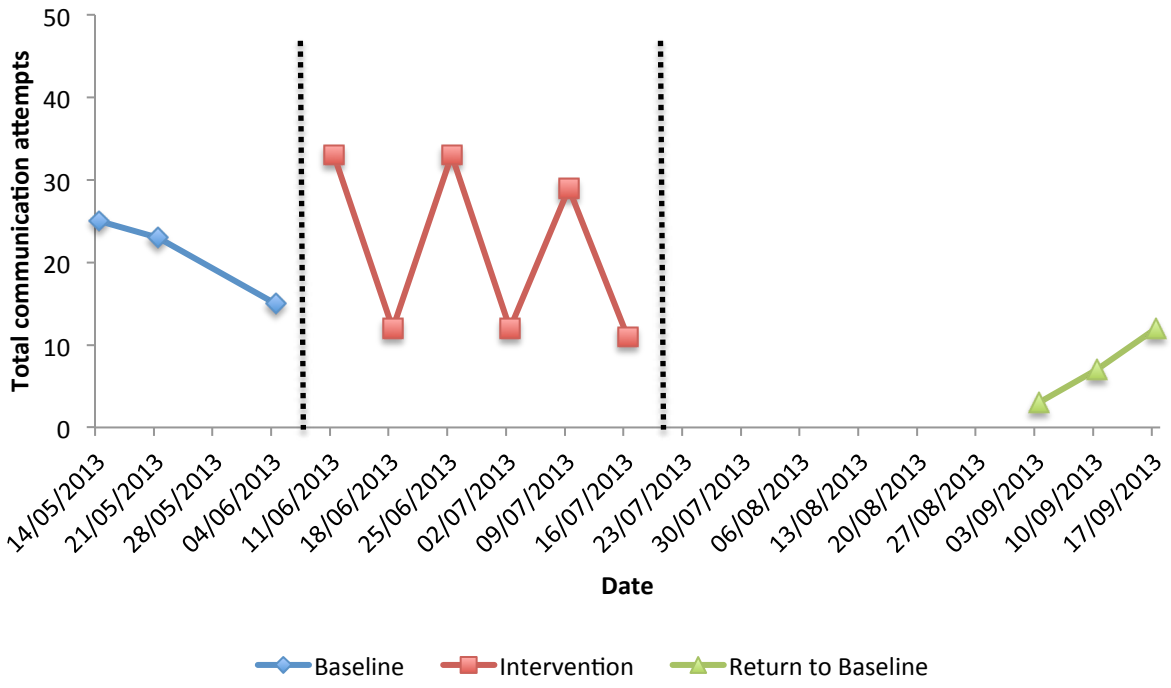
4.8.1. Taimoor's profile

Gender: Male **Age (at start of study):** 6 years 10 months

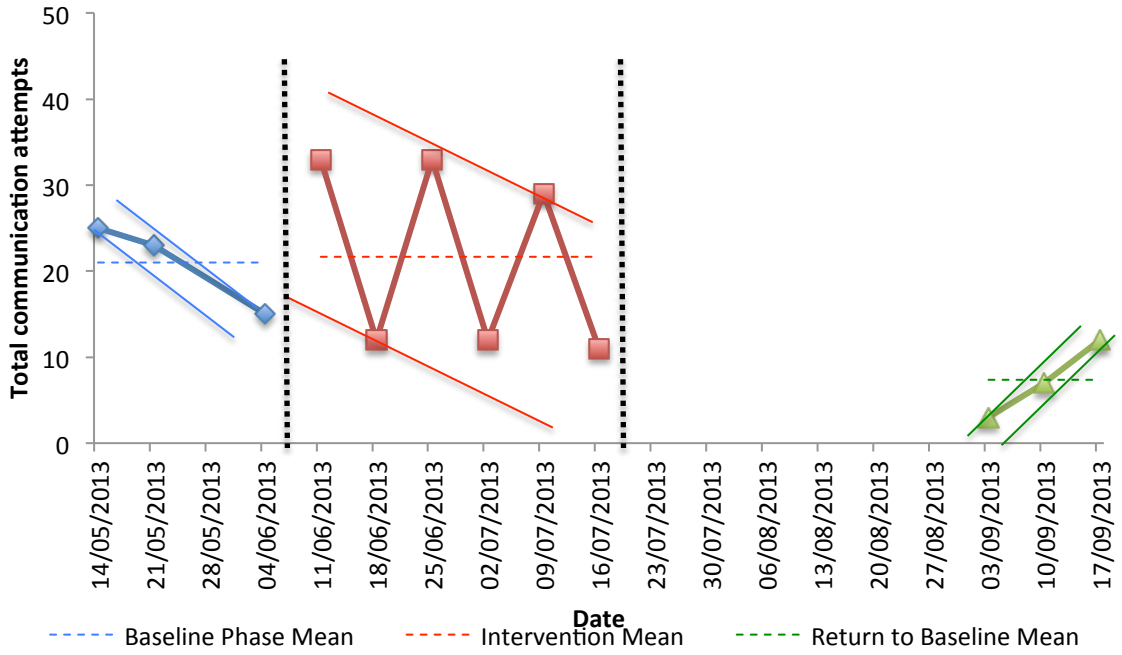
The school SENCo described Taimoor as having tendencies that are related to ASD. They reported that Taimoor had difficulty with his social skills and social interaction and can be quite passive with his peers. He is said to be very shy and will only interact with staff or other pupils when others initiate this. During the baseline and intervention phases of the study Taimoor attended a nurture base class within a primary school which caters for pupils with additional learning and social needs. Within the Return to Baseline phase Taimoor was in a mainstream classroom.

4.8.2. SCED graphs

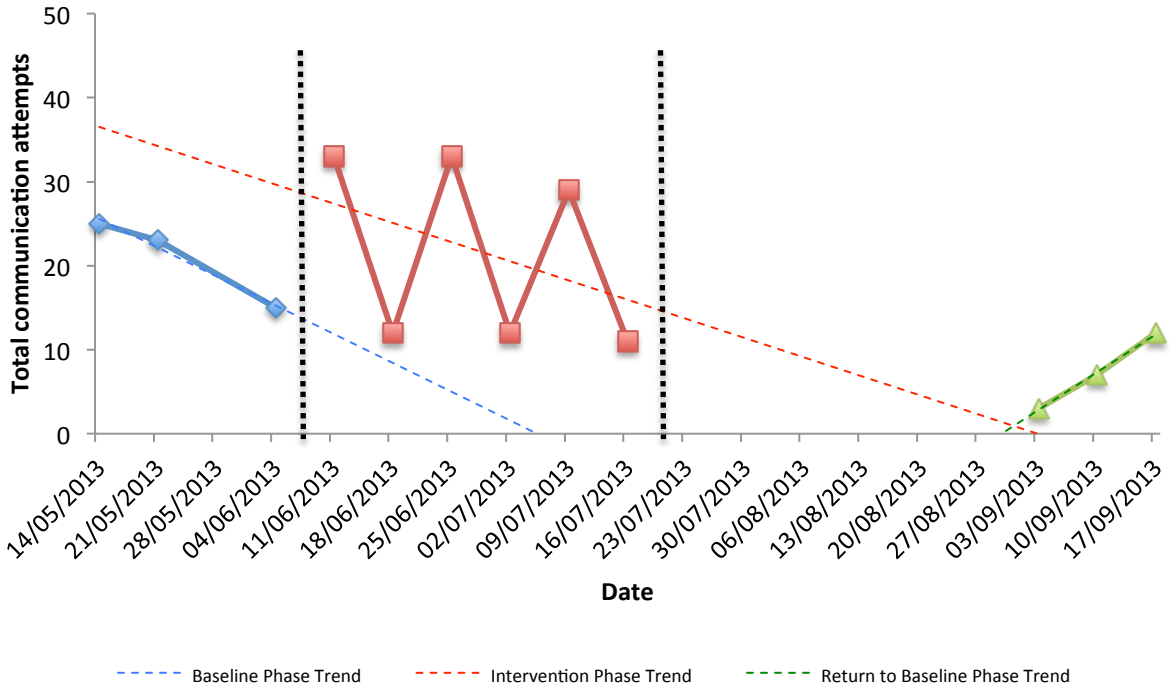
4.8.2.1. Total communication attempts



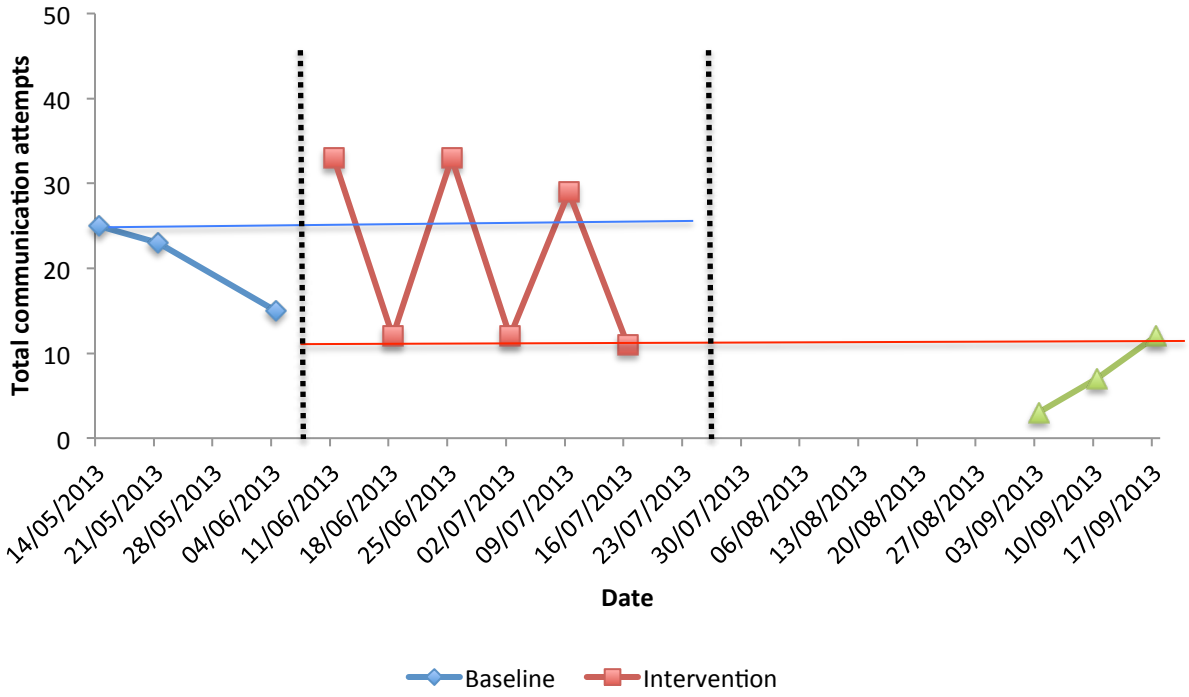
Graph 29: A line graph showing Taimoor's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 30: A line graph with **mean and variance lines** showing Taimoor's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 31: A line graph with **trend lines** showing Taimoor's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 32: A line with **overlap lines** showing Taimoor's total communication attempts across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	Graph 30 show that the mean remained around the same level in Baseline (21) and Intervention (21.6), and reduces within Return to Baseline (7.3).
Trend	Graph 31 shows a steep negative trend within both Baseline and Intervention, whilst a fairly steep incline trend is shown in the Return to Baseline.
Variability	Graph 30 shows some variance in data within Baseline (SD: 5.2) and Return to Baseline (SD: 4.5). However, a large variation can be seen within the Intervention (SD: 11).
Immediacy of effect	Graph 29 shows that the Baseline data points fit within the large variation of data in the first three data points in the Intervention. A large drop in communication can be seen from the final Intervention data points and Return to Baseline.
Overlap	Graph 32 shows that all data in the Baseline overlapped with half the data in the Intervention. Only one data point in the Return to Intervention overlapped with the Intervention.
Consistency	Graph 29 shows no consistency between Baseline and Return to Baseline data, with the amount of communication attempts being greater in the Baseline phase.

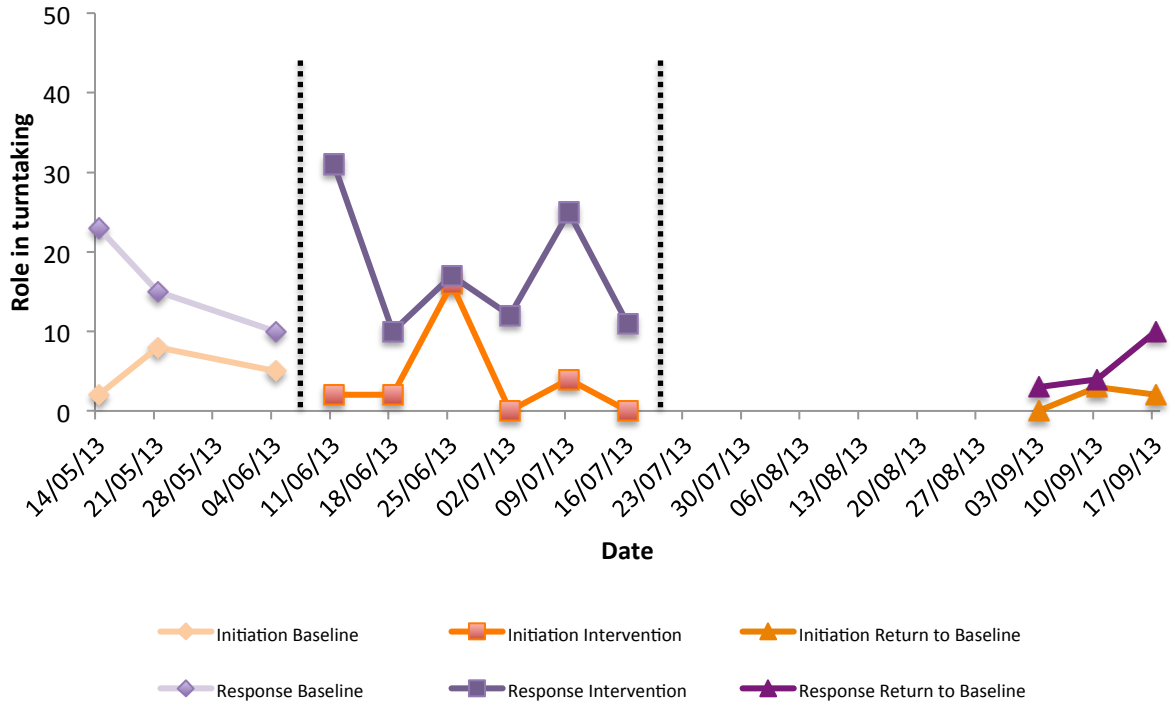
Table 25: A summary of the outcome of the visual analysis of Taimoor's total communication attempts graphs

4.8.2.2. Taimoor's total communication attempts: summary

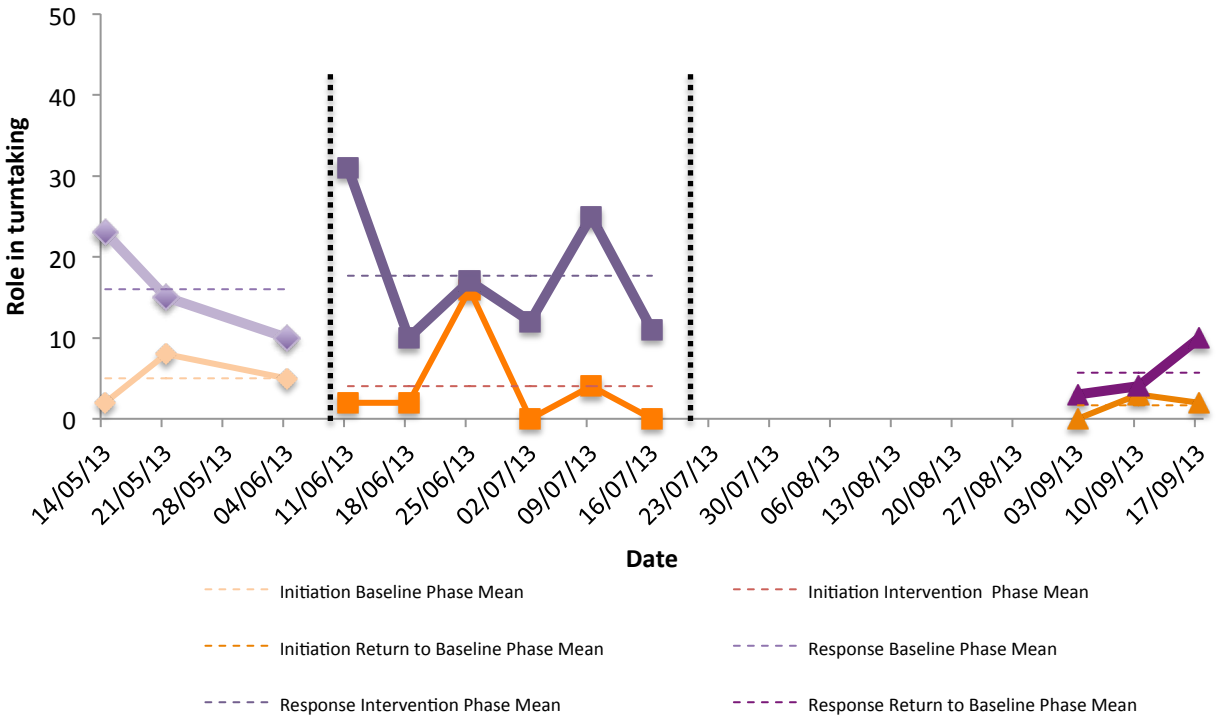
The visual analysis shows that the intervention did not appear to have an effect on Taimoor's total communication attempts. His communication within the Intervention phase appears very variable and trend lines suggest this variability might have continued even with further intervention and without the school holidays.

According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Total Communication Attempts) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

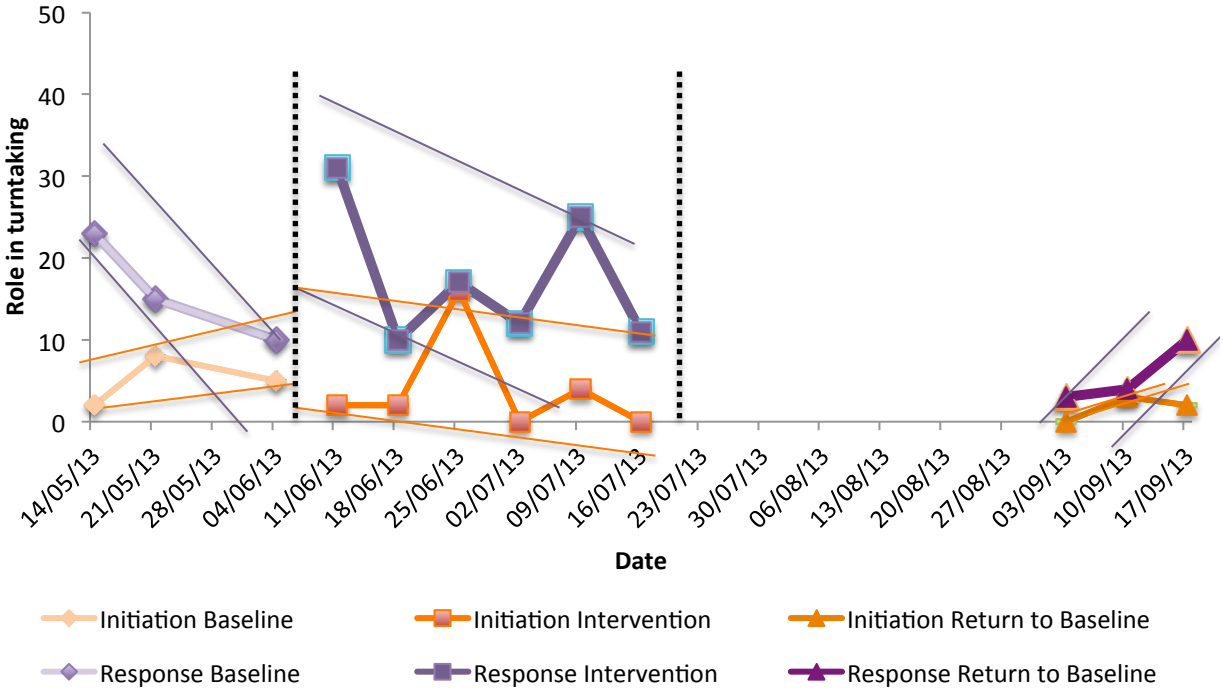
4.8.2.3. Role in turn taking: initiation & response



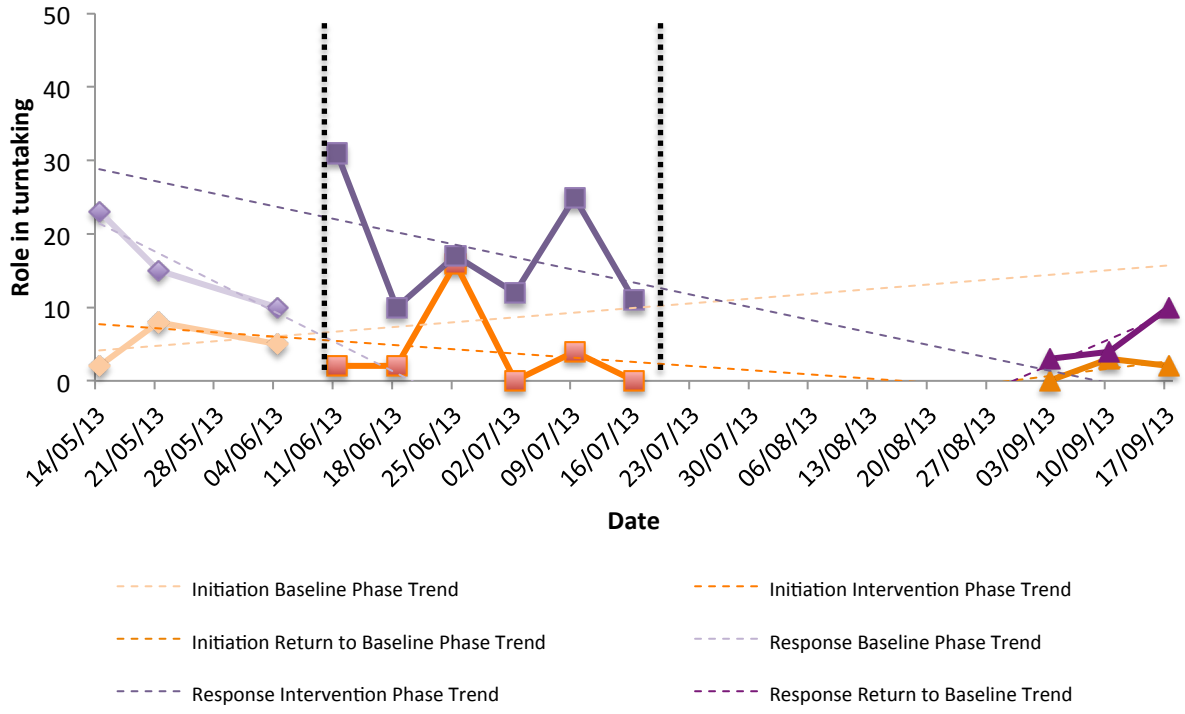
Graph 33: A line graph showing Taimoor's role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



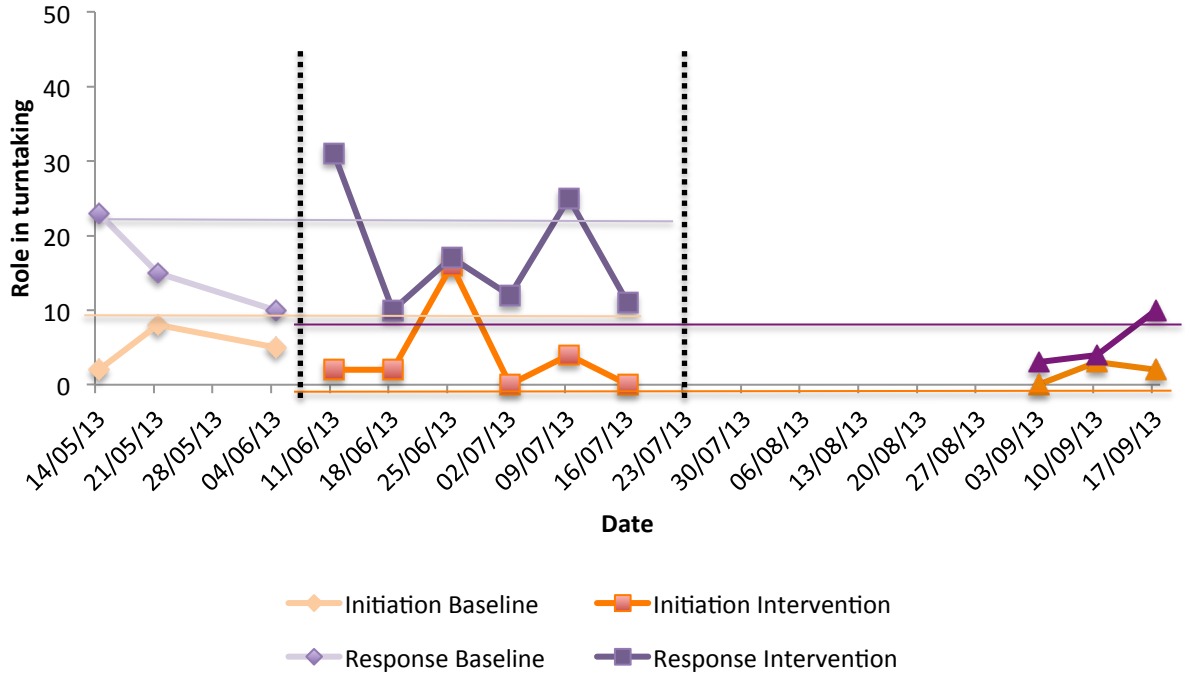
Graph 34: A line graph with **mean lines** showing Taimoor's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 35: A line graph with **variance lines** showing Taimoor's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 36: A line graph with **trend lines** showing Taimoor's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 37: A line graph with **overlap lines** showing Taimoor's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 34 shows the mean remained around the same level in Baseline (5) and Intervention (4). This low level dropped further in Return to Baseline (1.6). *Response:* Graph 34 shows that the mean increased slightly from Baseline (16) to Intervention (17.6). This high level dropped very low in Return to Baseline (5.6).
Trend	*Initiation:* Graph 36 shows the trend line changed from a slight incline slope to a slight declining slope within the Intervention. The Return to Baseline trend is of a positive slope. *Response:* Graph 36 shows a severe declining slope within the Baseline, which becomes less severe within the Intervention. The Return to Baseline phase had an inclining slope.
Variability	*Initiation:* Graph 35 shows low variability in Baseline (SD: 3) and Return to Baseline (SD: 1.5), whilst the variability in the Intervention (SD: 6) was fairly high. *Response:* Graph 35 shows a fairly high level of variability within both Baseline (SD: 6.5) and Intervention (SD: 8.5), whilst low variability was shown within the Return to Baseline (SD: 3.7).
Immediacy of effect	*Initiation:* Graph 33 shows a drop in level between Baseline and the first two points in the Intervention, followed by a high incline. Data within the final three points in the Intervention and Return to Baseline phase remained around the same level. *Response:* Graph 33 shows the high variability of data within the Baseline and initial points in the Intervention. A sudden incline in Taimoor's response attempts is shown after the introduction of the intervention, but reduces back after. A clear decline in Taimoor's responses can be seen from Intervention to Return to Baseline.
Overlap	*Initiation:* Graph 37 shows that the majority of data within the initiation phases overlapped, except for a high point within the Intervention. *Response:* Graph 37 shows that all the Baseline points overlapped with the Intervention points. The rest of the data does not overlap.

Consistency	*Initiation:* Graph 33 shows some consistency in data between Baseline and Return to Baseline. *Response:* Graph 33 shows little consistency between Baseline and Return to Baseline. Taimoor's responses being higher in the Baseline phase.

Table 26: A summary of the outcome of the visual analysis of Taimoor's turn taking (initiation & response) graphs

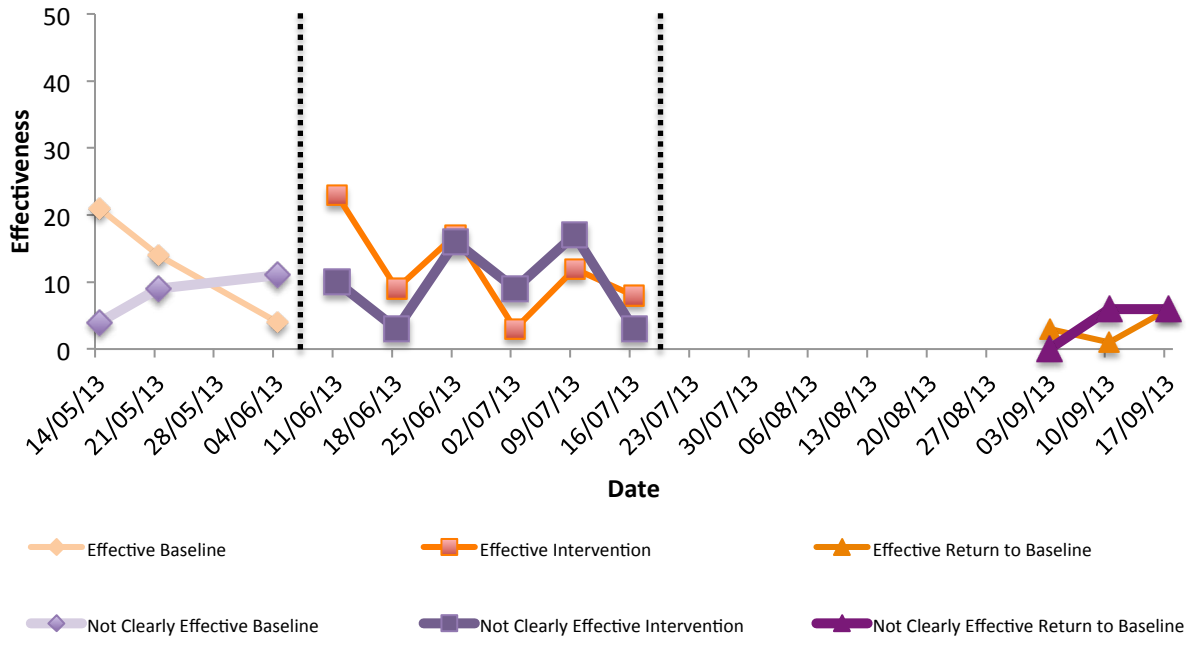
4.8.2.4. Taimoor's role in turn taking: summary

Visual analysis of the data suggests that overall Taimoor engaged in more response to communication than initiation of communication throughout all the phases.

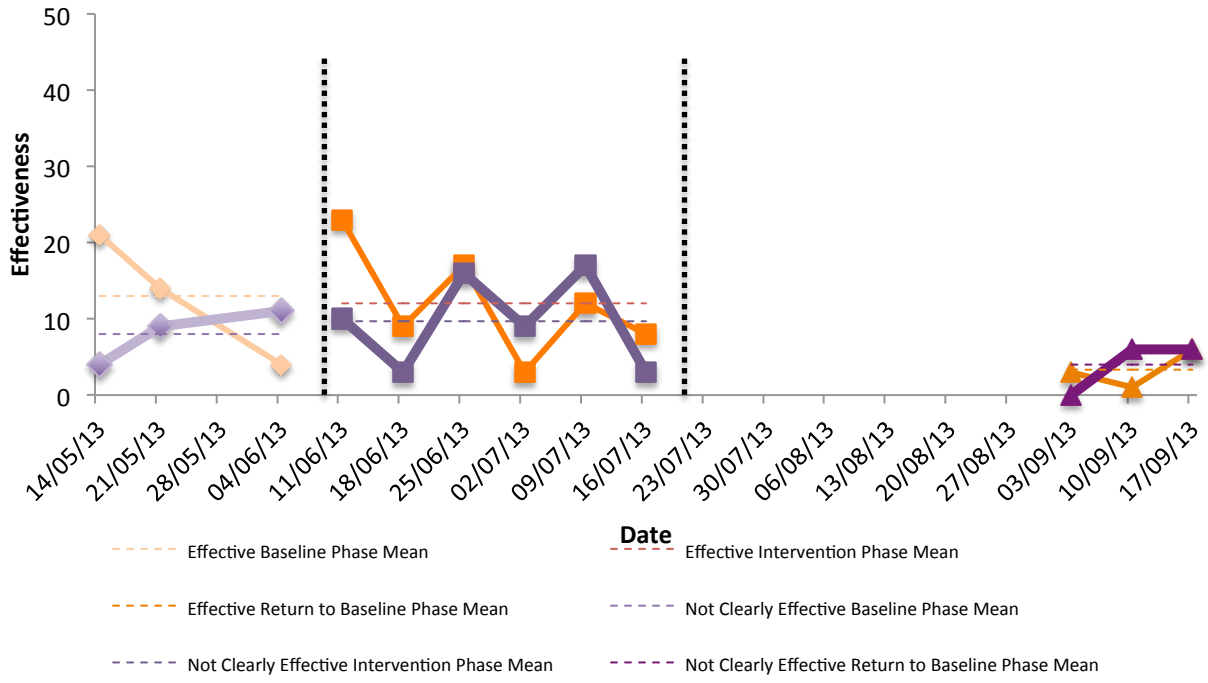
His initiation of communication does not appear to have been affected by the introduction of the intervention, as its frequency remained low throughout the majority of the intervention and Return to Baseline phases. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Initiation) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

Taimoor's response to communication attempts also does not appear to have been greatly impacted upon by the intervention. The slight change in mean and slope line indicates a very small improvement to this skill within the Intervention phase. Although any positive impact does not appear to have maintained over the summer holidays and within the Return to Intervention phase. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* to Research Question 1 (Role in turn taking: Response) as three demonstrations of an effect (level, trend, immediacy of effect, overlap) and at least one demonstration of a non-effect can be seen. *No Evidence* was shown for Question 2.

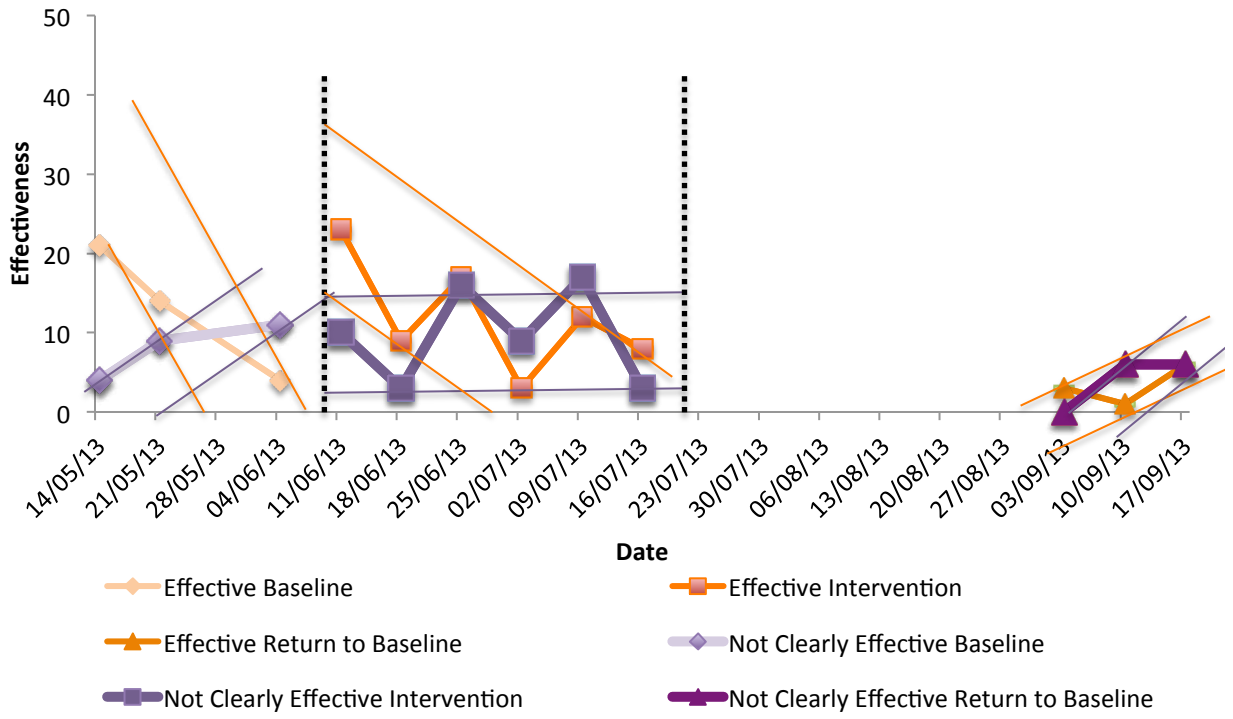
4.8.2.5. Effectiveness: effective & not clearly effective



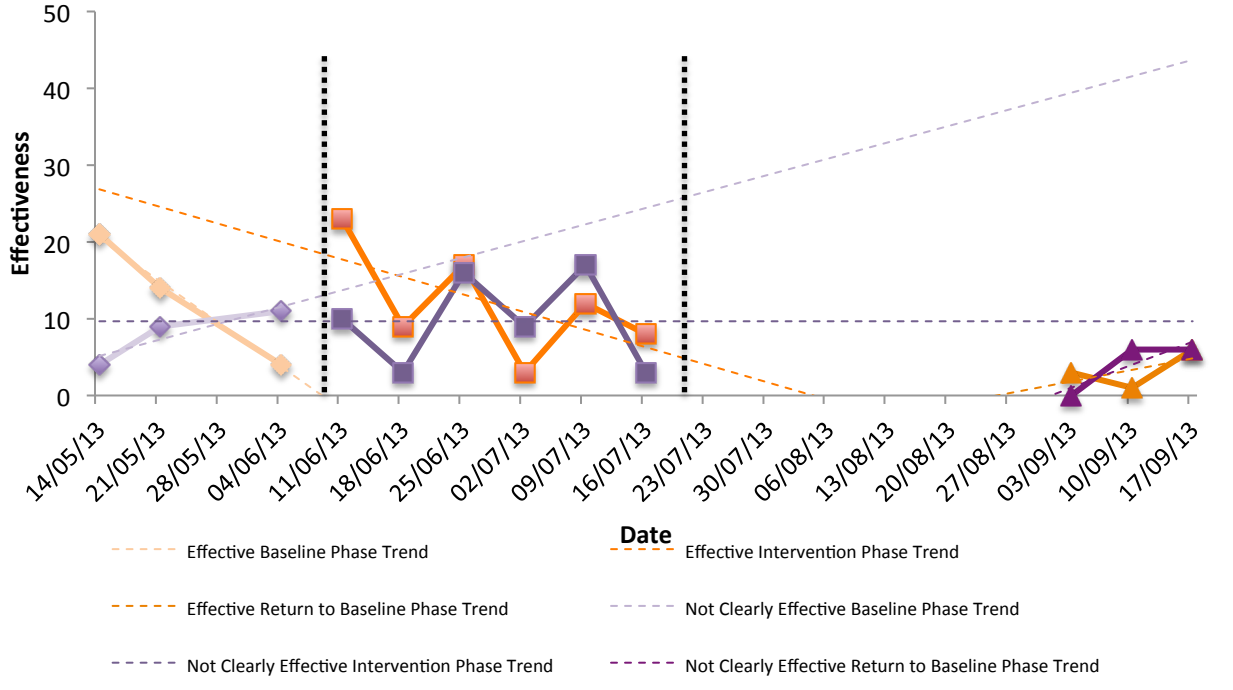
Graph 38: A line graph showing Taimoor's communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



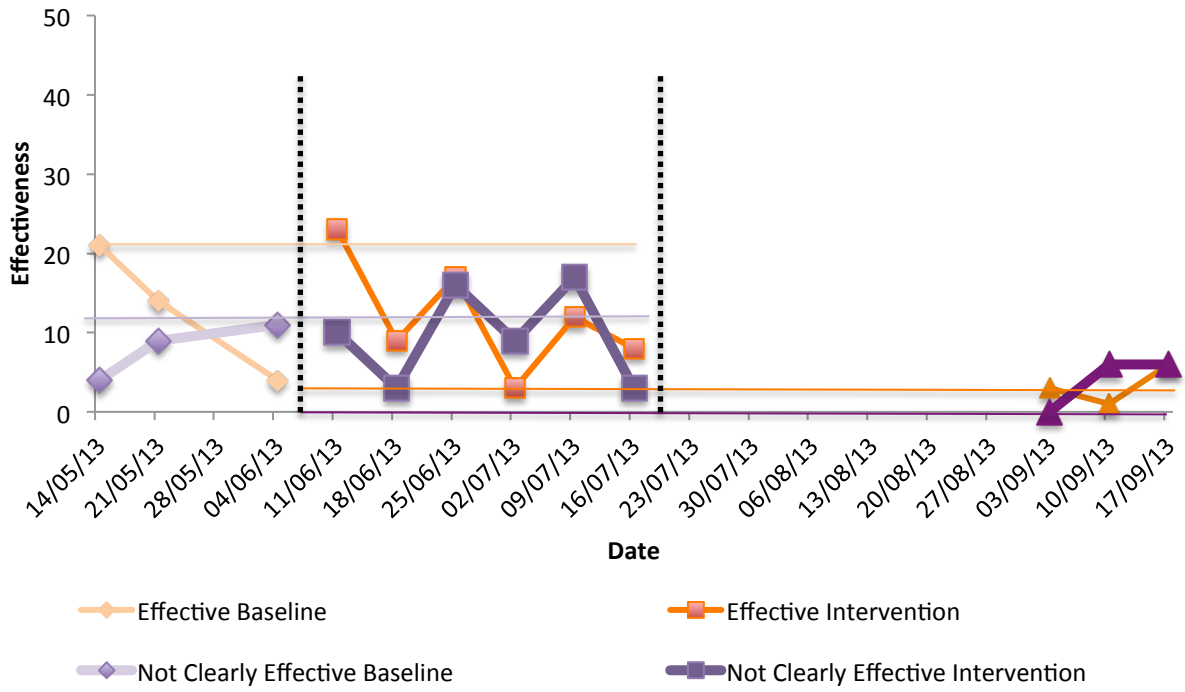
Graph 39: A line graph with **mean lines** showing Taimoor's effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 40: A line graph with **variance lines** showing Taimoor's turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 41: A line graph with **trend lines** showing Taimoor's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 42: A line graph with **overlap lines** showing Taimoor's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	**Visual Analysis**
Level	*Effective:* Graph 39 shows that the mean remained around the same level within the Baseline (13) and Intervention (12). This reduced dramatically in the Return to Baseline (3.3). *Not Clearly Effective:* Graph 39 shows that the mean remained around the same level within Baseline (8) and Intervention (9.6). This reduced dramatically in the Return to Baseline (4).
Trend	*Effective:* Graph 41 shows a declining slope within both the Baseline and Intervention, this being slightly less steep in the Intervention. The trend within the Return to Baseline had a slight incline. *Not Clearly Effective:* Graph 41 shows the steep incline trend in Baseline became more horizontal within the Intervention. The trend within the Return to Baseline had a slight incline.
Variability	*Effective:* Graph 40 shows a fairly high level of variability within Baseline (SD: 8.5) and Intervention (7), but was low (SD: 3.4) in the Return to Baseline.

	Not Clearly Effective: Graph 40 shows low variability in the data for both Baseline (SD: 3.6) and Return to Baseline (SD: 3.4) phases, with a slightly high variability in data within the Intervention (SD: 6) phase.
Immediacy of effect	*Effective:* Graph 38 shows the variability amongst the data in Baseline to Intervention was fairly similar. A sudden increase from Baseline to Intervention can be seen, followed by a decline. A decline from the final data points in Intervention to Return to Baseline can also be seen. *Not Clearly Effective:* Graph 38 shows there was no immediate effect from Baseline to the first two data points in Intervention, however an increase occurred in the third data point. A decline in level from the final data points in Intervention phase to the Return to Baseline can be seen.
Overlap	*Effective:* Graph 42 shows that all the data points in the different phases overlapped. *Not Clearly Effective:* Graph 42 shows that the majority of the data points, bar two high points in the Intervention phase overlapped.
Consistency	*Effective:* Graph 38 shows little consistency in the Baseline and Return to Baseline phase. With data generally being higher in the baseline phase. *Not Clearly Effective:* Graph 38 shows consistency in the Baseline and Return to Baseline phase.

Table 27: A summary of the outcome of the visual analysis of Taimoor's effectiveness (effective & not clearly effective) graphs

4.8.2.6. Taimoor's effectiveness: summary

Visual analysis suggests that effectiveness of Taimoor's communication is variable and that his effective communication marginally outweighs his not clearly effective communication.

The intervention does not appear to have positively impacted on his effective communication. There appeared to be an immediate improvement in his effectiveness of his communication, however this improvement was short-lived and declined throughout the Intervention and Return to Baseline phase. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Effectiveness: Effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

Taimoor's not clearly effective communication appears to have remained around the same level. Analysis of trend lines suggests that without the intervention his not clearly effective communication may have increased, as opposed to being maintained at the same level. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Effectiveness: Not clearly effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

4.8.3. Descriptive data – mode of communication

	Baseline		**Intervention**		**Return to Baseline**	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	15.67	38.21	13.33	29.74	5.33	36.36
Gesture	7.00	17.07	7.50	16.73	4.33	29.55
Graphic	3.00	7.32	5.00	11.15	0.00	0.00
Vocalisation	2.00	4.88	3.50	7.81	1.33	9.09
Speech: one word utterance	1.67	4.07	4.33	9.67	0.00	0.00
Speech: 2/3 words	4.67	11.38	6.33	14.13	2.33	15.91
Speech: flowing speech	7.00	17.07	4.83	10.78	1.33	9.09

Table 28: Descriptive data of Taimoor's mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data suggests that Taimoor's main mode of communication within the Baseline phase was eye contact, gesture and flowing speech. His use of eye contact reduced within the Intervention phase but increased within the Return to Baseline phase. His use of gestures remained around the same percentage within Baseline and Intervention but increased within the Return to Baseline phase. Taimoor's flowing speech reduced in the Intervention and Return to Baseline phases, but his use of 2/3 words speech increased in the Intervention and Return to Baseline phase.

4.8.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	1.7	3.5	+ 1.8	3.5	2.2	- 1.3
Social Initiative	2.7	3	+ 0.3	3	2.7	- 0.3
Overall	2	3.2	+ 1.2	3.2	2.2	- 1

Table 29: Taimoor's class teacher's scores on the Social Competency Inventory pre, post and delayed

Home perceptions (Mother);

SCI	Pre	Post	*Difference*	Post	Delayed	*Difference*
Prosocial Orientation	3.5	3.2	- 0.3	3.2	2.5	- 0.7
Social Initiative	3.4	3.4	0	3.4	2.6	- 0.8
Overall	3.4	3.1	- 0.3	3.1	2.4	- 0. 7

Table 30: Taimoor's parent's scores on the Social Competency Inventory pre, post and delayed

4.8.4.1. Taimoor's SCI scores: summary

Table 29 shows that Taimoor's teacher's perceptions of his pro-social orientation and social initiative behaviour increased after the intervention was introduced. This positive change was larger for his pro-social orientation skills than his social initiative behaviours. Positive perception's reduced greatly for his pro-social orientation after the intervention was withdrawn and returned to the same level as before the intervention for his social initiative skills.

Table 30 shows that Taimoor's parent's perceptions of his pro-social orientation skills slightly decreased immediately after the intervention and decreased further after a break from the intervention. Perceptions of his social initiative skills remained the same after the introduction of the intervention and reduced somewhat after the break from intervention.

4.8.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*	Post	Delayed	*Difference*
Belonging Scale	2.9	2.5	- 0.4	2.5	2.5	0

Table 31: Taimoor's self-reported scores on the Belonging Scale pre, post and delayed

4.8.5.1. Taimoor's BS scores: summary

Table 31 shows a small decrease in Taimoor's self-reported sense of school belonging with the introduction of the intervention. This remained at the same level after the intervention was withdrawn.

4.9. Data Analysis – Chloe

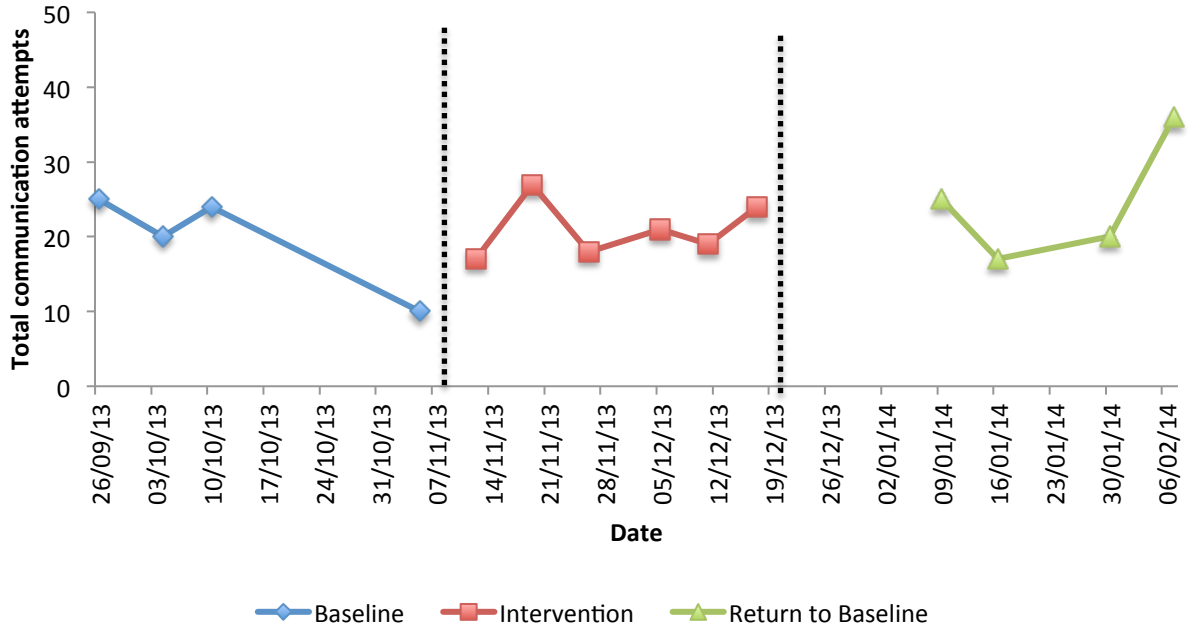
4.9.1. Chloe's profile

Gender: Female **Age (at start of study):** 8 years 11 months

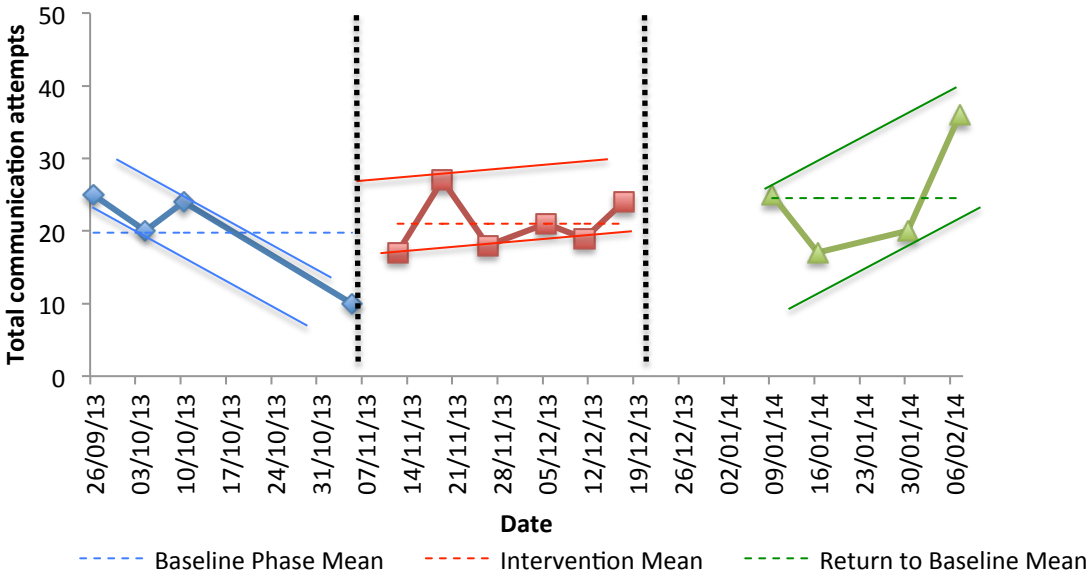
The school SENCo described Chloe as a very shy young girl. They suggested that Chloe's general interactions with both staff and particularly peers was limited, except for with one other female peer with whom she had developed a positive relationship. During all the phases in the study Chloe remained in her mainstream classroom and was able to access the whole curriculum.

4.9.2. SCED graphs

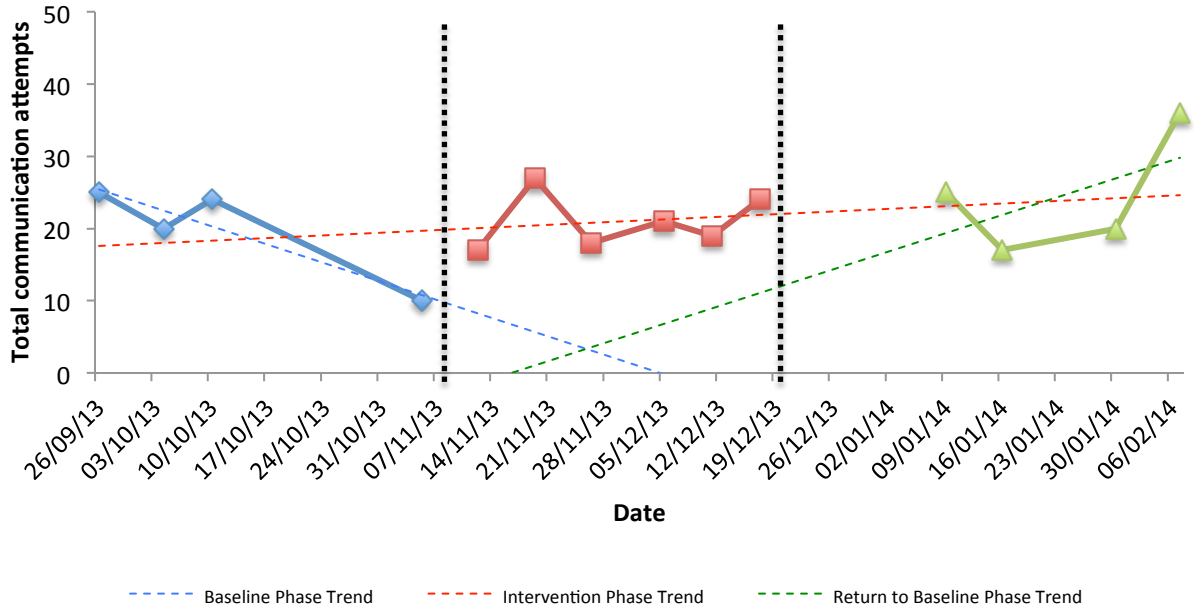
4.9.2.1. Total communication attempts



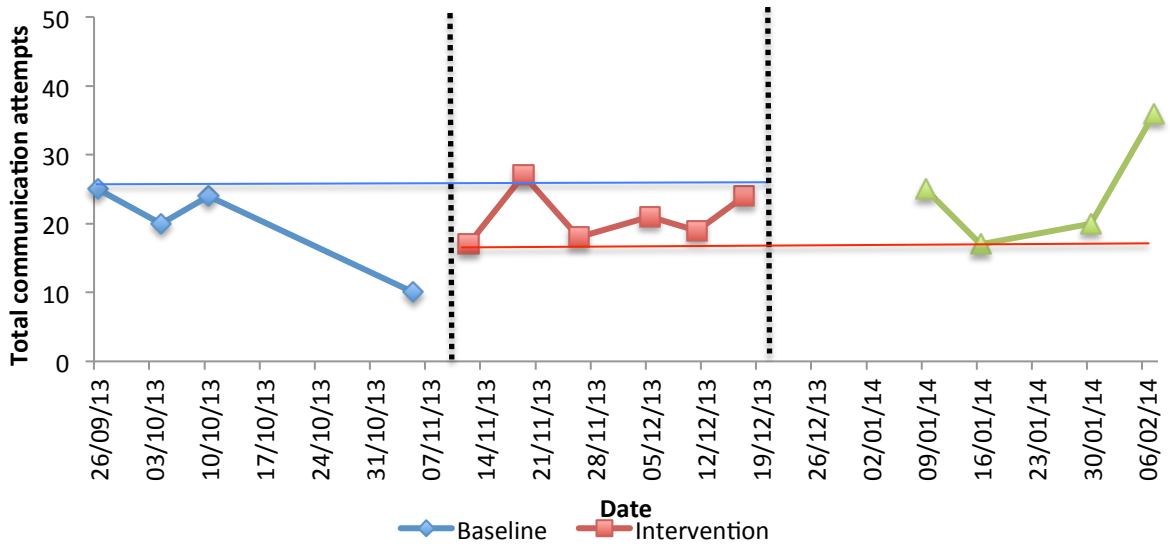
Graph 43: A line graph showing Chloe's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 44: A line with **mean and variance lines** showing Chloe's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 45: A line graph with **trend lines** showing Chloe's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 46: A line graph with **overlap lines** showing Chloe's total communication attempts across Baseline, Intervention and Return to Baseline

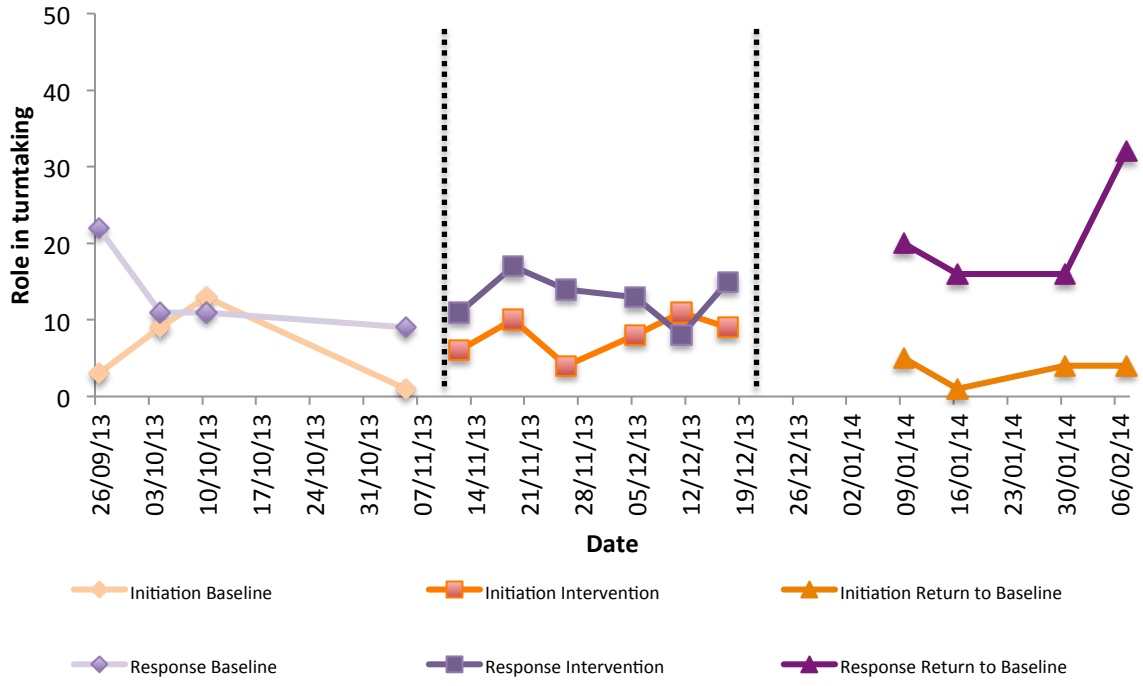
Characteristic	Visual Analysis
Level	Graph 44 shows the mean increased between Baseline (19.7) and Intervention (21). This increase was higher between Intervention (21) and Return to Baseline (24).
Trend	Graph 45 shows a change in trend from a strong decline within Baseline to a moderate incline in Intervention. The trend became a stronger incline within the Return to Baseline.
Variability	Graph 44 shows the variability within Baseline (SD: 6.8) and Return to Baseline (SD: 8.3) was fairly high, whilst variability was low within the Intervention (SD: 3.8).
Immediacy of effect	Graph 43 shows that an impact on Chloe's total communication attempts occurred after the first intervention session but then returned back to within the Baseline phase range. The removal of the intervention appears to have led to a slight immediate decrease.
Overlap	Graph 46 shows that the majority of the data overlapped in all the stages, besides a high data point within the Return to Baseline.
Consistency	Graph 43 shows some consistency between Baseline and Return to Baseline phases, besides the extreme low data point in Baseline and extreme high data point in Return to Baseline.

Table 32: A summary of the outcome of the visual analysis of Chloe's total communication attempts graphs

4.9.2.2. Chloe's total communication attempts: summary

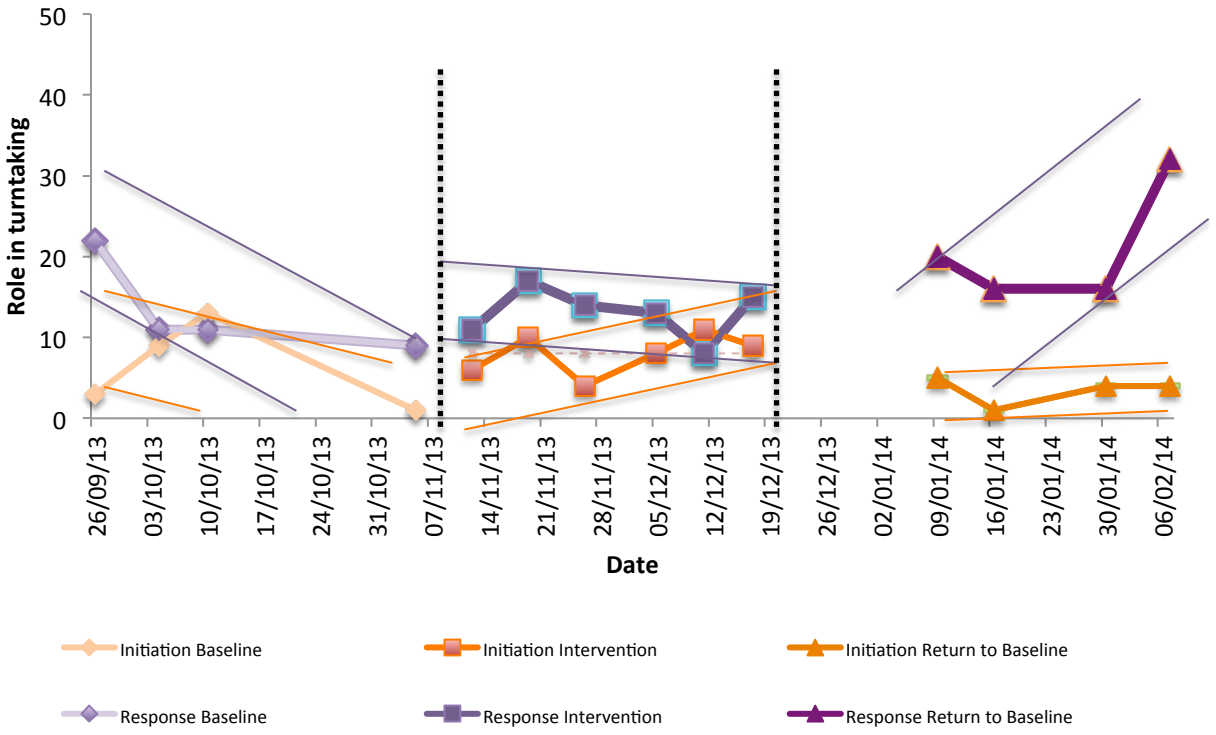
The visual analysis suggests that the intervention had a very slight positive effect upon Chloe's total communication attempts. This positive effect appears to be maintained within the Return to Baseline phase where it slightly increases still. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 (Total Communication attempts) as three demonstrations of an effect (level, trend, variability, immediacy of effect) and at least one demonstration of a non-effect can be seen. It also provided *Moderate Evidence* which can be used to answer Research Question 2 (Total Communication attempts) as three demonstrations of an effect (level, trend, overlap) and at least one demonstration of a non-effect can be seen.

4.9.2.3. Role in turn taking: initiation & response

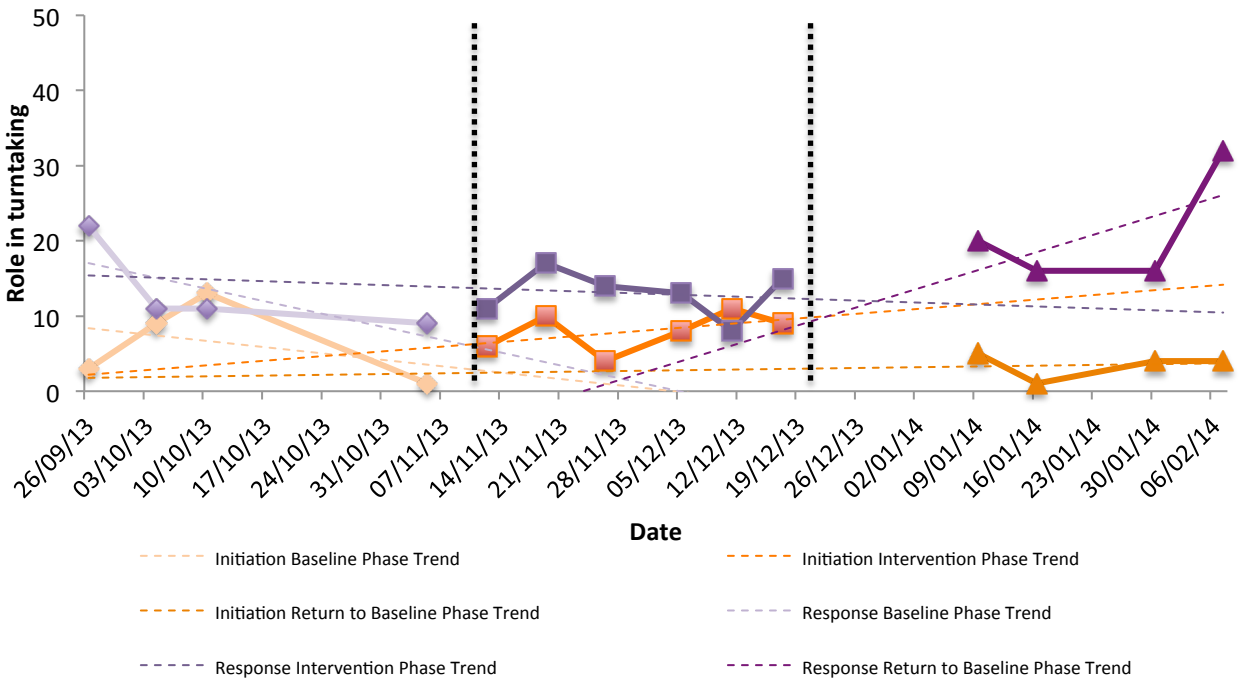


Graph 47: A line graph showing Chloe's role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

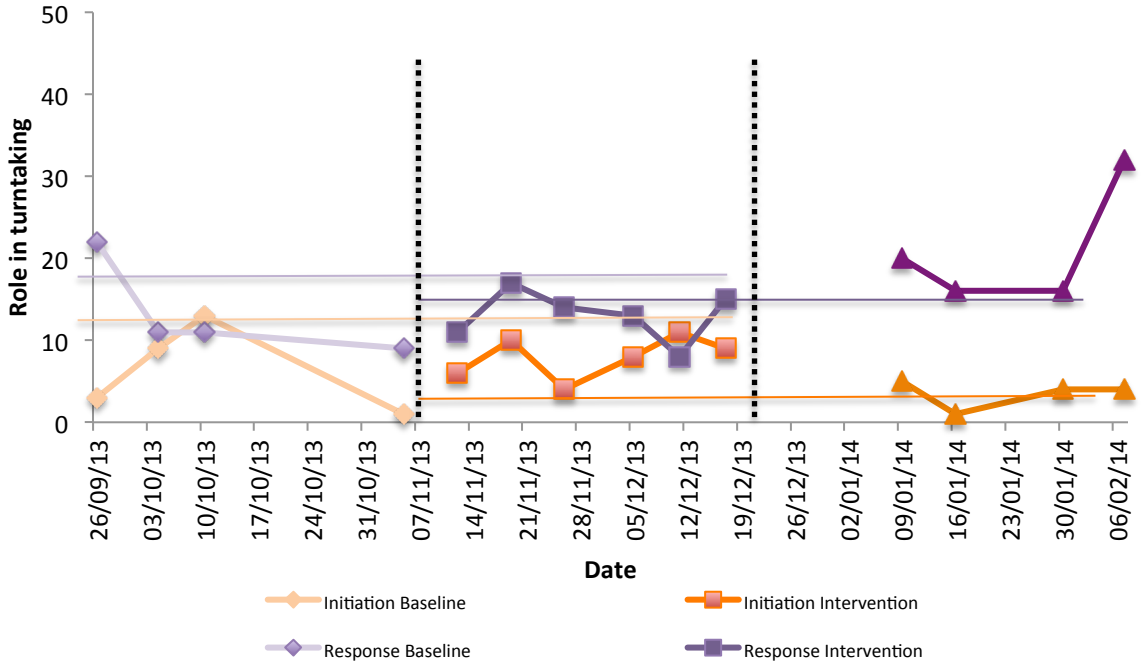
Graph 48: A line graph with **mean lines** showing Chloe's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 49: A line graph with **variance lines** showing Chloe's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 50: A line graph with **trend lines** showing Chloe's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 51: A line graph with **overlap lines** showing Chloe's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 48 shows a positive increase in Chloe's mean from Baseline (6.5) to Intervention (8) and decreases in Return to Baseline (3.5). *Response:* Graph 48 shows that the mean remains around the same level within Baseline (13.2) and Intervention (13) and increases in the Return to Baseline (21).
Trend	*Initiation:* Graph 50 shows a change in trend from a fairly steep negative line in Baseline, to a fairly steep positive trend in the Intervention. The trend in the Return to Baseline phase levels out to a slightly positive incline. *Response:* Graph 50 shows a fairly steep negative trend in Baseline, which became a less steep negative trend within the Intervention. Within the Return to Baseline phase a positive steep line can be seen.
Variability	*Initiation:* Graph 49 shows that the data in the Baseline (SD: 5.5) phase was fairly varied, whilst the Intervention (SD: 2.6) and Return to Baseline (SD: 1.7) were stable. *Response:* Graph 49 shows fairly large variation in data within Baseline (SD: 5.9) and Return to Baseline (SD: 7.5). Data within the Intervention (SD: 3.1) was far more stable.
Immediacy of effect	*Initiation:* Graph 47 shows that the data within the first three data points in the Intervention phase fit between the last three data points in the Baseline phase. A negative decline can be seen between the final data points in the Intervention phase and Return to Baseline phase. *Response:* Graph 47 shows an immediate positive effect from Baseline to Intervention and Intervention to Return to Baseline.
Overlap	*Initiation:* Graph 51 shows the majority of the data overlapped between all the phases, besides an extreme high point in Baseline and extreme low points in Baseline and Return to Baseline. *Response:* Graph 51 shows two thirds of Baseline data overlapped with the Intervention data. Half the data in Return to Baseline overlapped with the Intervention phase.

Consistency	*Initiation:* Graph 47 shows some consistency within the Intervention phase but little consistency between Baseline and Return to Baseline phases. *Response:* Graph 47 shows some consistency within the Intervention phase but little consistency between Baseline and Return to Baseline phases.

Table 33: A summary of the outcome of the visual analysis of Chloe's turn taking (initiation & response) graphs

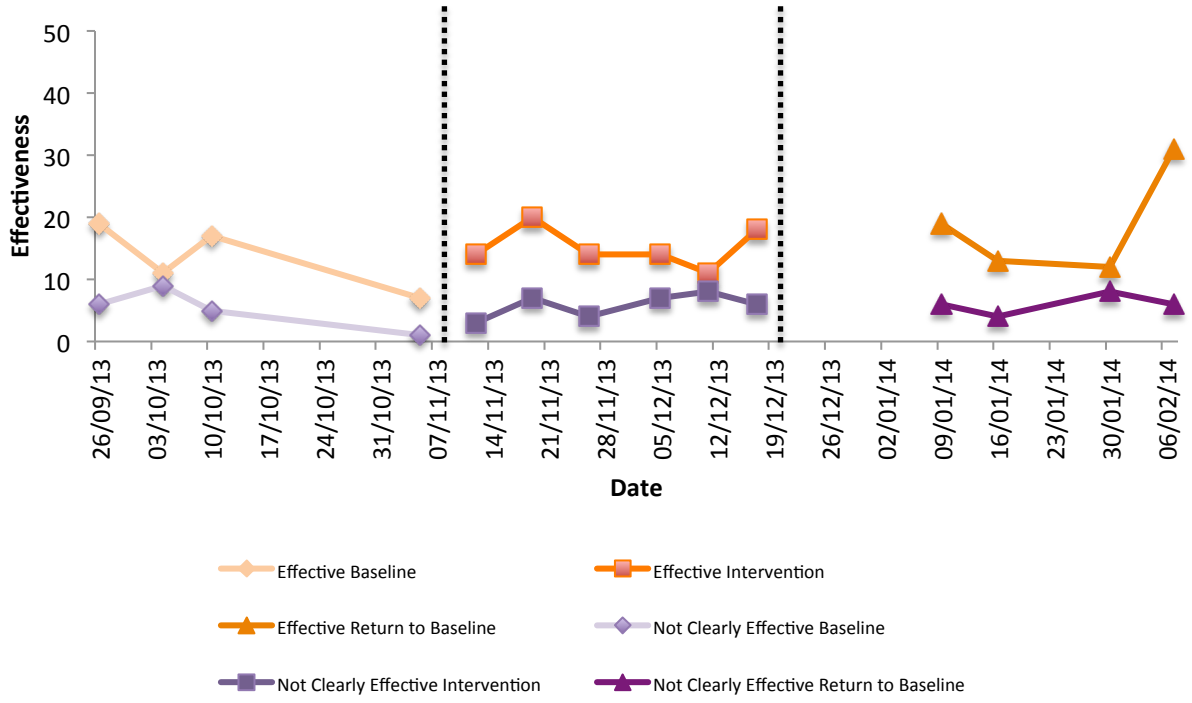
4.9.2.4. Chloe's role in turn taking: summary

The visual analysis suggests that overall Chloe responded to communication more than she initiated communication within all the phases.

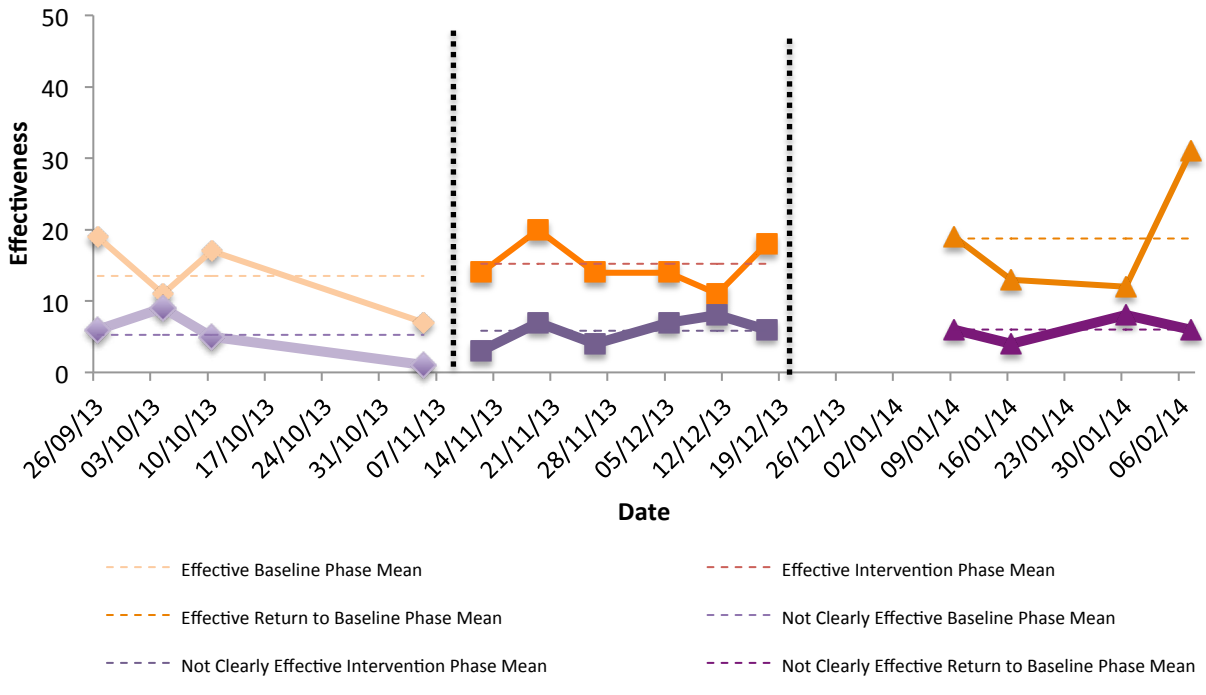
The intervention appears to have had a slight positive effect upon her initiation of communication, shown by mean and trend lines. This does not appear to have been maintained after the Christmas holidays and within the Return to Baseline phase. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 (Role in turn taking: Initiation) as three demonstrations of an effect (level, trend, variability) and at least one demonstration of a non-effect can be seen. It also provided *Moderate Evidence* which can be used to answer Research Question 2 (Role in turn taking: Initiation) as three demonstrations of an effect (trend, variability, overlap) and at least one demonstration of a non-effect can be seen.

The intervention also appears to have had a slight positive effect upon her response to communication attempts, shown by the increase in trend slope. This effect appears to have continued to increase after the withdrawal of the intervention, indicating either a delayed response to intervention or other factors that may have increased her responses to communication. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 and 2 (Role in turn taking: Response) as three demonstrations of an effect (trend, variability, immediacy of effect) and at least one demonstration of a non-effect can be seen.

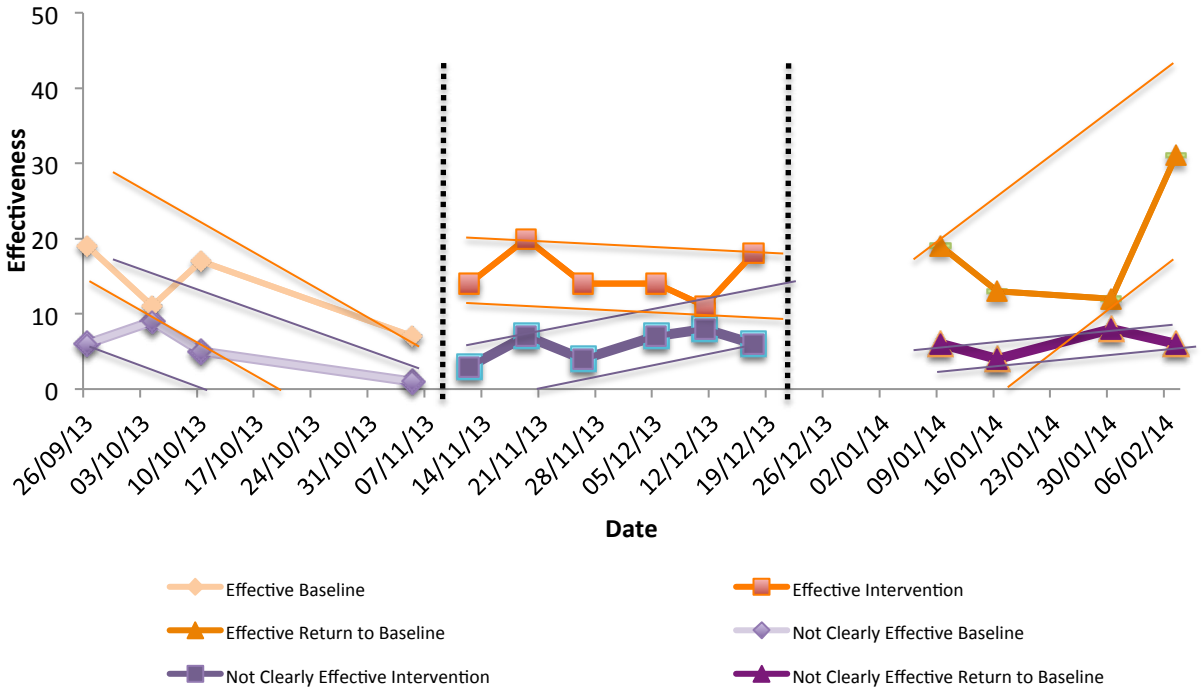
4.9.2.5. Effectiveness: effective & not clearly effective



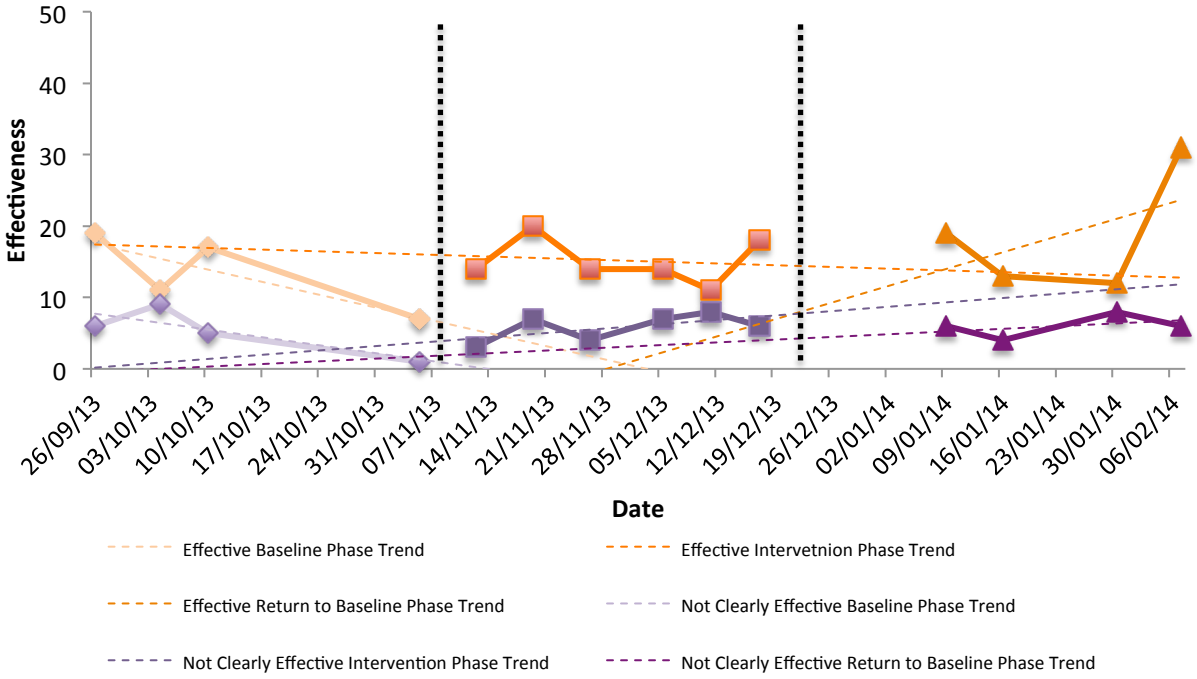
Graph 52: A line graph showing Chloe's communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



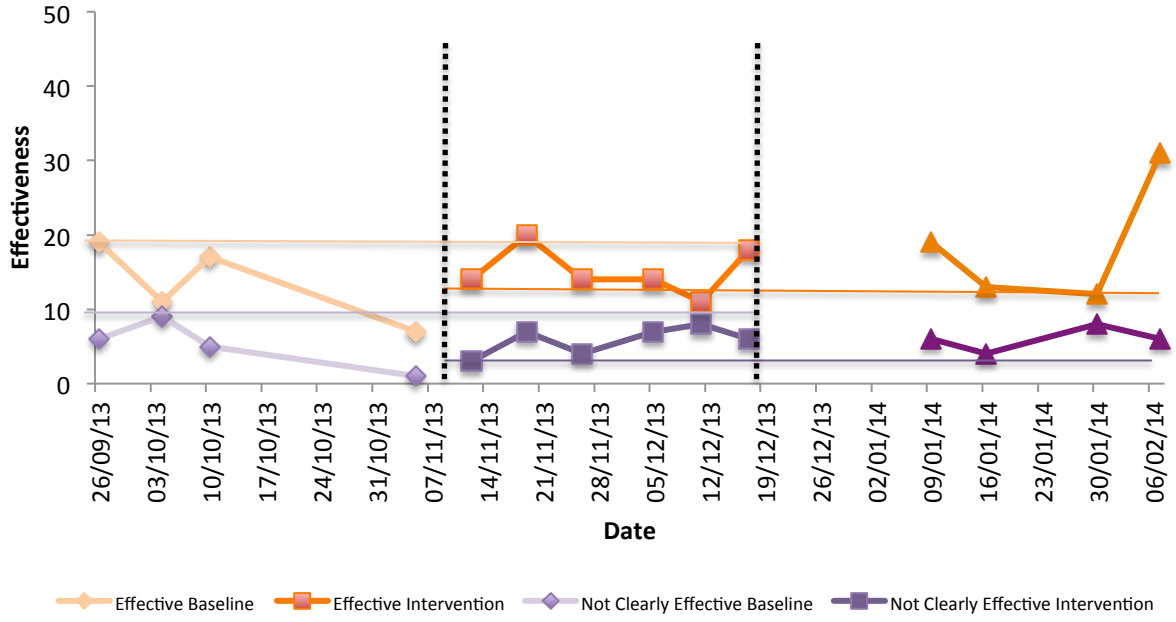
Graph 53: A line graph with **mean lines** showing Chloe's effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 54: A line graph with **variance lines** showing Chloe's turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 55: A line graph with **trend lines** showing Chloe's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 56: A line graph with **overlap lines** showing Chloe's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Effective:* Graph 53 shows a slight increase in the mean from Baseline (13.5) to Intervention (15.1) to Return to Baseline (18.7). *Not Clearly Effective:* Graph 53 shows the mean remained around the same level within Baseline (5.2), Intervention (5.8) and Return to Baseline (6).
Trend	*Effective:* Graph 55 shows that the declining trend in Baseline became less steep within the Intervention and changed to a positive slope within the Return to Baseline. *Not Clearly Effective:* Graph 55 shows the negative slope changed to a fairly positive slope within both the Intervention and Return to Baseline.
Variability	*Effective:* Graph 54 shows that the variability in data within the Baseline (SD: 5.5) and Return to Baseline (SD: 8.7) phases were fairly high. Data was far more stable within the Intervention phase (SD: 3.2). *Not Clearly Effective:* Graph 54 shows low variability within all phase; Baseline (SD: 3.3), Intervention (SD: 1.9) and Return to Baseline (SD: 1.6).

Immediacy of effect	*Effective:* Graph 52 shows an immediate positive effect from Baseline to Intervention, whilst a stable trend can be seen between Intervention and Return to Baseline. *Not Clearly Effective:* Graph 52 shows data stability between Baseline to Intervention and Intervention to Return to Baseline.
Overlap	*Effective:* Graph 56 shows that two thirds of the Baseline data overlapped with the Intervention phase. Whilst two thirds of the Return to Baseline phase also overlapped with the Intervention phase. *Not Clearly Effective:* Graph 56 shows that half the Baseline phase overlapped with the Intervention phase, and all the Return to Baseline phase overlapped with the Intervention phase.
Consistency	*Effective:* Graph 52 shows some consistency in the data between Baseline and Return to Baseline, with the Return to Baseline having a slightly higher trend. *Not Clearly Effective:* Graph 52 shows large consistency between Baseline and Return to Baseline.

Table 34: A summary of the outcome of the visual analysis of Chloe's effectiveness (effective & not clearly effective) graphs

4.9.2.6. Chloe's effectiveness: summary

The visual analysis suggests that overall Chloe demonstrated more effective communication than not clearly effective communication across the entire study.

The intervention appears to have had a slight positive impact upon her effective communication and this positive impact maintained within the Return to Baseline phase. According to Kratochwill et al's (2010) guidance these findings provide Strong *Evidence* which can be used to answer Research Question 1 and 2 (Effectiveness: Not clearly effective) as at least three demonstrations (level, trend, variability, immediacy of effect) of the intervention effects and no non-effects can be seen.

The intervention does not appear to have impacted positively on reducing her not clearly effective communication, which remained around the same level within all the phases. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* which can be used to answer Research Question 1 & 2 (Effectiveness: Not clearly effective) as it does not provide three demonstrations of an effect.

4.9.3. Descriptive data – mode of communication

	Baseline		Intervention		Return to Baseline	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	13.75	35.71	12.33	31.62	18.50	38.14
Gesture	7.25	18.83	6.50	16.67	7.00	14.43
Graphic	0.00	0.00	1.50	3.85	2.75	5.67
Vocalisation	2.00	5.19	1.50	3.85	5.50	11.34
Speech: one word utterance	5.50	14.29	4.50	11.54	5.00	10.31
Speech: 2/3 words	3.50	9.09	5.50	14.10	2.00	4.12
Speech: flowing speech	6.50	16.88	7.17	18.38	7.75	15.98

Table 35: Descriptive data of Chloe's mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data suggests that Chloe's main mode of communication within the Baseline phase was eye contact, gesture and flowing speech. Her use of eye contact remained around the same percentage throughout all the phases. Her use of gesture reduced within the Intervention and further reduced in the Return to Baseline phase. Chloe's flowing speech increased within the Intervention phase, however reduced back to a similar percentage in the Return to Baseline phase.

4.9.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*
Prosocial Orientation	3.5	3.4	- 0.1
Social Initiative	3.4	3.4	0
Overall	3.3	3.3	0

Table 36: Chloe's class teacher's scores on the Social Competency Inventory pre and post

Home perceptions (Mother);

SCI	Pre	Post	*Difference*
Prosocial Orientation	4	3.7	- 0.3
Social Initiative	3.9	4	+ 0.1
Overall	3.8	3.6	- 0.2

Table 37: Chloe's parent's scores on the Social Competency Inventory pre and post

4.9.4.1. Chloe's SCI scores: summary

Table 36 shows Chloe's teacher's perceptions of her pro-social orientation skills declined slightly whilst their perceptions of her social initiative behaviour remained the same after the intervention was introduced.

Table 37 shows that Chloe's parent's perceptions of her pro-social orientation skills declined slightly whilst their perceptions of her social initiative behaviour increased slightly after the intervention was introduced.

4.9.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*
Belonging Scale	2.8	2.8	0

Table 38: Chloe's self-reported scores on the Belonging Scale pre and post

4.9.5.1. Chloe's BS scores: summary

Table 38 shows that Chloe's self-reported sense of school belonging remained the same after the intervention.

4.10. Data Analysis – William

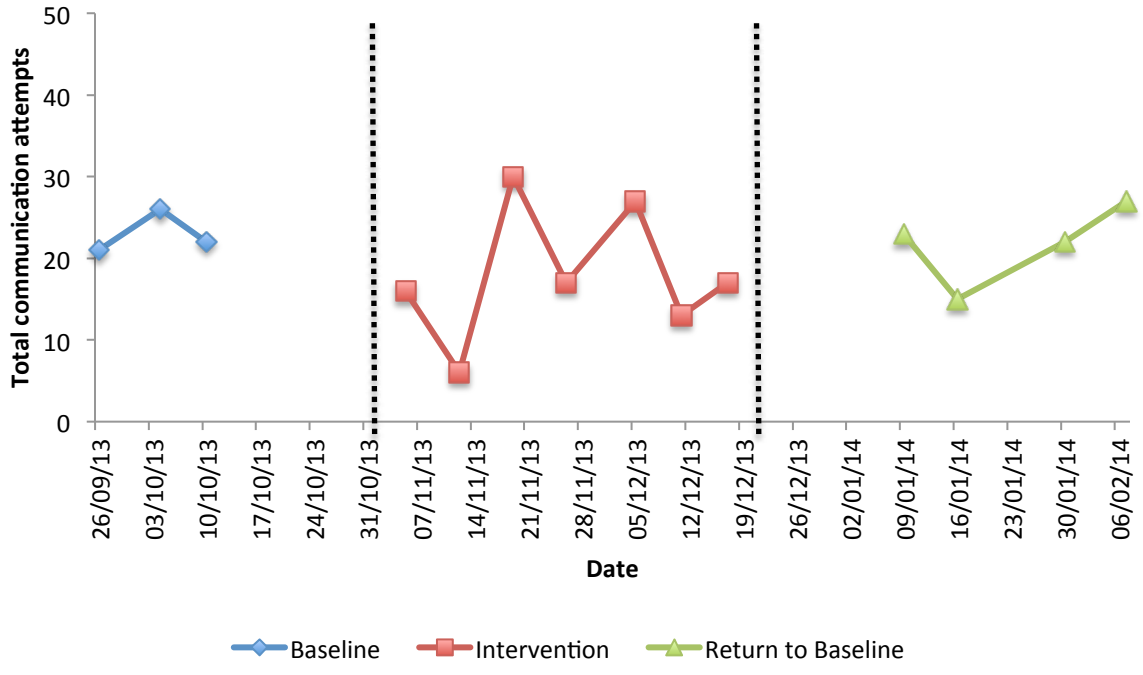
4.10.1. William's profile

Gender: Male **Age (at start of study):** 8 years 6 months

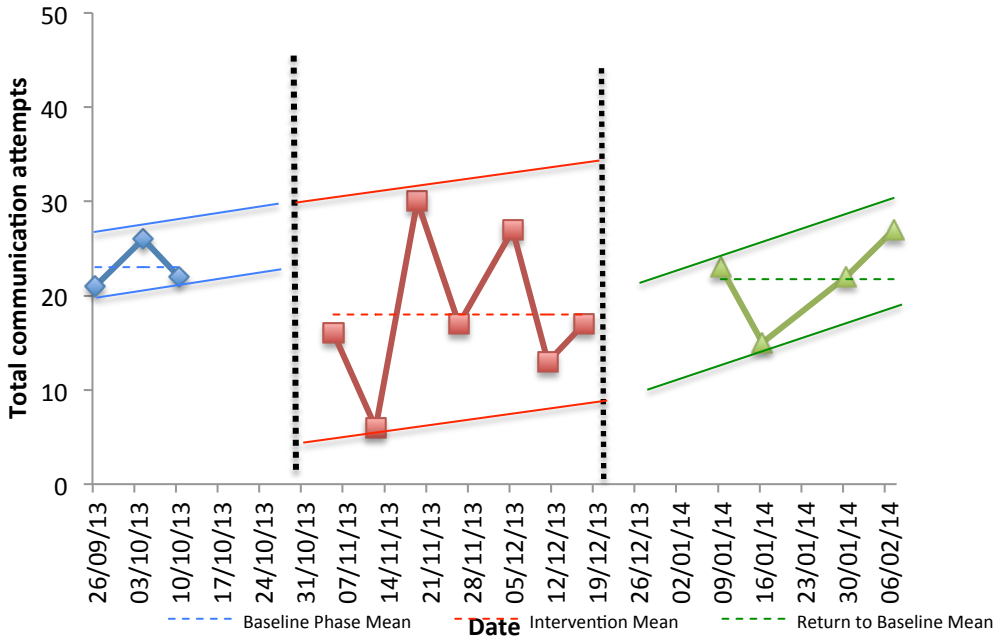
The school SENCo described William as an extremely shy boy whose interaction with his peers and teachers is low, unless initiated by the speaking partner. He is said to be reluctant to speak. William had been seen by Speech and Language Therapists since Year 1 due to difficulties with speech sound. He had been diagnosed with a speech impediment and a slight lisp could still be heard in his speech. He had previously accessed The Social Use of Language Programme (SULP, Rinaldi, 2004) and staff reported little effect on his social independence and confidence. During all the phases in the study William remained in his mainstream classroom and was able to access the whole curriculum.

4.10.2. SCED graphs

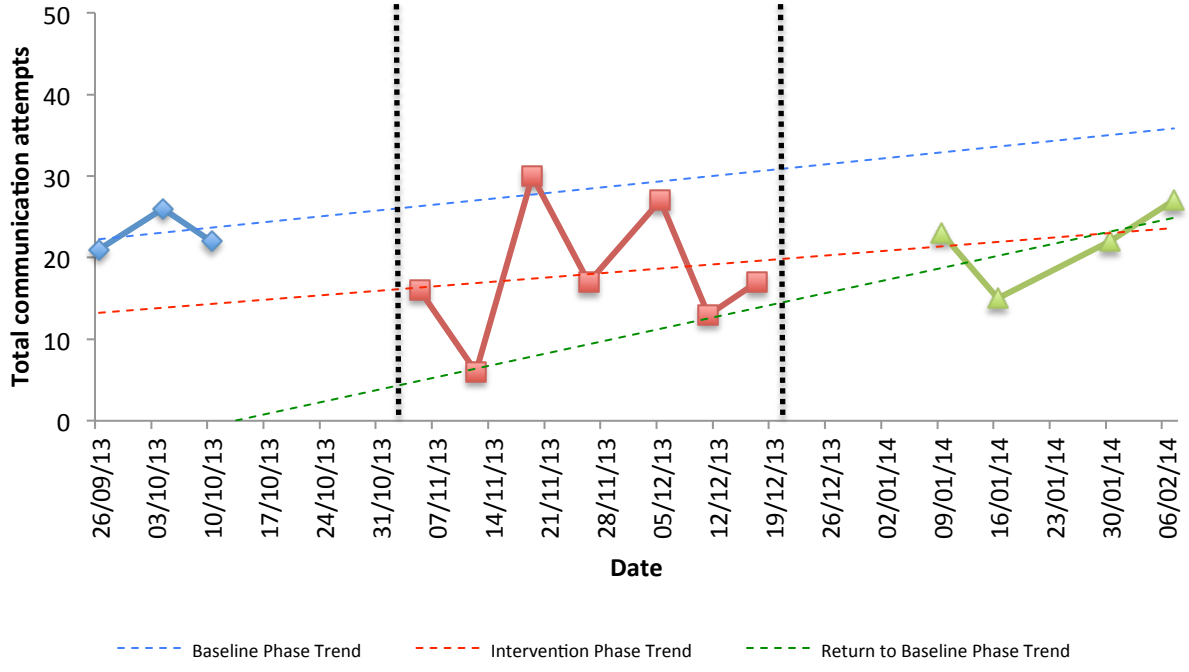
4.10.2.1. Total communication attempts



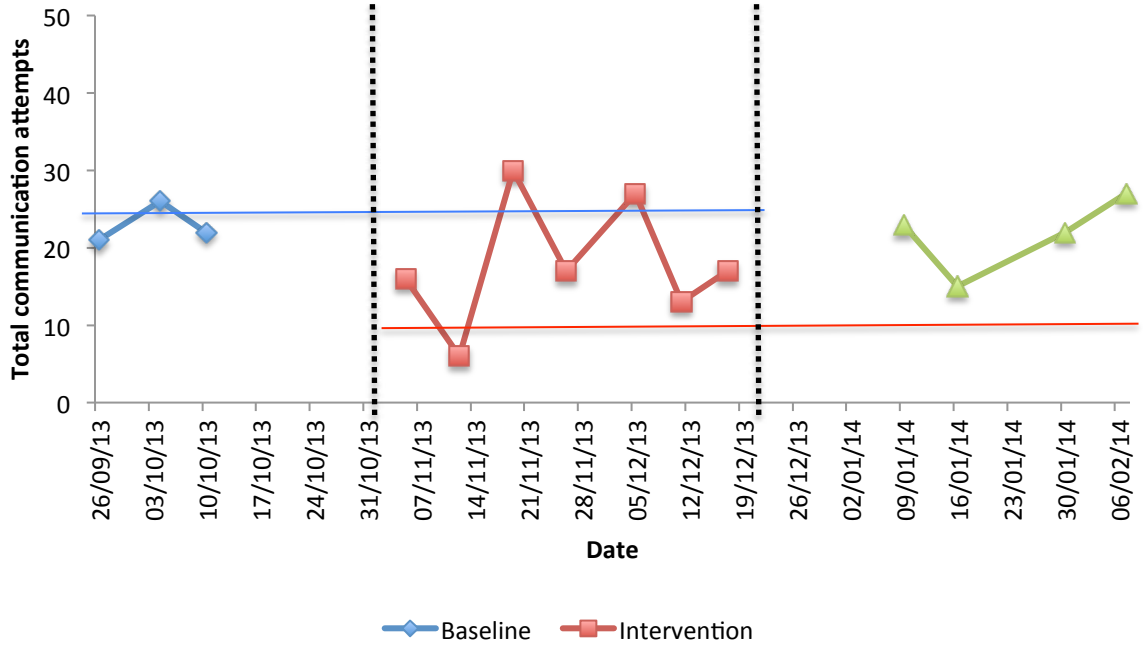
Graph 57: A line graph showing William's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 58: A line graph with **mean and variance lines** showing William's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 59: A line graph with **trend lines** showing William's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 60: A line graph with **overlap lines** showing William's total communication attempts across Baseline, Intervention and Return to Baseline

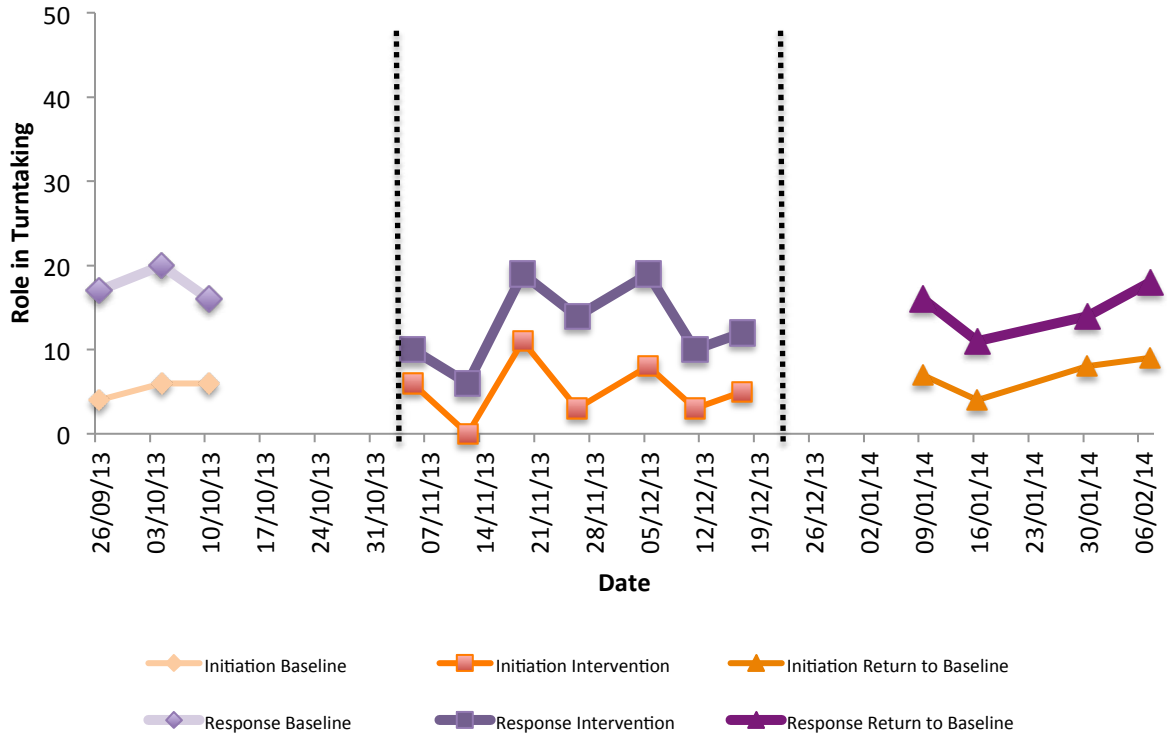
Characteristic	Visual Analysis
Level	Graph 58 shows a reduction in mean from Baseline (23) to Intervention (18). This increased within the Return to Baseline (21.7).
Trend	Graph 59 shows a positive trend within all the phases. This reduces slightly in its positive incline within the Intervention and resumed to a similar higher positive incline in the Return to Baseline.
Variability	Graph 58 shows low variability in data in the Baseline (SD: 2.6) and Return to Baseline (SD: 4.9), whilst high variability is seen in the Intervention (SD: 8.1).
Immediacy of effect	Graph 57 shows an immediate decline in trend from Baseline and Intervention, and an immediate incline in trend from Intervention to Return to Baseline.
Overlap	Graph 60 shows a high amount of overlap in data amongst all the phases.
Consistency	Graph 57 shows some consistency in the data between Baseline and Return to Baseline. William's overall communication was slightly higher in the Baseline phase.

Table 39: A summary of the outcome of the visual analysis of William's total communication attempts graphs

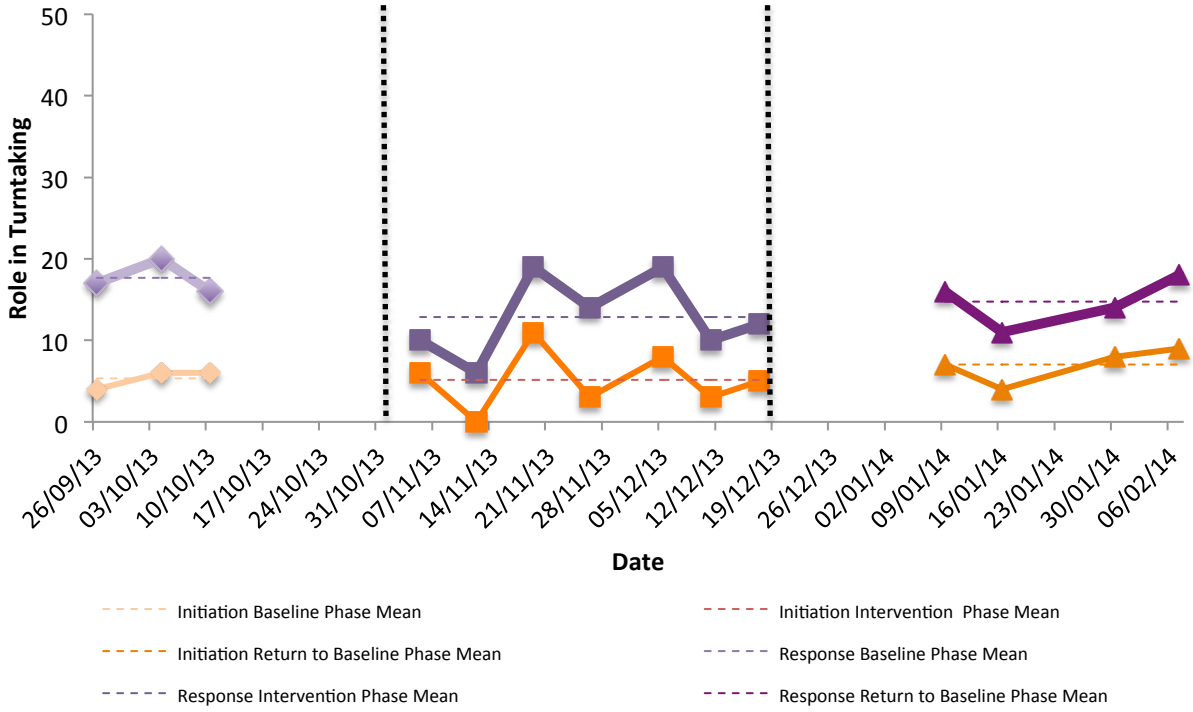
4.10.2.2. William's total communication attempts: summary

The visual analysis suggests that the intervention appeared to have a slightly negative effect on William's overall communication attempts. This appeared to become more variable and after some initial improvement somewhat reduced through the intervention period, but became more positive and stable once the intervention was withdrawn. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Total Communication attempts) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

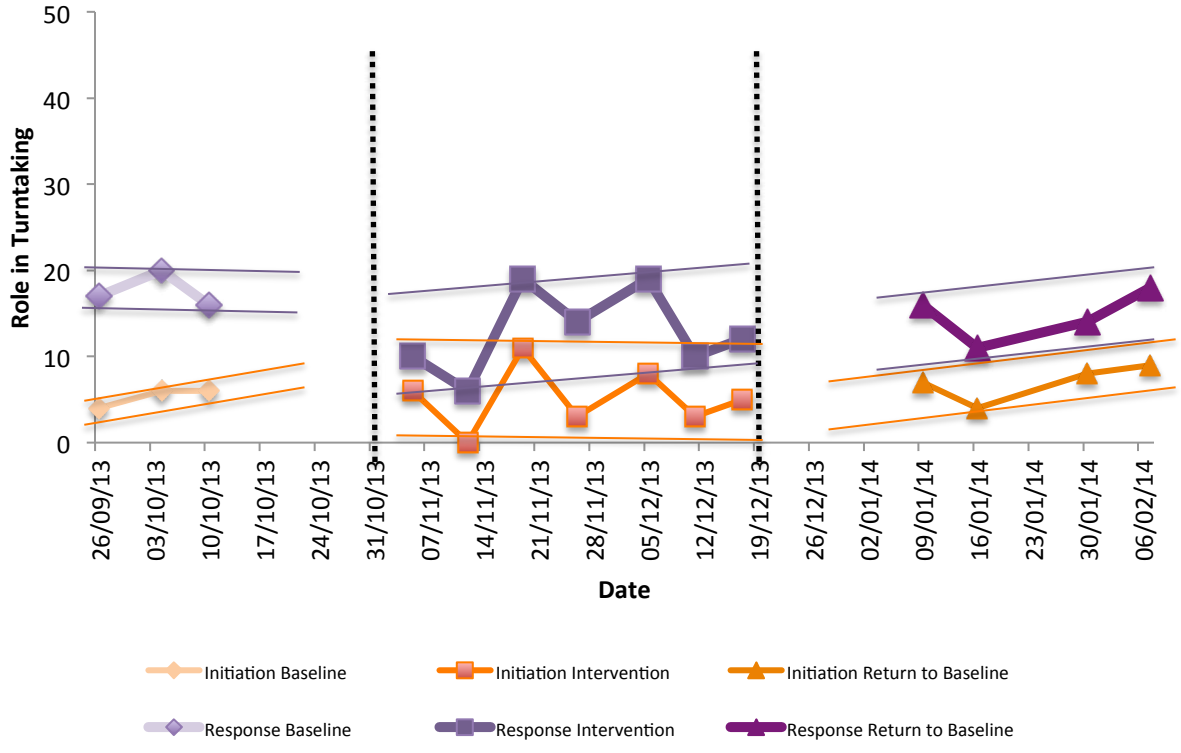
4.10.2.3. Role in turn taking: initiation & response



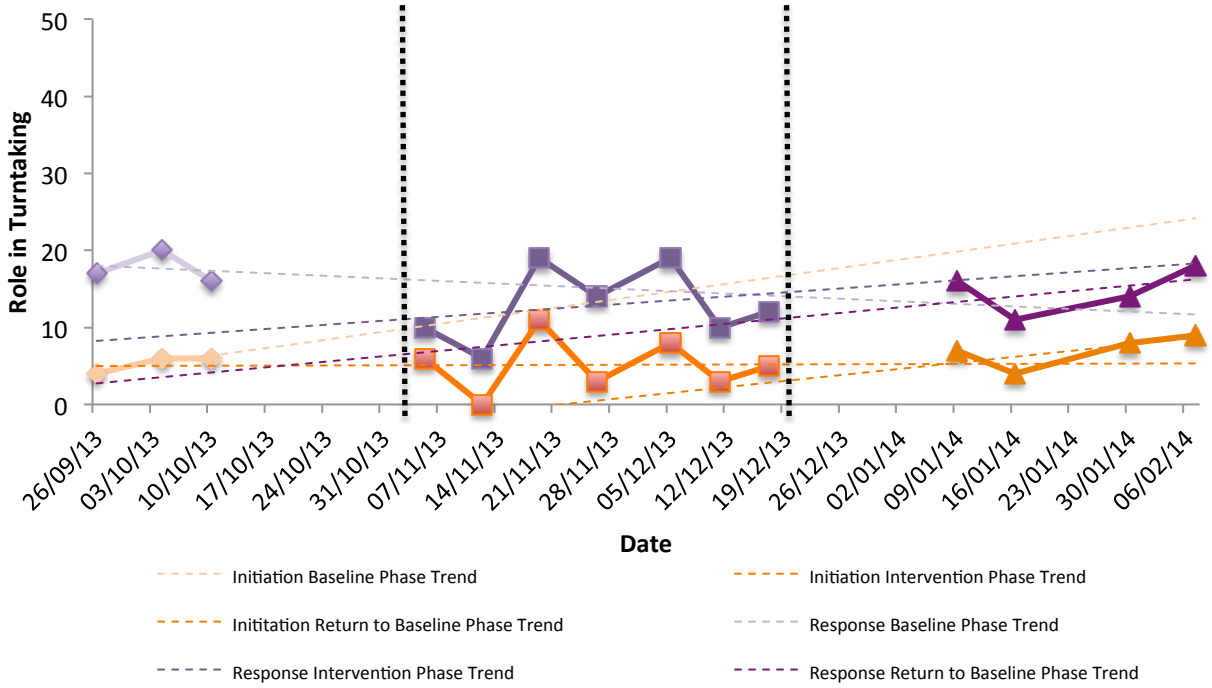
Graph 61: A line graph showing William's role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



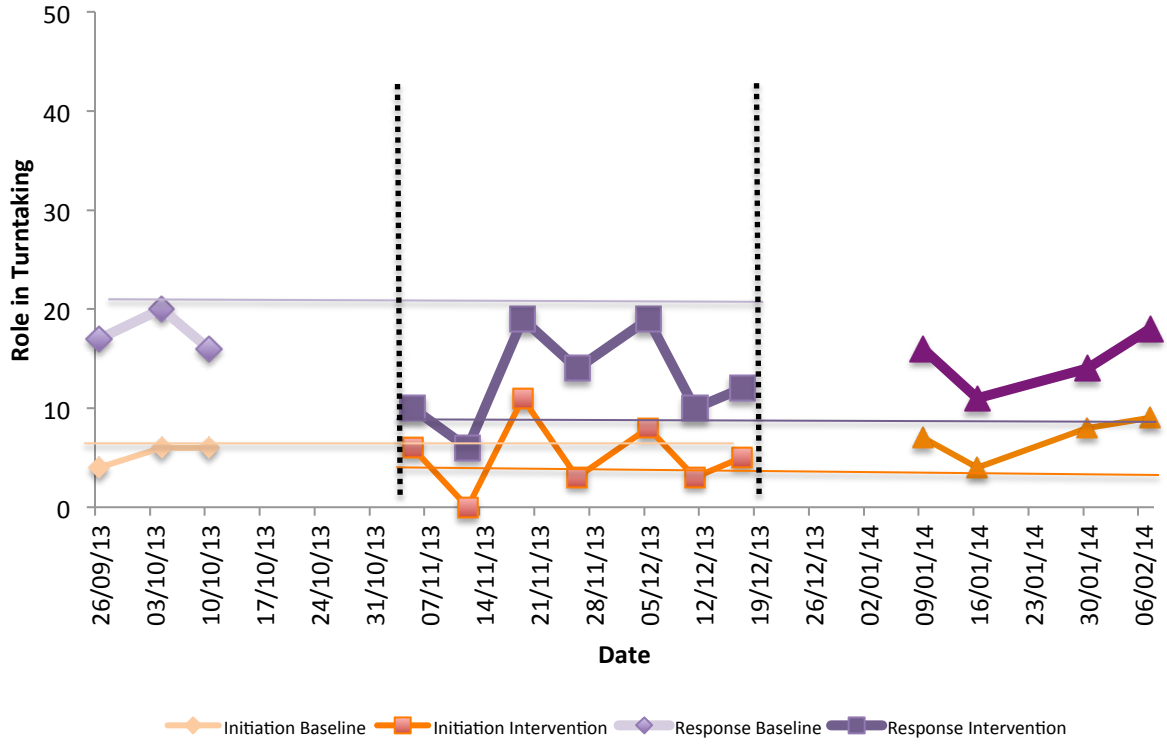
Graph 62: A line graph with **mean lines** showing William's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 63: A line graph with **variance lines** showing William's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 64: A line graph with **trend lines** showing William's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 65: A line graph with **overlap lines** showing William's turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 62 shows that the mean remained around the same level for Baseline (5.3) and Intervention (5.1). This rose in the Return to Baseline (7). *Response:* Graph 62 shows that the mean reduced from Baseline (17.6) to Intervention (12.8). This increased in the Return to Baseline (14.7).
Trend	*Initiation:* Graph 64 shows a positive trend throughout all the phases. The strength of this positive trend reduced slightly within the Intervention and rose again to a similar incline in the Return to Baseline, as the Baseline. *Response:* Graph 64 shows a change from a negative trend to a fairly positive trend in both the Intervention and Return to Baseline phases.
Variability	*Initiation:* Graph 63 shows data is fairly stable within all the phases; Baseline (SD: 1.1), Intervention (SD: 3.6) and Return to Baseline (SD: 2.1). *Response:* Graph 63 shows stability of data within the Baseline (SD: 2) and Return to Baseline (SD: 2.9), variability is slightly higher in the Intervention (SD: 4.8).
Immediacy of effect	*Initiation:* Graph 61 does not show an immediate effect form Baseline to Intervention or Intervention to Return to Baseline. *Response:* Graph 61 shows an immediate decline in trend from Baseline to Intervention and an immediate incline from Intervention to Return to Baseline.
Overlap	*Initiation:* Graph 65 shows overlap between Baseline and half of the Intervention data. All the data within the Return to Baseline phase overlapped with the Intervention. *Response:* Graph 65 shows that the majority of the data overlapped between all the phases, bar low points within the intervention phase.
Consistency	*Initiation:* Graph 61 shows a high level of consistency in the data between Baseline and Return to Baseline. *Response:* Graph 61 shows some consistency in the data between Baseline and Return to Baseline, although responses were higher in the Baseline.

Table 40: A summary of the outcome of the visual analysis of William's turn taking (initiation & response) graphs

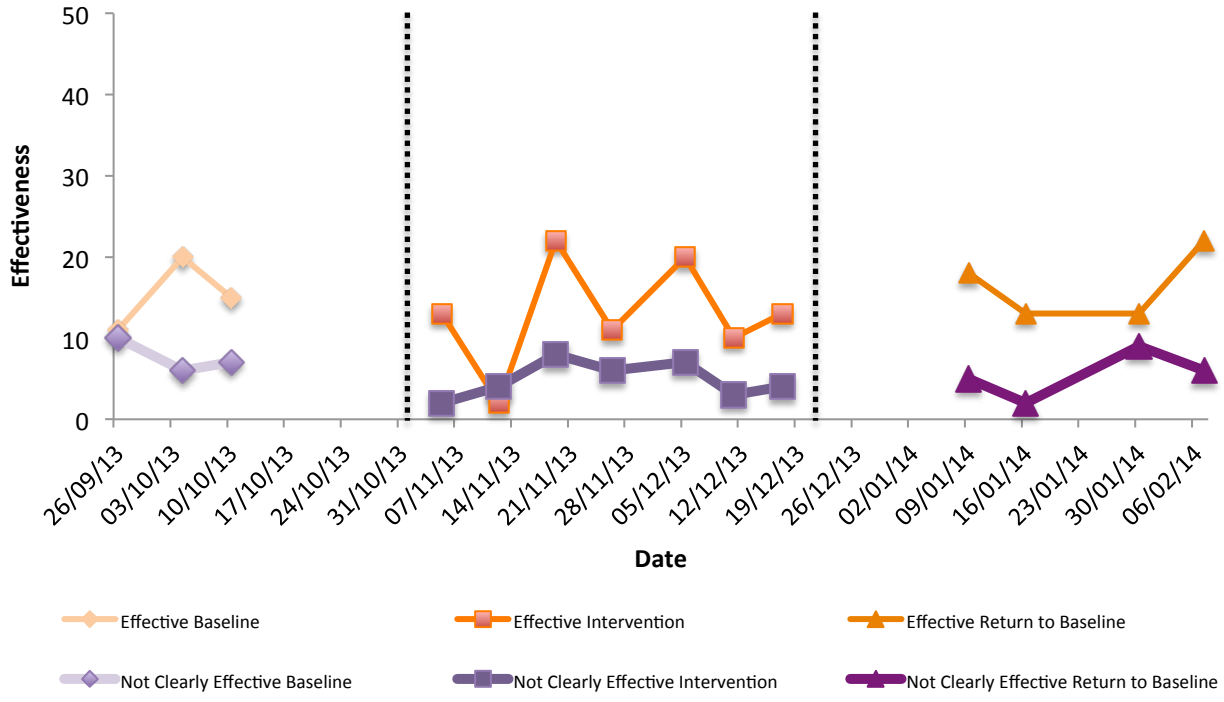
4.10.2.4. William's role in turn taking: summary

The visual analysis suggests that overall William engaged in more response to communication attempts than initiation of communication across all the phases.

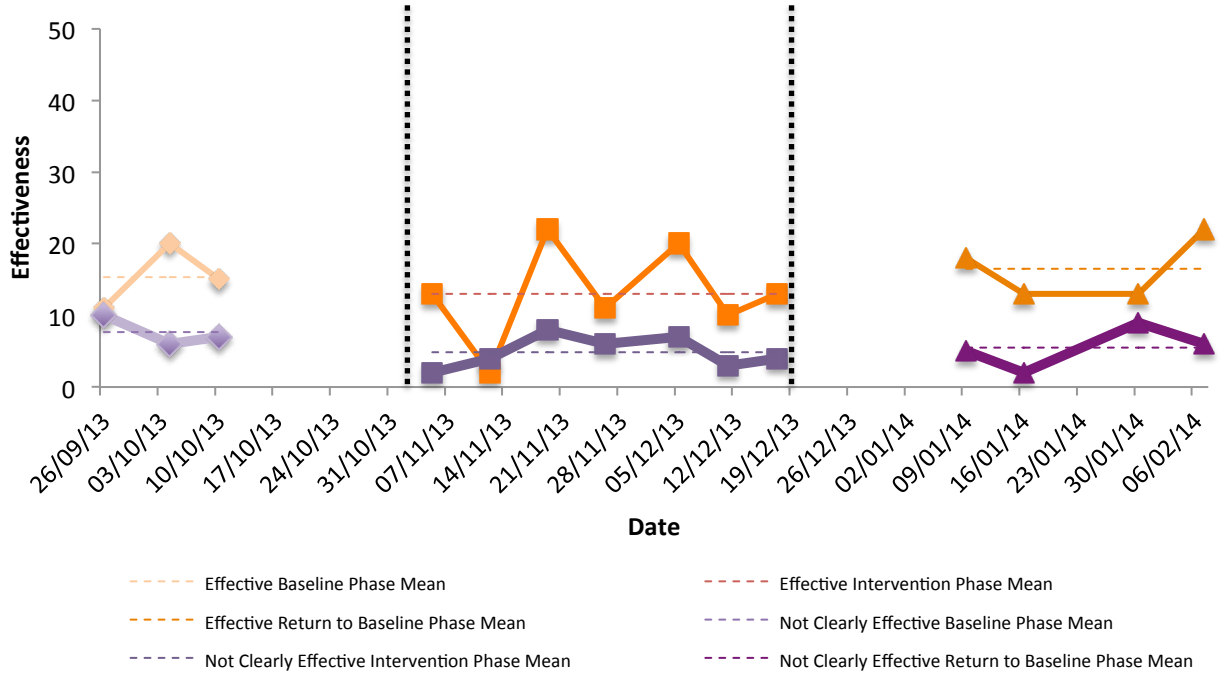
The intervention does not appear to have impacted upon William's initiation attempts. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Initiation) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

The intervention does appear to have had a slight positive impact on his number of response attempts. This increases further post withdrawal of the intervention. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Response) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

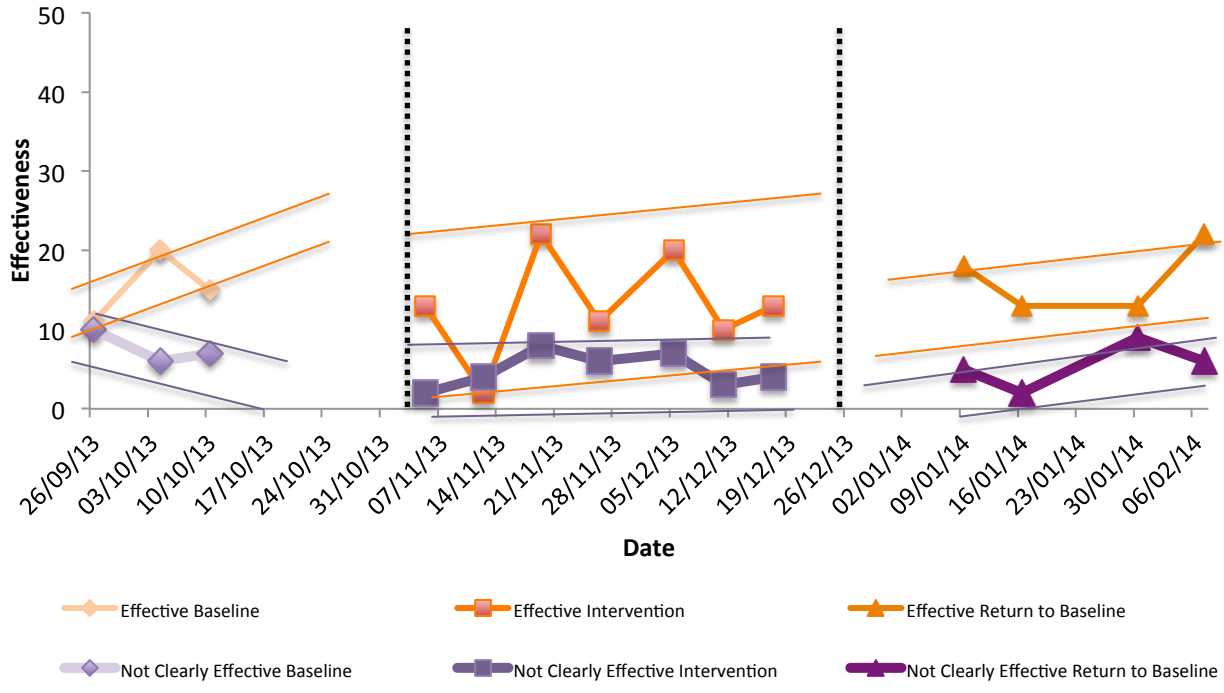
4.10.2.5. Effectiveness: effective & not clearly effective



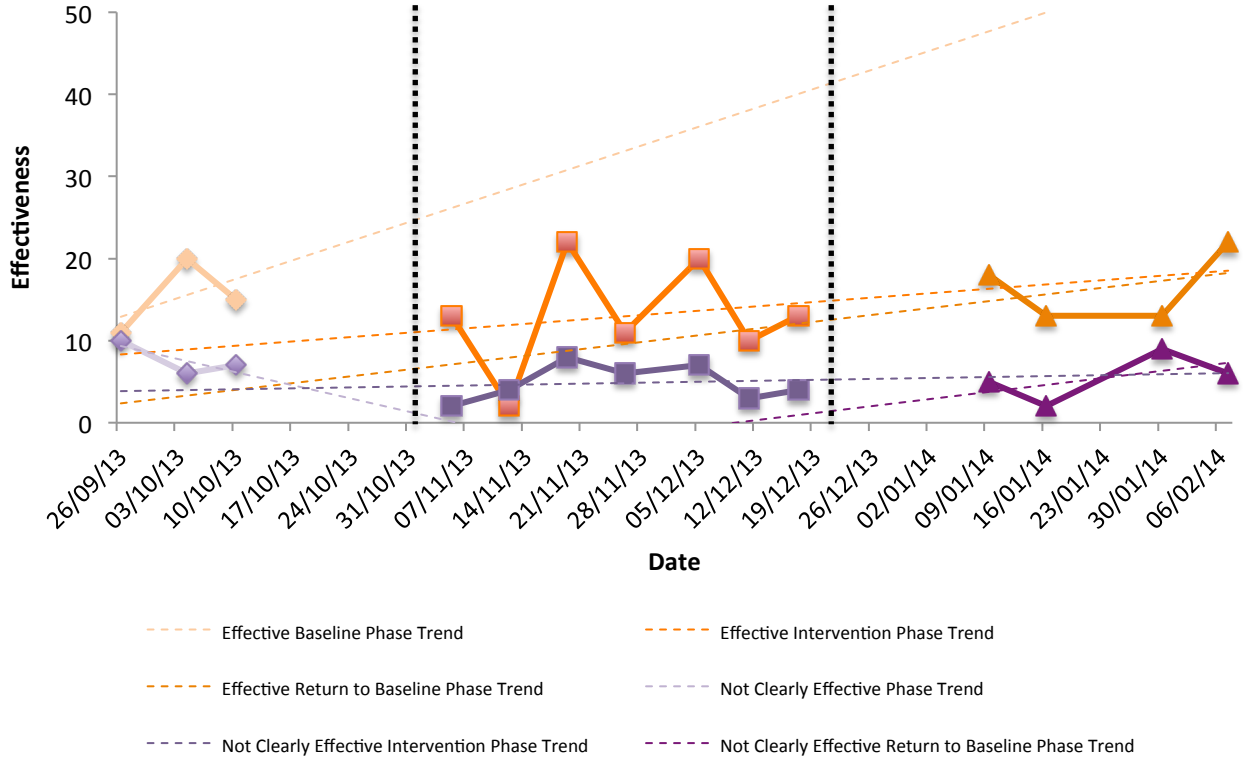
Graph 66: A line graph showing William's communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



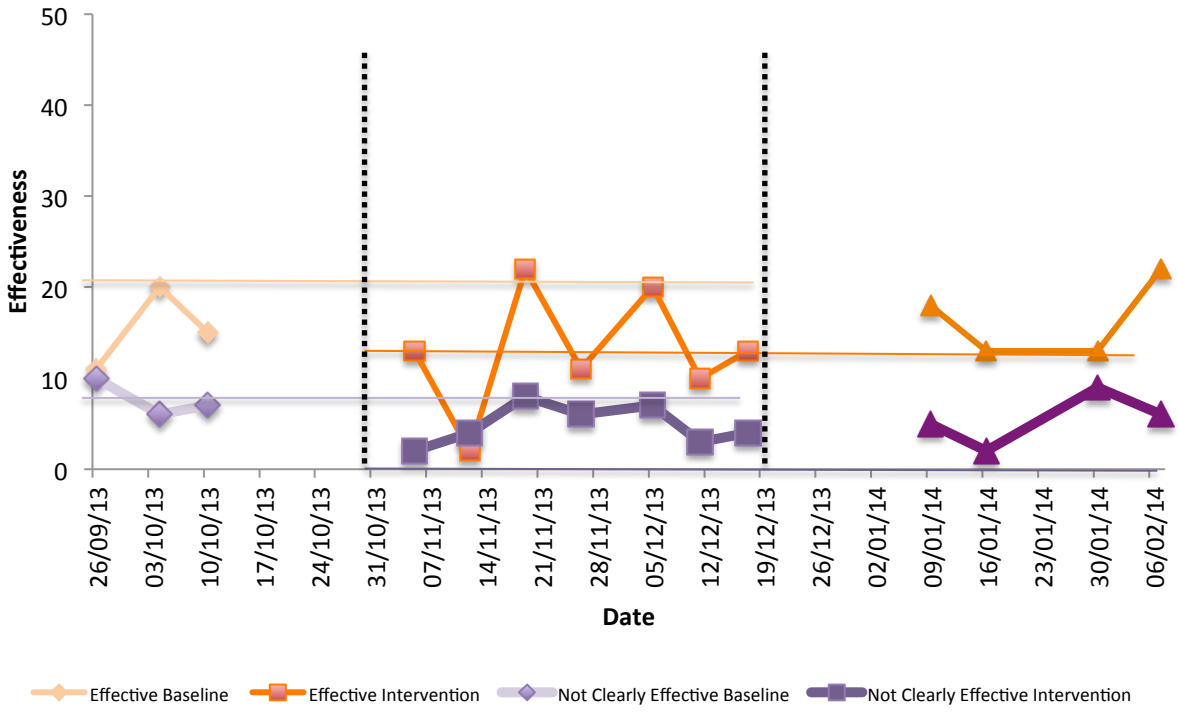
Graph 67: A line graph with **mean lines** showing William's effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 68: A line graph with **variance lines** showing William's turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 69: A line graph with **trend lines** showing William's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 70: A line graph with **overlap lines** showing William's effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Effective:* Graph 67 shows the mean dropped from Baseline (15.3) to Intervention (13) and increased once the intervention is removed (16.5). *Not Clearly Effective:* Graph 67 shows the mean reduced from Baseline (7.6) to Intervention (4.8), and maintained within the Return to Baseline (5.5).
Trend	*Effective:* Graph 69 shows a positive trend in William's effective communication within all phases of the study. This high incline became less steep within the Intervention and slightly increased in the Return to Baseline. *Not Clearly Effective:* Graph 69 shows the declining trend in the Baseline levelled out in the Intervention and inclined in the Return to Baseline.
Variability	*Effective:* Graph 68 shows some variability in the data across all the phases; Baseline (SD: 4.5), Intervention (SD: 6.6) and Return to Baseline (SD: 4.3). *Not Clearly Effective:* Graph 68 shows very low variability across the phases; Baseline (SD: 2), Intervention (SD: 2.1) and Return to Baseline (SD: 2.8).
Immediacy of effect	*Effective:* Graph 66 shows no immediate effect from Baseline to Intervention, due to the variability of the data in the Intervention phase. No immediate effect between Intervention and Return to Baseline can be seen. *Not Clearly Effective:* Graph 66 shows no immediate effect between Baseline and Intervention or Intervention and Return to Baseline.
Overlap	*Effective:* Graph 70 shows the majority of the data overlapped from Baseline, Intervention and Return to Baseline, except for extreme high and low points within the Intervention and extreme high points in the Return to Baseline. *Not Clearly Effective:* Graph 70 shows the majority of the data overlapped from Baseline, Intervention and Return to Baseline, except for extreme high points in Baseline and Return to Baseline phases.
Consistency	*Effective:* Graph 66 shows some consistency in the data between Baseline and Return to Baseline phases. *Not Clearly Effective:* Graph 66 shows some consistency in the data between Baseline and Return to Baseline phases.

Table 41: A summary of the outcome of the visual analysis of William's effectiveness (effective & not clearly effective) graphs

4.10.2.6. William's effectiveness: summary

The visual analysis showed that the majority of William's communication was seen as effective rather than not clearly effective across all phases.

The effectiveness of his communication does not appear to have been greatly impacted upon by the intervention. Indeed, a slight decline in his effective communication within the Intervention and return to a similar mean to the Baseline within the Return to Baseline phase suggests the intervention may have temporarily decreased his effective communication. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Effectiveness: Effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

His not clearly effective communication slightly decreased with the introduction of the intervention but again increased after the removal of the intervention. Thus suggesting the positive effect observed may not be maintained without the intervention. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Effectiveness: Not Clearly Effective) as it does not provide three demonstrations of an effect between Baseline to Intervention and Intervention to Return to Baseline phases.

4.10.3. Descriptive data – mode of communication

	Baseline		**Intervention**		**Return to Baseline**	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	13.33	33.90	7.14	23.47	13.00	31.71
Gesture	5.00	12.71	4.00	13.15	3.25	7.93
Graphic	0.00	0.00	2.14	7.04	3.00	7.32
Vocalisation	1.67	4.24	1.43	4.69	4.50	10.98
Speech: one word utterance	5.33	13.56	3.86	12.68	4.50	10.98
Speech: 2/3 words	4.33	11.02	4.43	14.55	3.00	7.32
Speech: flowing speech	9.67	24.58	7.43	24.41	9.75	23.78

Table 42: Descriptive data of William's mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data suggests that William's main mode of communication within the Baseline phase was eye contact, one word utterances and flowing speech. His use of eye contact reduced in the Intervention phase and increased after the removal of the

intervention. His use of one word utterances and flowing speech remained around the same level across the phases. Within the intervention his use of 2/3 words rose.

4.10.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*
Prosocial Orientation	2.6	2.7	+ 0.1
Social Initiative	2.2	2.7	+ 0.5
Overall	2.4	2.6	+ 0.2

Table 43: William's class teacher's scores on the Social Competency Inventory pre and post

Home perceptions (Mother);

SCI	Pre	Post	*Difference*
Prosocial Orientation	3.4	3.8	+ 0.4
Social Initiative	3.4	4	+ 0.6
Overall	3.3	3.7	+ 0.4

Table 44: William's parent's scores on the Social Competency Inventory pre and post

4.10.4.1. William's SCI scores: summary

Table 43 and Table 44 show that both teacher and parents perceptions of William's social skills increased after the introduction of the intervention.

William's teacher and parent's rated a larger increase for his social initiative skills than his pro-social skills.

4.10.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*
Belonging Scale	2.8	2.8	0

Table 45: William's self-reported scores on the Belonging Scale pre and post

4.10.5.1. William's BS scores: summary

Table 45 shows that William's self-reported sense of school belonging remained at the same level after the intervention.

4.11. Data Analysis – James

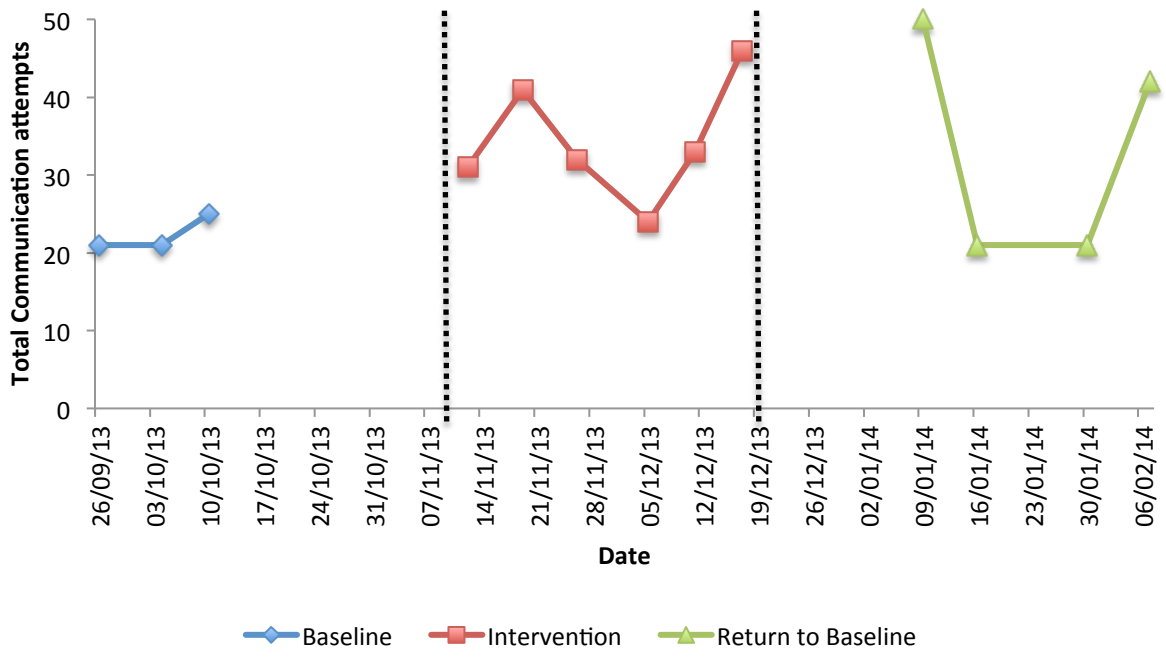
4.11.1. James' profile

Gender: Male **Age (at start of study):** 8 years 4 months

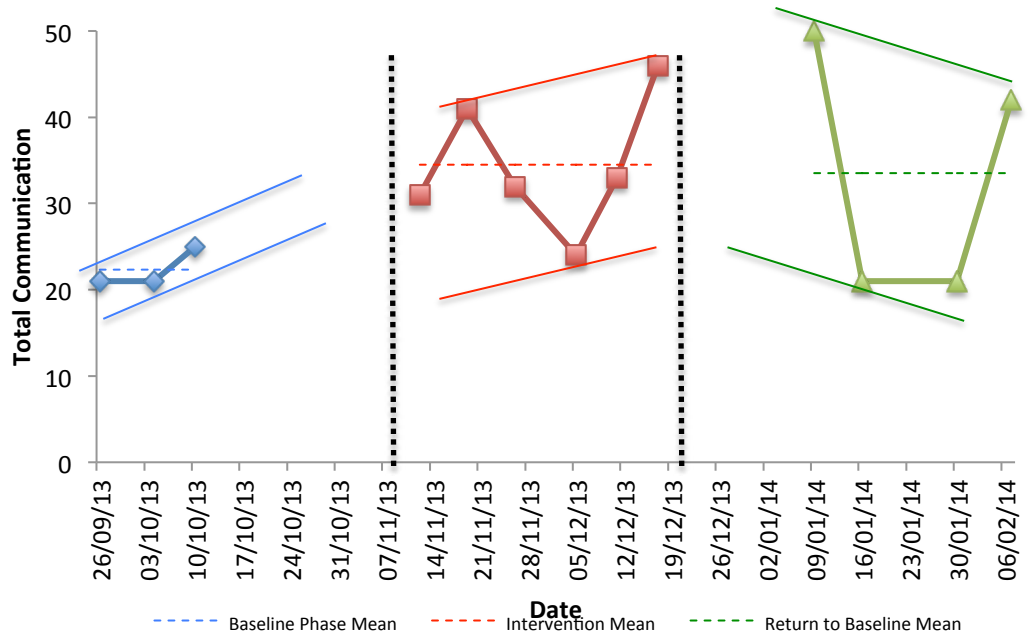
The school SENCo described James as a very quiet and withdrawn boy. They commented that James is very reluctant to engage in communication with his peers and adults. During all the phases in the study James remained in his mainstream classroom and was able to access the whole curriculum.

4.11.2. SCED graphs

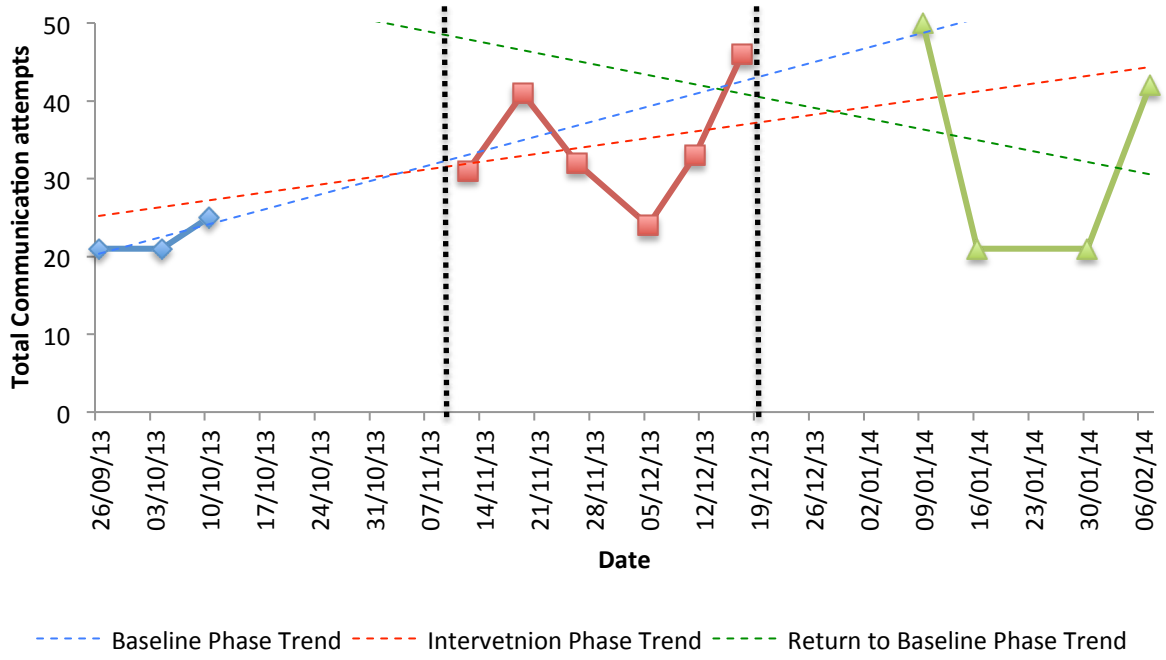
4.11.2.1. Total communication attempts



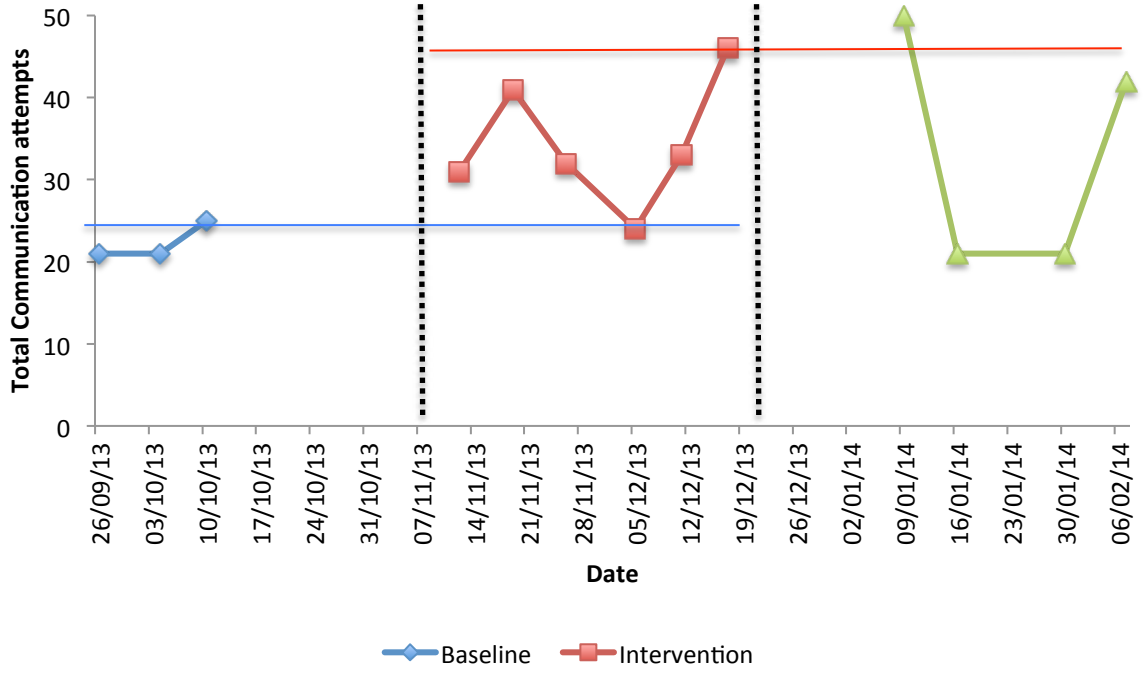
Graph 71: A line graph showing James' total communication attempts across Baseline, Intervention and Return to Baseline



Graph 72: A line graph with **mean and variance lines** showing James' total communication attempts across Baseline, Intervention and Return to Baseline



Graph 73: A line graph with **trend lines** showing James's total communication attempts across Baseline, Intervention and Return to Baseline



Graph 74: A line graph with **overlap lines** showing James' total communication attempts across Baseline, Intervention and Return to Baseline

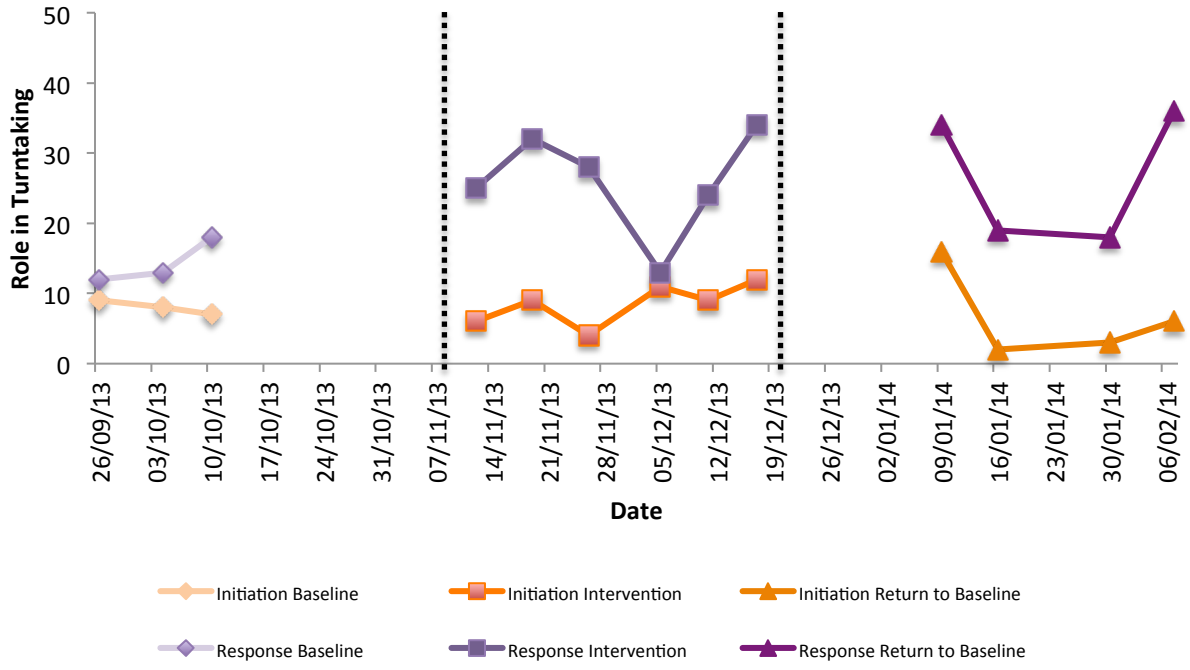
Characteristic	Visual Analysis
Level	Graph 72 shows a positive mean change from Baseline (22.3) to Intervention (34.5). This maintained within the Return to Baseline (33.5) phase.
Trend	Graph 73 shows positive inclining trends in both the Baseline and Intervention. A negative declining trend was shown in the Return to Baseline.
Variability	Graph 72 shows data within the Baseline (SD: 2.3) was stable. Whilst high variability of data was shown in the Intervention (SD: 7.8), and very high variability in Return to Baseline (SD: 14.7).
Immediacy of effect	Graph 71 shows an immediate positive effect from Baseline to Intervention. Whilst no immediate effect was shown between Intervention and Return to Baseline.
Overlap	Graph 74 shows only one data point overlapped from Baseline to Intervention. Only one data point from Return to Baseline overlapped with the intervention.
Consistency	Graph 71 shows half of the Return to Baseline data overlapped with the Baseline, however data was very variable in the Return to Baseline phase.

Table 46: A summary of the outcome of the visual analysis of James' total communication attempts graphs

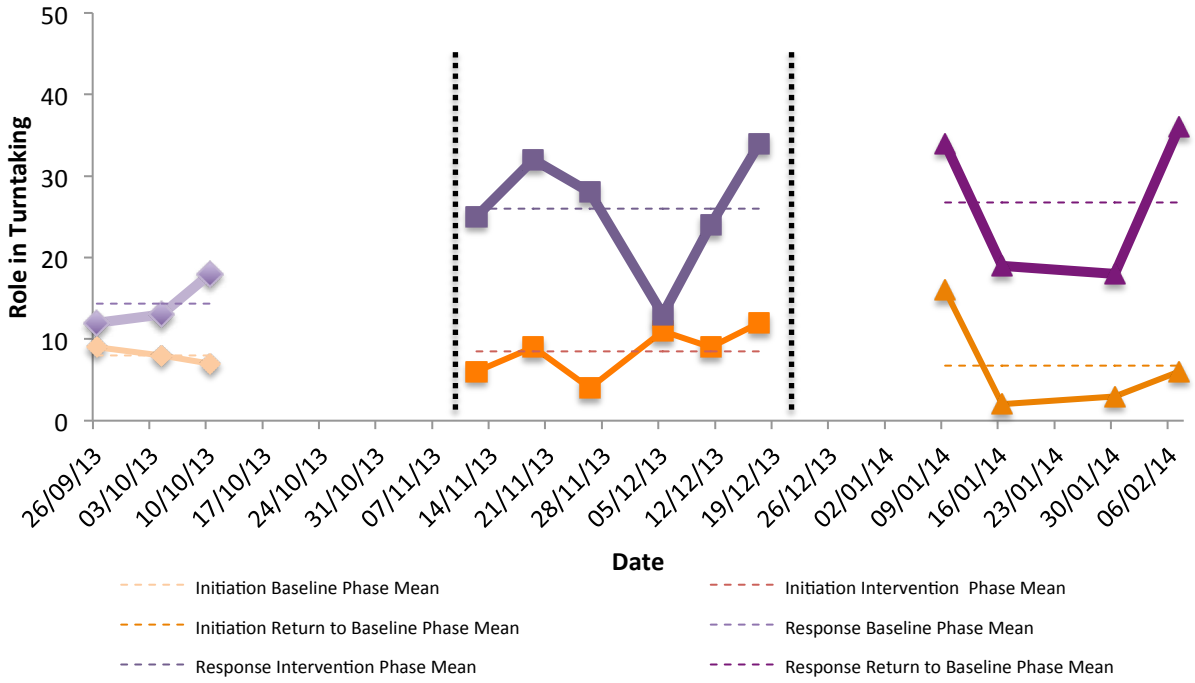
4.11.2.2. James' total communication attempts: summary

Visual analysis suggests that the intervention had a large positive effect upon James' social communication attempts. This effect was fairly immediate from the introduction of the intervention, reduced and then increased towards the end of the intervention. It appeared to initially maintain after the Christmas holidays then the effect varied. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* to Research Question 1 & 2 (Total Communication attempts) as three demonstrations of an effect (level, immediacy of effect, overlap) and at least one demonstration of a non-effect can be seen.

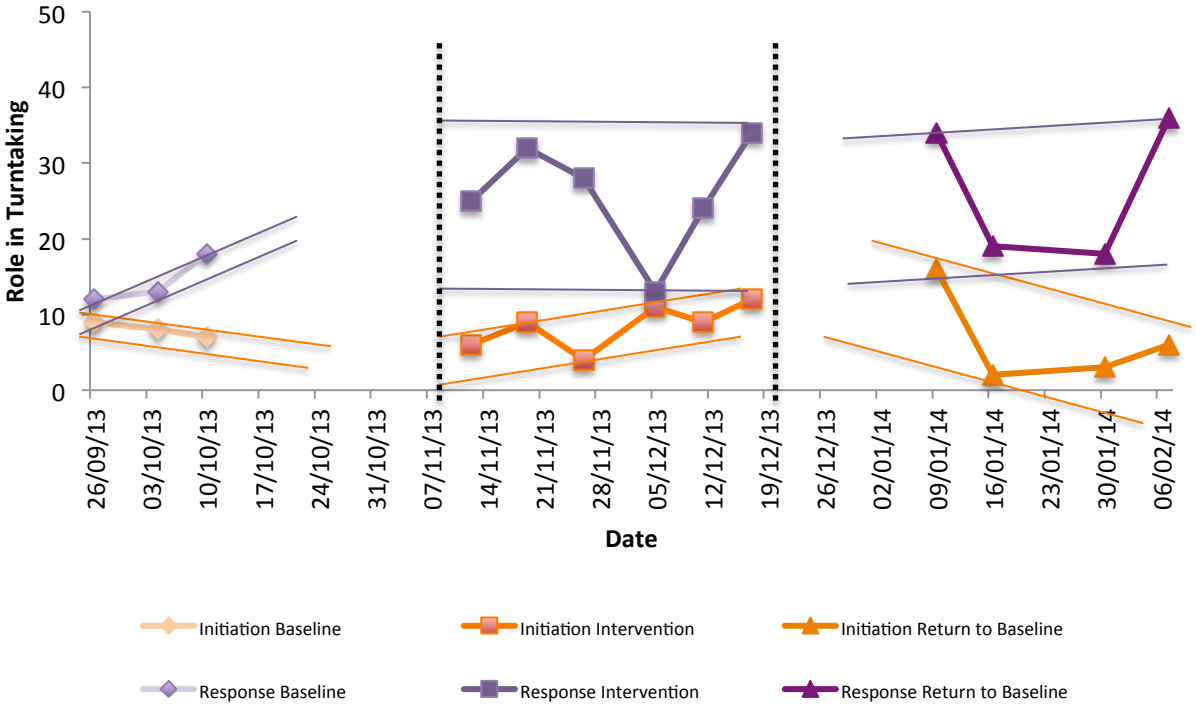
4.11.2.3. Role in turn taking: initiation & response



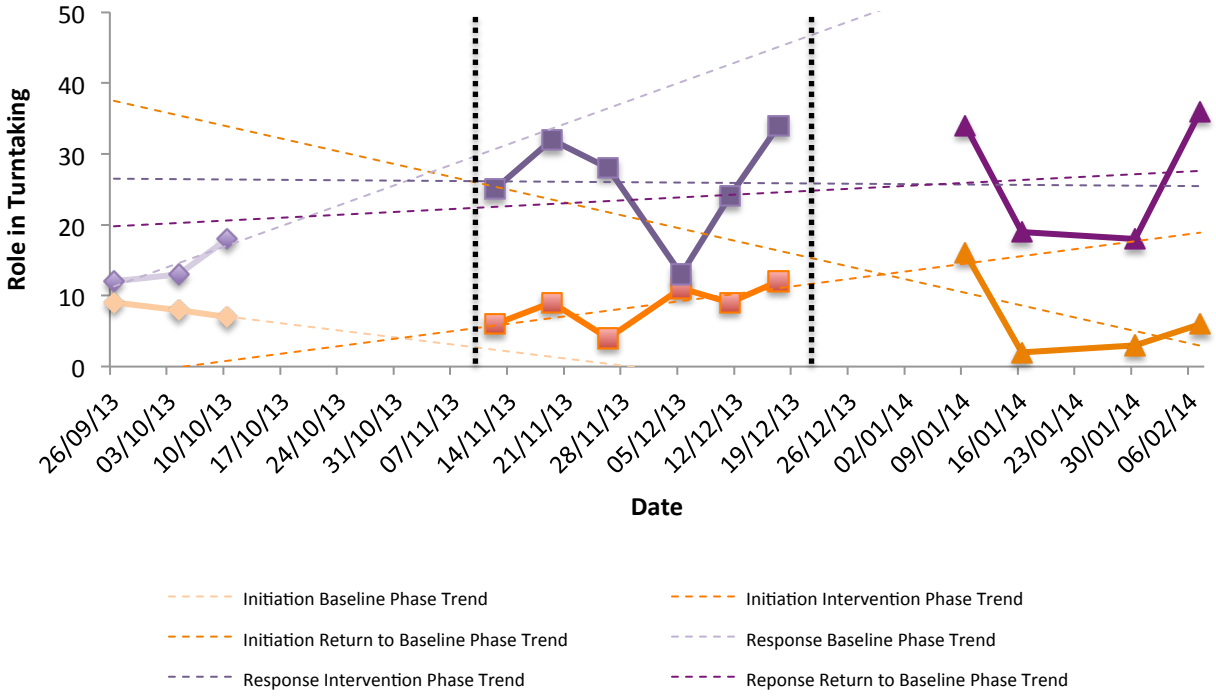
Graph 75: A line graph showing James' role in turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



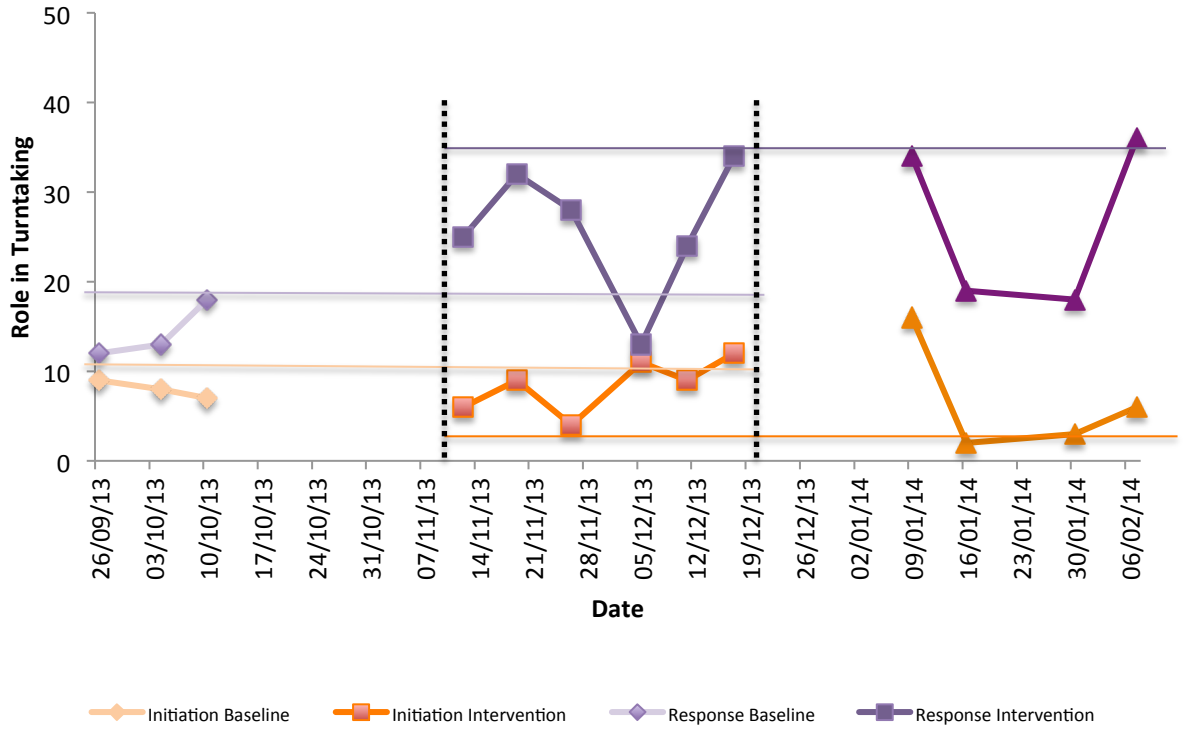
Graph 76: A line graph with **mean lines** showing James's turn taking (initiation & response) attempts across Baseline, Intervention and Return to Baseline



Graph 77: A line graph with **variance lines** showing James' turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 78: A line graph with **trend lines** showing James' turn taking (initiation & response) across Baseline, Intervention and Return to Baseline



Graph 79: A line graph with **overlap lines** showing James' turn taking (initiation & response) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Initiation:* Graph 76 shows a slight increase in mean from Baseline (8) to Intervention (8.5), this declines within the Return to Baseline (6.75). *Response:* Graph 76 shows a large increase in mean from Baseline (14.3) to Intervention (26), which is maintained within the Return to Baseline (26.8).
Trend	*Initiation:* Graph 78 shows a fairly steep declining trend in Baseline to a fairly steep incline in the Intervention. This changes to a very steep negative trend in the Return to Baseline. *Response:* Graph 78 shows a steep positive trend in Baseline, which becomes less steep in the Intervention and slightly steeper in the Return to Baseline.
Variability	*Initiation:* Graph 77 shows low variability within Baseline (SD: 1) and Intervention (SD: 3). Return to Baseline (SD: 6.3) is fairly unstable. *Response:* Graph 77 shows low variability in the Baseline (SD: 3.2), but is very unstable within Intervention (SD: 7.4) and Return to Baseline (SD: 9.5).
Immediacy of effect	*Initiation:* Graph 75 shows no immediate effect between Baseline and Intervention. A fairly immediate decline can be seen from Intervention to Return to Baseline. *Response:* Graph 75 shows an immediate positive effect from Baseline to Intervention. No immediate effect between Intervention and Return to Baseline was shown.
Overlap	*Initiation:* Graph 79 shows that the majority of data within all the phases overlapped, besides an extreme high point in the Return to Baseline. *Response:* Graph 79 shows only one Baseline data point overlapped with the Intervention. The majority of Intervention and Return to Baseline data overlapped besides an extreme low point in Intervention and high point in Return to Baseline.
Consistency	*Initiation:* Graph 75 shows high consistency of data from Baseline to Return to Baseline phases. *Response:* Graph 75 shows low consistency of data from Baseline to Return to Baseline phases.

Table 47: A summary of the outcome of the visual analysis of James' turn taking (initiation & response) graphs

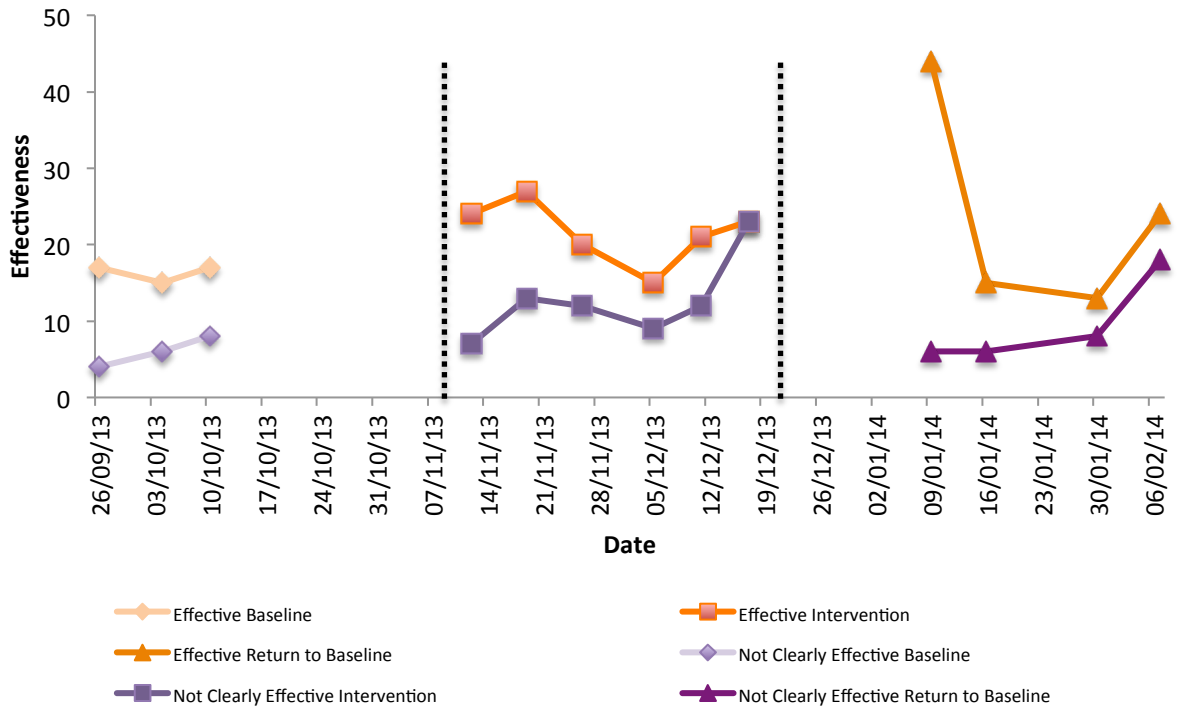
4.11.2.4. James' role in turn taking: summary

Visual analysis suggests that overall James engaged in more response to communication attempts than initiating.

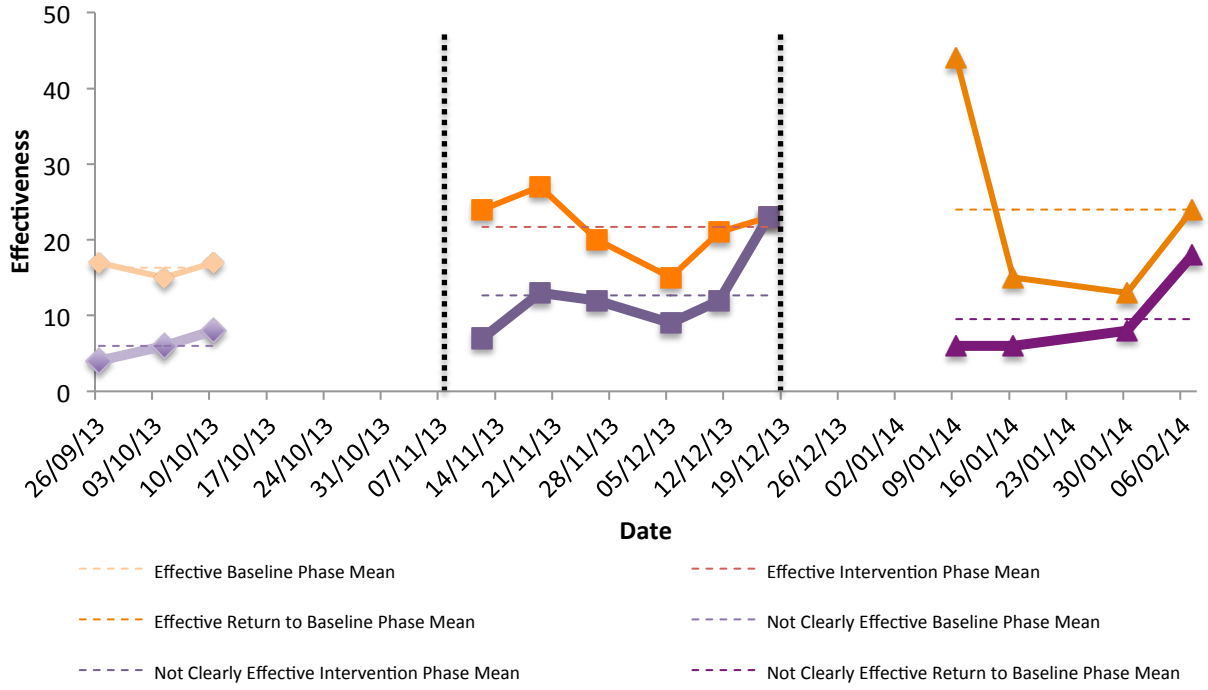
The intervention does not appear to have greatly impacted on James' initiation of communication. Trend lines suggest that this may have increased positively if the intervention had not been withdrawn and lasted longer than six weeks. Instead James' initiation of communication maintained around the same level through the study. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 and 2 (Role in turn taking: Initiation).

The intervention appears to have had a large positive impact on James' amount of responses to communication. This impact appears to have been very immediate and somewhat maintained after the intervention was withdrawn, although this varied. According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 & 2 (Role in turn taking: Response) as three demonstrations of an effect (level, immediacy of effect, overlap) and at least one demonstration of a non-effect can be seen.

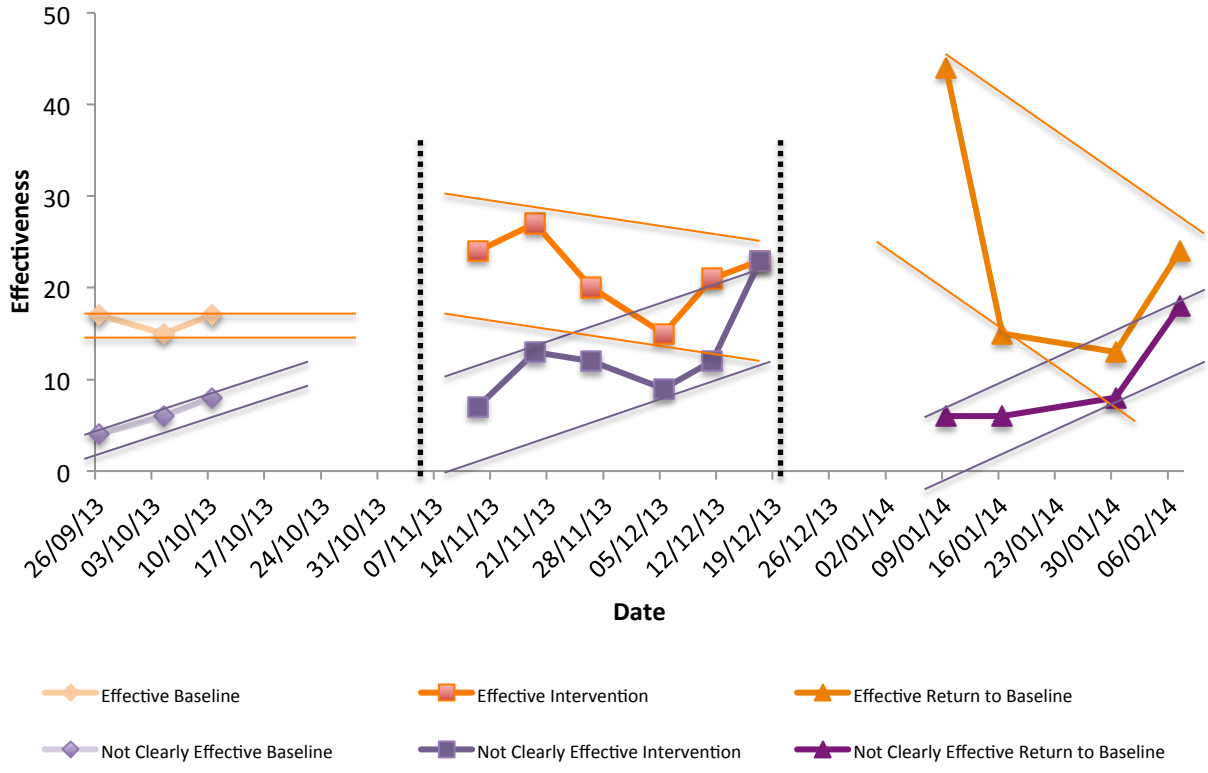
4.11.2.5. Effectiveness: effective & not clearly effective



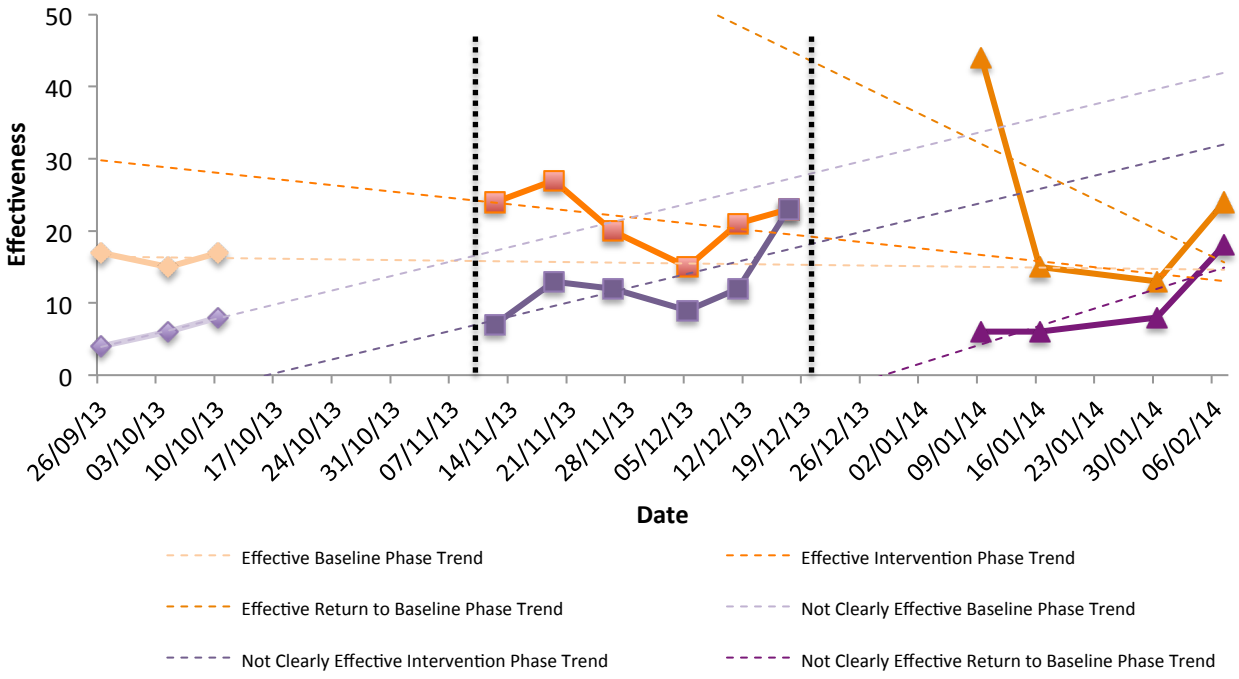
Graph 80: A line graph showing James' communication effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



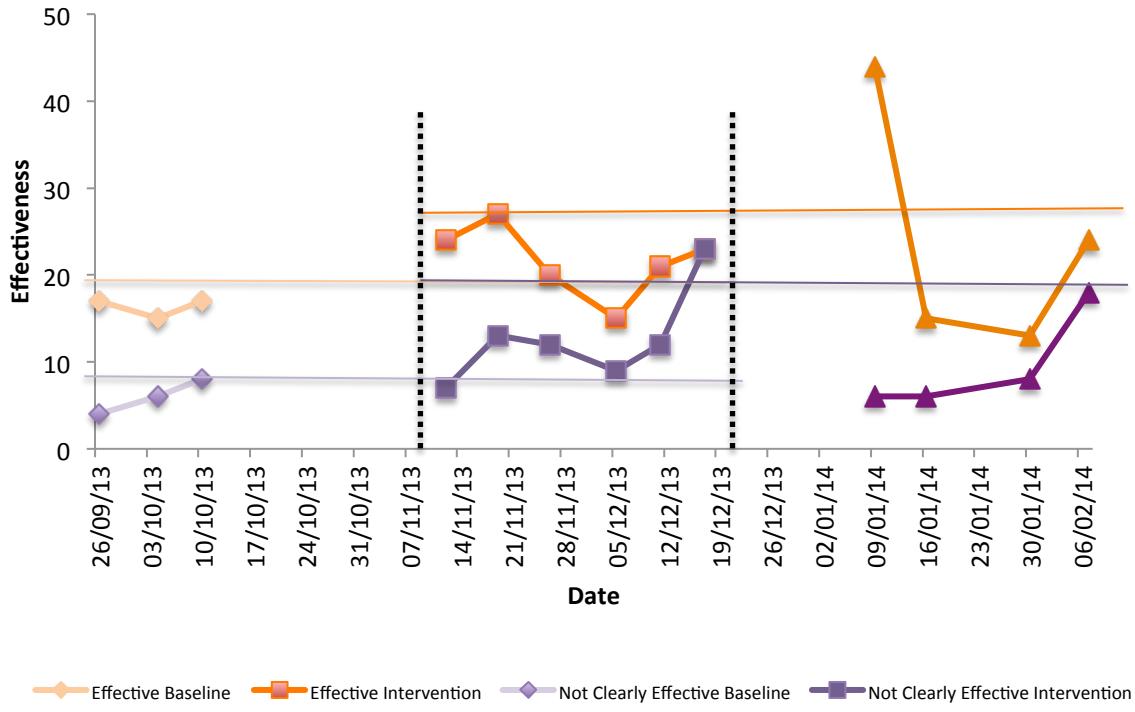
Graph 81: A line graph with **mean lines** showing James' effectiveness (effective & not clearly effective) attempts across Baseline, Intervention and Return to Baseline



Graph 82: A line graph with **variance lines** showing James' turn taking effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 83: A line graph with **trend lines** showing James' effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline



Graph 84: A line graph with **overlap lines** showing James' effectiveness (effective & not clearly effective) across Baseline, Intervention and Return to Baseline

Characteristic	Visual Analysis
Level	*Effective:* Graph 81 shows a large positive change in mean from Baseline (16.3) to Intervention (21.6) and a slight positive change from Intervention to Return to Baseline (24). *Not Clearly Effective:* Graph 81 shows a large positive change in mean from Baseline (6) to Intervention (12.6). This reduced once the intervention was withdrawn; Return to Baseline (9.5).
Trend	*Effective:* Graph 83 shows a fairly horizontal trend in Baseline change to a shallow declining trend in Intervention and a steep declining trend in Return to Baseline. *Not Clearly Effective:* Graph 83 shows a fairly steep positive trend remained at a similar slope throughout the Baseline, Intervention and Return to Baseline phase.
Variability	*Effective:* Graph 82 shows low variability in Baseline (SD: 1.1) and Intervention (SD: 4). Extremely high variability in data can be seen in the Return to Baseline (SD: 14.1). *Not Clearly Effective:* Graph 82 shows high stability in the Baseline (SD: 2) , whilst higher variability was shown in Intervention (SD: 5.5.) and Return to Baseline (SD: 5.7).
Immediacy of effect	*Effective:* Graph 80 shows an immediate large positive effect from Baseline to Intervention. No immediate effect was shown from Intervention to Return to Baseline. *Not Clearly Effective:* Graph 80 shows a fairly large positive effect from Baseline to Intervention. Immediate negative effect from Intervention to Return to Baseline phase can also be seen.
Overlap	*Effective:* Graph 84 shows that the baseline data only overlapped with one low data point in the Intervention. Only one data point overlapped from Return to Baseline and the Intervention. *Not Clearly Effective:* Graph 84 shows that the majority of data overlapped across the stages, except for an extreme high data in Intervention and extreme low in the Baseline.

Consistency	*Effective:* Graph 80 shows some consistency between data in the Baseline and Return to Baseline. Effective communication appears to be higher in the Return to Baseline. *Not Clearly Effective:* Graph 80 shows some consistency between data in the Baseline and Return to Baseline phase. Not clearly effective communication appears to be higher in the Return to Baseline.

Table 48: A summary of the outcome of the visual analysis of James' effectiveness (effective & not clearly effective) graphs

4.11.2.6. James' effectiveness: summary

Visual analysis suggests that overall James demonstrated more effective communication than not clearly effective communication across all the stages in the study.

The intervention appears to have impacted positively on the amount of effective communication James had, although it also appears to have increased the amount of not clearly effective communication he displayed. Therefore, suggesting an increase in overall communication but the positive effect on his effectiveness is perhaps less clear.

According to Kratochwill et al's (2010) guidance these findings provide *Moderate Evidence* which can be used to answer Research Question 1 & 2 (Effectiveness: Effective) as three demonstrations of an effect (level, immediacy of effect, overlap, consistency) and at least one demonstration of a non-effect can be seen. According to Kratochwill et al's (2010) guidance these findings provide *No Evidence* to Research Question 1 & 2 (Effectiveness: Not clearly effective) as it does not provide three demonstrations of an effect.

4.11.3. Descriptive data – mode of communication

	Baseline		Intervention		Return to Baseline	
Mode	*Mean*	*Percentage*	*Mean*	*Percentage*	*Mean*	*Percentage*
Eye contact	12.25	35.51	24.83	37.72	26.75	41.15
Gesture	6.00	17.39	5.50	8.35	8.75	13.46
Graphic	1.00	2.90	1.17	1.77	1.25	1.92
Vocalisation	2.75	7.97	5.17	7.85	5.75	8.85
Speech: one word utterance	2.50	7.25	11.33	17.22	7.50	11.54
Speech: 2/3 words	3.75	10.87	7.33	11.14	5.25	8.08
Speech: flowing speech	6.25	18.12	10.50	15.95	9.75	15.00

Table 49: Descriptive data of James' mode of communication across Baseline, Intervention and Return to Baseline phases

The descriptive data suggests that James' main mode of communication within the Baseline phase was eye contact, gesture and flowing speech. His use of eye contact increased within the intervention and continued to increase once the intervention was withdrawn. His use of gesture reduced in the Intervention phase but increased once the intervention was withdrawn. His flowing speech maintained around similar levels across all phases. His use of one-word utterances increased within the Intervention phase but was fairly low in the Baseline and Return to Baseline phases.

4.11.4. The Social Competency Inventory (SCI; pre, post, delayed measure)

School perceptions (Class Teacher);

SCI	Pre	Post	*Difference*
Prosocial Orientation	3.2	3.4	+ 0.2
Social Initiative	1.9	3.3	+ 1.4
Overall	2.7	3.2	+ 0.5

Table 50: James' class teacher's scores on the Social Competency Inventory pre and post

Home perceptions (Mother);

SCI	Pre	Post	*Difference*
Prosocial Orientation	4.2	4.3	+ 0.1
Social Initiative	3.4	3.9	+ 0.5
Overall	3.8	4	+ 0.2

Table 51: James' parent's scores on the Social Competency Inventory pre and post

4.11.4.1. James' SCI scores: summary

Table 50 and Table 51 show that both teacher and parent perceptions of James' social skills increased after the introduction of the intervention.

James' teacher and parents rated a larger increase for his social initiative skills than his pro-social skills.

4.11.5. The Belonging Scale (BS; pre, post, delayed measure)

	Pre	Post	*Difference*
Belonging Scale	2.8	3	+ 0.2

Table 52: James' self-reported scores on the Belonging Scale pre and post

4.11.5.1. James' BS scores: summary

Table 52 shows that James' self-reported sense of school belonging increase slightly after the introduction of the intervention.

4.12. Summary of results

A summary of the key findings (across all the cases) and the strength of evidence, according to Kratochwill et al (2010) will now be detailed for each research question. These will then be discussed in more depth within *Chapter 5: Discussion*.

Research Question 1: **Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties?**

Table 53 summarises the findings related to research question one, according to Kratochwill et al's (2010) criteria for demonstrating evidence of a relation between an IV and DV;

Participant	**Total communication**	**Role in turn taking**		**Effectiveness**	
		Initiation	**Response**	**Effective**	**Not Clearly Effective**
Ali	None	None	Moderate	None	None
Faisal	None	None	None	None	Moderate
Taimoor	None	None	Moderate	None	None
Chloe	Moderate	Moderate	Moderate	Strong	None
William	None	None	None	None	None
James	Moderate	None	Moderate	Moderate	None

Table 53: Summary of findings for Research Questions 1, according to Kratochwill et al's (2010) criteria for demonstrating evidence of a relation between an IV and DV

Table 53 shows that an effect in at least one area of communication measured was shown for all the participant's, except for William who had no positive effect for any of the skills measured. A positive increase in;

- total communication occurred for two participants (Chloe, James)
- amount of initiation for one participant (Chloe)
- amount of responses for four participants (Ali, Taimoor, Chloe, James)
- effective communication for two participants (Chloe, James)

A decline in not clearly effective communication occurred for one participant (Faisal).

Research Question 2: **Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties maintain after the intervention ends?**

Table 54 summarises the findings related to research question two, according to Kratochwill et al's (2010) criteria for demonstrating evidence of a relation between an IV and DV;

Participant	**Total communication**	**Role in turn taking**		**Effectiveness**	
		Initiation	**Response**	**Effective**	**Not Clearly Effective**
Ali	None	None	None	None	None
Faisal	None	None	None	None	Moderate
Taimoor	None	None	None	None	None
Chloe	Moderate	Moderate	Moderate	Strong	None
William	None	None	None	None	None
James	Moderate	None	Moderate	Moderate	None

Table 54: Summary of findings for Research Questions 2, according to Kratochwill et al's (2010) criteria for demonstrating evidence of a relation between an IV and DV

Table 54 shows that maintenance of the effects developed within the intervention could be seen for three of the five participants' that had an effect (Faisal, Chloe, James).

Research Question 3: **Does Lego® Therapy have a positive impact on parent and teacher perceptions of the generalisation (across home/school settings) of social confidence and independence of primary-aged children with social communication difficulties?**

Table 55 shows a summary of the findings for all the participants' teacher and parent perceptions of their social communication skills.

Participant	**Teacher Perception**				**Parent Perception**			
	Pro-Social orientation		***Social Initiative Skills***		***Pro-Social orientation***		***Social Initiative Skills***	
	Pre-Post	*Post - Delayed*	*Pre-Post*	*Post - Delayed*	*Pre-Post*	*Post - Delayed*	*Pre-Post*	*Post - Delayed*
Ali	+ 1.2	0	+ 0.3	- 2.2	- 0.6	0	- 0.2	- 2.2
Faisal	+ 1.5	- 0.1	+ 0.8	- 0.7	+ 0.9	0	- 0.1	- 0.1
Taimoor	+ 1.8	- 1.3	+ 0.3	- 0.3	- 0.3	- 0.7	0	- 0.8
Chloe	- 0.1	-	0	-	- 0.3	-	+ 0.1	-
William	+ 0.1	-	+ 0.5	-	+ 0.4	-	+ 0.6	-
James	+ 0.2	-	+ 1.4	-	+ 0.1	-	+ 0.5	-

Table 55: Summary of findings for Research Question 3

Table 55 shows that the majority of the participant's teacher's rated an increase in the pupil's pro-social and social initiative skills after the intervention. For those participant's that data was able to be obtained this increase did not appear to maintain for the majority of them.

Table 55 further shows that parent perceptions differed across the participants, with three participants (Faisal, William, James) parents showing an increase in pro-social skills) and three participants been seen as having positive increase in their social initiative skills (Chloe, William, James). For those participant's that data was able to be obtained this increase did not appear to maintain for the majority of them.

Research Question 4: **Does Lego® Therapy have an effect upon the primary-aged children with social communication difficulties self-reported sense of social belonging?**

Table 56 shows a summary of the findings for all the participants' self-reported perceptions of their sense of school belonging.

Participant	***Self-report sense of belonging***	
	Pre-Post	*Post - Delayed*
Ali	- 0.4	+ 0.35
Faisal	- 0.5	+ 0.3
Taimoor	- 0.4	0
Chloe	0	-
William	0	-
James	+ 0.2	-

Table 56: Summary of findings for Research Questions 4

Table 56 shows that a slight decline in sense of school belonging was self-reported by three (Ali, Faisal, Taimoor) after the intervention. However, this increased following the removal of the intervention for two of them (Ali, Faisal). Chloe and William's sense of belonging remained at the same level post intervention and increased for James.

5. CHAPTER 5 – DISCUSSION

5.1. Introduction to Chapter 5

This chapter aims to explore and examine the present study's findings in light of the literature and research discussed within the *Literature Review* (Chapter 2) and the design, procedure, measures and data analysis presented in the *Methodology* (Chapter 3). The chapter begins with a summary of the research findings related to each case and then across the cases for each research question. Possible explanations and links to the literature are considered. Limitations of the study are then discussed along with implications for educational and EP practice and potential future research. The chapter concludes with the author's reflections on the research experience and leads to the final chapter, *Conclusions* (Chapter 6).

5.2. Summary of findings related to each case

5.2.1. Summary of findings: Ali

Data from Ali's video observations suggest that Lego® Therapy did not have an immediate positive effect upon his amount of communication. An increase in his communication was shown towards the end of the intervention and it could be speculated that if the intervention was implemented for a longer period, then a greater positive effect may have been observed. The intervention also did not appear to impact positively on his initiation in turn taking, however according to Kratochwill et al (2010) a moderate positive effect upon the amount of his responses was shown. Furthermore, his amount of effective and non-effective communication did not appear to improve either from the introduction of the intervention. Moreover, no maintenance of skills was apparent after the removal of the intervention, and in fact showed a reduction in all of his skills. It is questioned as to whether this decline was due to the removal of the intervention or the gap in support over the summer holidays and transition into a mainstream classroom. In addition, the descriptive data suggests that Ali's main modes of communication (eye contact, flowing speech or 2/3 words) did not alter greatly across the phases, besides his use of gestures that appeared to increase.

Ali's teacher's views of his social skills increased after the intervention, particularly for his pro-social orientation. However, his parent's perceptions suggested a decline in his social skills following the intervention and afterwards, particularly his social initiative

skills. Ali's sense of school belonging also fluctuated, declining after the intervention and increasing after it was withdrawn.

5.2.2. Summary of findings: Faisal

Data from Faisal's video observations suggest that his communication was quite unstable across all phases and therefore makes any change difficult to establish. It appears that Lego® Therapy did not impact upon the majority of his skills (amount of communication, initiation, response). However, it is hypothesised that a positive impact may have occurred if the intervention had been implemented for longer, particularly for his amount of communication, response to communication and effective communication. However, a small decline in his not clearly effective communication does appear to have occurred, which was also maintained after the intervention was withdrawn. In addition, no maintenance of skills was evident after the removal of the intervention, and in fact a reduction was shown in all of his skills. It is questioned as to whether this decline in skill was due to the removal of the intervention or the impact of the gap in support over the summer holidays and transition into a mainstream classroom. In addition, the descriptive data suggests that Faisal's main modes of communication (eye contact, graphic) did not alter greatly across the phases. Another main mode of communication, flowing speech, reduced with the introduction of the intervention but increased after its removal. Also, the intervention does appear to have enhanced his ability to use gestures to support his communication.

Faisal's teacher and parent perceptions of his pro-social orientation rose following the introduction of the intervention. These perceptions reduced slightly after the withdrawal of the intervention for his teacher but maintained for his parents. His social initiative behaviour was seen as increasing during the intervention and maintained at this higher level after intervention withdrawal by his teachers, however it was perceived by his parents to have slightly declined with the introduction of the intervention and remained at this lower level after the intervention was withdrawn. Faisal self-reported a slight decrease in his sense of school belonging immediately after the intervention, however this increased after the interventions withdrawal.

5.2.3. Summary of findings: Taimoor

Data from Taimoor's video observations suggest that his communication was quite unstable across all phases and therefore makes any change difficult to establish. It

appears that Lego® Therapy did not impact upon the majority of his skills (amount of communication, initiation, effectiveness). A moderate effect, according to Kratochwill's (2010) guidance was seen for the amount of responses he made. This did not maintain after the withdrawal of the intervention and the summer holidays, and a decline in all of his skills was shown. The descriptive data suggests that Taimoor's main modes of communication were impacted upon by the intervention. His use of eye contact and flowing speech reduced, however rose again after the withdrawal of the intervention. His amount of gestures remained around the same level and he appeared to become more reliant upon shorter sentences within the intervention and post intervention phases.

Taimoor's teacher's views of his social skills increased after the intervention, particularly for his pro-social orientation. These perceptions declined after the withdrawal of the intervention. However, his parent's perceptions suggested a decline in his pro-social orientation following the intervention and no change to his social initiative behaviour. Both skills were perceived as reducing after the removal of the intervention. Taimoor self-reported a slight decrease in his sense of school belonging immediately after the intervention, this remained at the same level after the interventions withdrawal.

5.2.4. Summary of findings: Chloe

Data from Chloe's video observations suggest that the intervention impacted positively on all the social communication skills explored (amount of communication, initiation, response and effective communication). According to Kratochwill's (2010) definition a moderate effect was shown in supporting her amount of communication, initiation and response and a strong effect on the effectiveness of her communication. These positive effects appear to have maintained (for amount of initiation communication) and continued to improve (for amount of communication, response communication and effective communication) following the removal of the intervention. The continued positive increase in skill after the removal of the intervention could indicate a possible delayed response to intervention or other factors that may have increased her responses to communication, such as maturation. The descriptive data suggests that the intervention did not effect her main mode of communication, use of eye contact, however increased her use of flowing speech. This effect on flowing speech did not

appear to maintain after the removal of the intervention. Her use of gestures reduced within the intervention and once the intervention was removed.

Chloe's teacher and parent's perceptions of her social communication skills vary greatly. Her teacher suggested that her pro-social orientation skills declined during the intervention whilst her social initiative behaviour remained at the same level. Whilst her parents suggested her pro-social skills declined slightly and her social initiative behaviour increased with the introduction of the intervention. Chloe's self-reported sense of school belonging was at the highest level pre-intervention and remained the same after the intervention.

5.2.5. Summary of findings: William

Data from William's video observations suggest that William's skills were somewhat stable before the introduction of the intervention, became variable within the intervention phase and returned to a stable level once it was withdrawn. Overall, none of his skills were positively impacted upon by the introduction of the intervention, and in fact his amount of communication decreased during the intervention and increased once it was removed. It is queried as to whether the focus of having an explicit intervention for an area of weakness (his social skills) may have negatively impacted upon William's skills, which was also reported by the school SENCo as his response to a more explicit intervention, SULP. The descriptive data suggests that the intervention may have reduced his use of eye contact and didn't impact upon his other main modes of communication (flowing speech and one-word utterances). It may have encouraged him to use shorter sentences as well as these main modes of communication.

Contrary to the video observations his parents and teacher reported an increase in his social skills, particularly his social initiative skills. William's self-reported sense of school belonging was at the highest level pre-intervention and remained the same after the intervention.

5.2.6. Summary of findings: James

Data from James' video observations suggest that the intervention had a positive effect upon the majority of his social communication skills explored. According to Kratochwill's (2010) definition a moderate effect was shown in supporting his amount of communication, responses and the effectiveness of his communication. These positive effects appear to have maintained following the removal of the intervention. A

positive effect was not seen for his initiation communication, however it is queried as to whether this would have increased if the intervention had not been withdrawn and lasted longer than six weeks. The descriptive data suggests the intervention supported an increase in James' use of eye contact whilst his other main mode of communication (flowing speech) remained around the same level. A decline in use of gesture to support his communication was shown within the intervention but this was not maintained post intervention.

James' parent and teacher perceptions gave support to this increase in social communication skills after the introduction of the intervention. Gains were said to be larger in his social initiative skills than his pro-social skills. James' self reported sense of school belonging also increased after the introduction of the intervention.

In order to draw out potential themes in the cases and links to the literature these findings are to be discussed for each research question.

5.3. Key findings in relation to each research question

5.3.1. Research Question 1: Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties?

Research Hypothesis: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence within small group tasks within their classroom.*

5.3.1.1. Key findings

Total communication attempts

For two of the cases a positive effect on their overall amount of communication attempts was shown (Chloe & James). These varied in their size, with the intervention showing the largest and immediate influence on the amount of James' communication.

For three of the cases (Ali, Faisal & Taimoor) no clear positive effect was observed, however changes in their trend lines suggested a possible positive effect may have occurred had the intervention been sustained for a longer period and no break of support made over the summer holidays. For one of the cases (William) a slight negative impact of the intervention on his overall communication attempts was observed.

Role in Turn taking: initiation/response

All the cases in the study produced more responses to communication than initiation of communication across all the phases in the study.

Initiation

For one case (Chloe), a slight positive effect on her initiation of communication was shown. For another case (James) no clear positive effect was observed, however changes in trend lines suggested a possible positive effect may have occurred if the intervention had continued for longer than six weeks and without the Christmas holiday break. No effect was seen for four cases (Ali, Taimoor, Faisal & William), with the level of initiation of communication remaining around the same as at Baseline.

Response

For four cases a positive effect upon the amount of responses to communication that they made was seen. This varied in strength with, strong (James), medium (Ali) and small (Taimoor, Chloe) effects observed. For another case (Faisal) no clear positive

effect was observed, however changes in his trend lines suggested a possible positive effect may have occurred if the intervention had continued for longer than six weeks and he had not had the break of support over the Summer holidays.

Effectiveness: effective/not clearly effective

All the cases in the study produced more effective communication than not clearly effective across all the phases in the study.

Effective

For two cases (Chloe & James) a positive effect on their effective communication was shown. For one case (Taimoor) an immediate positive effect was shown but this did not maintain within the Intervention phase. For two cases (Ali & Faisal) no clear positive effect was shown however changes in their trend lines suggested a possible positive effect may have occurred had the intervention been sustained for a longer period and no break of support made over the summer holidays. For one case (William) a decline in his effective communication was seen.

Not Clearly Effective

For one participant (Faisal) a moderate positive effect was shown as his not clearly effective communication reduced. For three cases (Ali, Taimoor & William) no clear positive effect was shown however changes in their trend lines suggested a possible positive effect may have occurred had the intervention been sustained for a longer period and no break of support made over the holidays. For one participant (Chloe) no effect was shown and her amount of not clearly effective communication maintained. For one participant (James) a negative effect was shown as his amount of not clearly effective communication increased.

Mode of communication

Before the intervention all of the participants' main modes of communication were eye contact and flowing speech. A number of other modes of communication were also used, such as graphic (Ali, Faisal), gesture (Taimoor, Chloe, James) and one-word utterances (William). With the introduction of the intervention no change in eye contact was shown for Ali, Faisal and Chloe, however an increase in eye contact was shown by James and a reduction observed for Taimoor and William. Use of gestures increased for Ali and Faisal, reduced for Chloe and James and remained around the same level for

Taimoor. Flowing speech increased for Chloe, reduced for Ali and Faisal and remained at the same level for William and James. The use of graphics reduced for Ali and remained at the same level for Faisal.

5.3.1.2. Possible explanations for findings

- Such variability across cases may be due to the individual differences in social communication development across the children.
- The intervention was only implemented for six weeks, limiting the time that positive effects would have had to emerge.
- The naturalistic, less explicit programme may also have been more suitable for some children than others due to their different social communication needs and responses to instruction. The relaxed, nurturing and peer led nature of the intervention may have been more suitable for the older and more socially able children (in School 2) than the less socially able children (in School 1). It is hypothesised that the participants in School 1 needs were more acute and thus less structured and explicit approaches may not have been as appropriate.
- The main impact across the cases was on the participants' response to other's communication. It is therefore hypothesised that this turn taking skill may develop before initiation skills develop.
- In order for communication to become effective (as in Chloe and James' cases) the amount of communication and response skills need to be developed securely.

5.3.1.3. Links to key literature

These findings support the view of the individual nature of social communication skill development and the variability of needs in which children can have that impact on their social communication development (I Can, 2012).

The variety of skills that the children had prior to the intervention and developed within the intervention shows the complexity of becoming socially competent. Odom et al (2008) described how a person is said to be socially competent if they have the ability to initiate, develop and maintain satisfying relationships. Skills including using speech to comment and request, as well as having an understanding of the rules that govern turn taking and topic contributions were said to develop an individual's social competency (Stanton-Chapman & Snell, 2011). The findings suggest that Lego® Therapy can

support the development of some of the skills that support an individuals social competency, such as response to other's communication, however this is very individualistic. The majority of the participants' increased their responses to communication but not the amount of effective communication. Kaczmarek (2002) suggests that a person requires the development of initiation and response skills in order to become socially competent. It appears that the intervention supported the majority of the participants to develop their listener-responder role but not their speaker-initiator role and thus the intervention did not make them completely socially competent (Kaczmarek, 2002). This is exemplified by Chloe whose amount of communication, initiation and response skills increased and led to a positive effect upon her overall communication effectiveness.

The literature suggested two main categories of social communication intervention, child-specific (in which adults give instruction, prompting and reinforcing of targeted skills) and peer-mediated approaches (in which the child's peers are encouraged to implement an intervention in the child's natural context) (McConnell et al, 2002). Lego® Therapy falls into the peer-mediated approaches that have been critiqued for not providing intense direct instruction, a technique which is often used in effective child-specific and adult-led interventions (Brown et al, 2001; Brown et al, 2008). The findings of the present study indicate that some individual children can benefit from peer-mediated approaches, such as Lego® Therapy, in developing skill competencies, particularly their ability to respond to communication. As discussed, the optimum length of the intervention is queried and the researcher proposes this positive effect on skill development could have been enhanced with further implementation of the intervention, as shown in other Lego® Therapy research in which it was possible to implement the intervention for longer (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al, 2008; Andras, 2012).

5.3.1.4. Conclusions

Overall the results suggest that Lego® Therapy did have some positive effect on the majority of the participants' social confidence and independence, however the impact is variable depending on the participant's age, needs and response to the nature of the intervention. For two participants, Chloe and James, the impact was the largest and it is argued that pre-requisite development of both the amount of communication and

response to communication is required in order for the Lego® Therapy intervention to support improvement in the overall effectiveness of a child's communication. Also, more positive gains may have been seen for the majority of other participants if the intervention had been implemented for longer than six weeks.

5.3.2. Research Question 2: Does Lego® Therapy have an effect upon the social confidence and independence of primary-aged children with social communication difficulties maintain after the intervention ends?

Research Hypothesis: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence, which will be maintained once the intervention is withdrawn.*

5.3.2.1. Key findings

Total Communication attempts

Of the cases that had an effect (two cases, James & Chloe), maintenance of the positive effect was shown in both. No maintenance of the negative effect on total communication was shown for another case (William).

Role in Turn taking: Initiation/Response

Initiation

Of the case that had an effect (Chloe) maintenance of initiation of communication level does appear to have been held after the Christmas holidays.

Response

Of the cases that had an effect (four cases, Ali, Taimoor, Chloe, James) the positive impact on response to communication attempts were only maintained for two cases (Chloe & James).

Effectiveness: effective/not clearly effective

Effective

Of the cases that had an effect (two, Chloe & James) maintenance of the positive impact on their effective communication could be seen in both.

Not Clearly Effective

Of the cases that had an effect (one, Faisal) maintenance of the positive effect (i.e. reduction of not clearly effective communication) was shown. The negative effect

(increase of not clearly effective communication) was not maintained for one case (James), with the amount of not clearly effective communication reducing after intervention withdrawal.

5.3.2.2. Possible explanations for findings

- Such variability across cases may be due to the individual differences in social communication development across the children.
- Whether a skill is maintained, as observed in Chloe and James, may be influenced by the strength and effectiveness of skill development within the intervention. As the participants' communication effectiveness increased their confidence to engage in social communications may also increase, leading to further rehearsal of their skills.
- The lack of maintenance in skill for Ali and Taimoor may be due to them not developing their skills sufficiently within the intervention for them to be maintained afterwards. It may also be due to extraneous variables, such as the large gap in support over the summer holidays and changes in their environment once they returned back to school (such as change in classroom, teacher and some of their peer group).

5.3.2.3. Links to key literature

The maintenance of skills following Lego® Therapy evident in some individual cases supports the notion that social communication interventions that provide instruction, rehearsal, feedback and reinforcement can lead to successful maintenance of social communication skill development (Stanton-Chapman et al, 2008). Although Lego® Therapy is less explicit in its instruction the routine nature of the approach leads to these components being implemented in a subtle way and they appear to maintain once the intervention was withdrawn (for Chloe & James). Potentially the less explicit nature of Lego® Therapy may not have been as suitable for other participants (Ali & Taimoor) and thus not as appropriate to their needs for skill maintenance to occur, as suggested by Brown et al (2008).

5.3.2.4. Conclusions

Overall the results suggest that skills developed within the Lego® Therapy can be maintained once the intervention is withdrawn for some participants. This is variable

depending upon the participant's response to intervention, type of skill developed within the intervention and other extraneous variables, such as environmental changes (break over summer holidays, change in classroom, peer group).

5.3.3. Research Question 3: Does Lego® Therapy have a positive impact on parent and teacher perceptions of the generalisation (across home/school settings) of social confidence and independence of primary-aged children with social communication difficulties?

Research Hypothesis: Participation in the Lego® *Therapy intervention will result in positive gains in the focus children's social confidence and social independence across home and school settings, as shown by positive changes in parent and teacher perceptions.*

5.3.3.1. Key findings

The majority of the participants' teachers rated an increase in the pupils' pro-social and social initiative skills after the intervention. For those participants where data could be obtained (three of six) increases only maintained for Ali's pro-social orientation.

Parent perceptions differed across the participants, with three participants' parents (Faisal, William, James) reporting an increase in pro-social skills and three participants' parents (Chloe, William, James) indicating positive increases in their social initiative skills. For the participants where data could be obtained (three of six) this increase only maintained for Ali and Faisal's pro-social orientation.

5.3.3.2. Possible explanations for findings

- The participants' parents and teachers saw an increase in overall social communication skills following the intervention possibly due to the skills developed within Lego® Therapy generalising into their school and home environments.
- The positive views may not have maintained after the withdrawal of the intervention as the skills developed within the intervention were not shown post withdrawal in the home and school settings. The gap in support over the summer and Christmas holidays may have influenced this outcome.
- Parent and teacher perceptions may have been impacted upon by their view of the research intentions (i.e. evaluation of the effectiveness of Lego® Therapy)

and wish to report positive outcomes for the participants and demonstrate the effectiveness of the Lego® Therapy intervention.

5.3.3.3. Links to key literature

Skills developed within the Lego® Therapy intervention do appear to have generalised into the school and home settings, as perceived by their teachers and parents. This may be due to the naturalistic nature of the intervention, which has been triumphed for its ability to generalise skills developed in the intervention into children's social world as they are incorporated into routine classroom activities (Rule et al, 1998). Thus contradicting other research that suggests that peer-mediated approaches do not support skill generalisation without the support of a teacher (Odom et al, 1985). Lego® Therapy's key components of giving instruction, rehearsal, feedback and reinforcement through a naturalistic and supported play environment appears to have supported skill generalisation, as suggested by Stanton-Chapman et al (2008). These components are further said to lead to both generalisation and maintenance of skills (Rule et al, 1998; Stanton-Chapman et al, 2008), however the perceptions shown here do not support Lego® Therapy's ability to maintain skill generalisation once an intervention is withdrawn.

5.3.3.4. Conclusions

Overall the results suggest that Lego® Therapy can have a positive effect on social skill development which appears to be generalised into home and school settings for some children. The effect appears to have generalised more into the school settings than the home settings. These generalisations do not appear to maintain after withdrawal of the intervention. Contradictions between the repeated measures and pre-post test, i.e. no effect on Williams skills shown within the repeated measures, yet large skill development rated by his parents and teachers, lead the researcher to query the overall reliability of the pre-post measure. This measure may have been impacted by threats to reliability and validity such as observer bias and maturation, which will be discussed further in *Section 5.4, Limitations of the research*.

5.3.4. Research Question 4: Does Lego® Therapy have an effect upon the primary-aged children with social communication difficulties self-reported sense of social belonging?

Research Hypothesis: Participation in the Lego® *Therapy intervention will result in an increase in the focus children's self-reported sense of school belonging.*

5.3.4.1. Key findings

All the participants rated their sense of school belonging highly prior to the intervention. A small decline in sense of school belonging was self-reported by three participants (Ali, Faisal & Taimoor) immediately after the intervention. However, this increased following the removal of the intervention for two of them (Ali & Faisal). Chloe and William's sense of belonging remained at the same level post intervention and increased for James.

5.3.4.2. Possible explanations for findings

- Prior to the intervention all the participants' felt a strong sense of school belonging. This may have meant that a potential ceiling effect occurred and the measure was not sensitive enough to pick up further increases in the participant's sense of school belonging.
- This high sense of school belonging may come from the participant's actual sense of belonging, but also potentially due to participant bias in which they change their scores to fit with their perceived view of the interventions purpose and cultural norms, i.e. school is a positive place where they feel safe.
- James' increase in sense of school belonging may have been due to the intervention developing his social communication skills which enabled him to engage more positively with peers and adults within the school.
- The lack of change in Chloe and William's pre-post test scores may have been due to the ceiling effect described, alternatively the intervention may not have affected their already positively developed sense of school belonging.
- Some of the participant's (Ali, Faisal & Taimoor) decline in their sense of school belonging may have been due to the nature of the 'withdrawal' intervention which may have made them feel less connected to their class

and sense of school belonging. Alternatively, the decline may have been due to a threat to the measures internal validity, statistical regression. This suggests that extreme scores at pre-test are likely to regress towards the mean at subsequent testing.

5.3.4.3. Links to key literature

These findings support the literature that suggests that many children, with or without difficulties in social communication, often seek peer affiliation and a positive sense of school belonging (Wolfberg et al, 1999). The literature suggests that often children with social communication difficulties face exclusion from their peer group (Wolfberg et al, 1999), however the findings indicate this was not the case for all six participants. As most participants' scores were high prior to intervention it is unclear whether the intervention had an effect upon their sense of school belonging. However, as communication skills have risen for the majority of the participants within the intervention, the literature would suggest that they should be more socially accepted and chosen as preferred communication partners which should, in turn, lead to a higher sense of school belonging (Black, 1992; Black and Hazen, 1990). This is evident for both James and Chloe. Those whose skills were less developed within the intervention (Ali, Taimoor, Faisal, William) appear to have slightly decreased or maintained their sense of school belonging possibly due to them being less socially skilled and more socially isolated. This skill level and isolation from peers may have led them to interact more with adults, as opposed to peers, which can lead to a reduction in peers initiating further interactions with them Rice et al (1991).

5.3.4.4. Conclusions

Overall the results do not provide a clear answer to the research question due to the high level of sense of school belonging demonstrated prior to the intervention. It could be argued that the Lego® Therapy intervention supported the maintenance of this high level and increased the level for some participants. However, this is variable across the participants. The measures may have also been impacted by threats to reliability and validity due to the self-reported nature of the measure, to be discussed further in *Section 5.4, Limitations of the research*.

5.4. Limitations of the Research

It is important that the limitations of the current research are explored and presented in order to understand the results reported within context, their implications and potential future research. The limitations of this research are now considered across the methodology described in *Chapter 3*.

5.4.1. Design

SCED

The use of a SCED was selected for a number of reasons, detailed within *Section 3.5.5. The rational for the design used in this study*, for example it's relevance for evaluating educational practices at an individual level (Horner, et al 2005). Although this leads to limitations in the researcher's ability to generalise the findings from the study, it is argued that a SCED enabled for a more detailed exploration of the impact of the intervention at an individual level.

ABA design

The use of an ABA design has been supported over the traditional AB SCEDs due to its ability to make clearer judgments of the impact of an intervention (Robson, 2011). However, other types of SCED designs, such as multiple-baseline designs would have enhanced the clarity of the impact of the intervention further as subjects are introduced to the intervention at different points in time reducing external threats to the reliability of the measures (Robson, 2011), The ABA design was selected due to it allowing for a closer evaluation of the development of change, which would not have been as sensitive within group designs (Barlow et al, 2009) and due to it being more ecological valid within the current research context than multiple baseline designs.

Baseline phase

The Baseline phase is essential in SCEDs in order to be able to predict how the behaviour being explored is likely to continue without the introduction of an intervention (Barlow et al, 2009; Rizvi & Nock, 2008). Barlow and Hersen (1984) recommend at least three data points be gathered within baselines in order to develop a stable baseline. Three data points were gathered for all the participants and Chloe had four baseline data points. Due to practical restrictions, such as TA availability to run the intervention sessions, some of the participant's baselines were not as stable as the

researcher would have hoped for before the intervention had to begin (Faisal, Taimoor, Chloe). This variability within the baseline impacts on the validity of the results (Kratochwill et al, 2010). Faisal and Taimoor's variability in skills continued throughout the Intervention and Return to Baseline phases, which in itself makes it difficult to establish any real effect of the intervention. Chloe's baseline was stable until her final baseline data point; this again limits the researcher's ability to reliably suggest an impact of the intervention onto her skills.

Intervention phase

When planning the length of the Intervention phase, previous evaluations of the Lego® Therapy, the researcher's time and the schools feasibility were considered, as discussed in *Section 3.5.6.1. ABA Design, the length of phase B (intervention).* As no set length of intervention had previously been established and to fit with the Summer (for School 1) and Christmas (for School 2) holidays a six week intervention period was established. As discussed earlier within *Section 5.3, Key findings and possible interpretation to each research question* this length of intervention may have reduced the effectiveness of the intervention. Changes in trend for many of the skills observed suggested that if the intervention had continued then further positive effects may have been made for some of the participants. Also of note is the time of year that the intervention ran for School 2. The impact of extraneous events, including the build up to the Christmas holidays, may have impacted upon the participant's engagement in the intervention and within the weekly observations.

Return to baseline phase

The Return to Baseline phase aimed to give strength to the researcher's ability to demonstrate an effect of the intervention onto the target skills (Barlow et al, 2009). Due to the practicalities of the research a break between data collection for six weeks, over the summer holidays (for School 1) and for two weeks over the Christmas holidays (for School 2) occurred. This length of time without repeated measurement, as well as the change in class for School 1, reduces the reliability of the data within the Return to Baseline phase due to the inability to control any impact of these changes.

5.4.2. Defining and measuring social communication skills

The measures were chosen in an attempt to explore the research questions that emerged from the literature. The literature showed that there are various skills that could have been explored, such as length of interactions. From these skills, fundamental aspects of social communication measures were chosen which best supported the researcher in answering the research questions.

Observational measures

As discussed in *Section 3.6.4.2 Measuring dependent variable 1 & 2: social communication observations (repeated measures*) observational measures have been triumphed for their ability to "get at 'real life' in the real world" (Robson, 2011, pg. 316). An exploration of observational measures used in previous research, as described in *Section 2.5.10 Conclusions and implications onto the current research project of the systematic review* allowed the researcher to apply good practice in the current research and enhanced the reliability and validity of the measures used.

The use of video data and a coding system (Thunberg et al, 2007) enabled inter-observer agreement to be developed which reduced the potential criticism of observer bias due to selective attention, encoding and memory, observer drift and expectancy effects, as described by Robson (2011). The blind rating of the second coder also added more rigour to the agreements made. Piloting the coding system enabled a system to be developed which was most applicable to the population sampled within this research project. A customisation period for the video equipment was also used two weeks prior to the actual filming began. The impact, however, of the presence of an observer cannot be eradicated completely, and an awareness of this is needed in reporting the results (Robson, 2011). In School 1 a known TA conducted the filming, whilst in School 2 the researcher had to carry out the filming due to lack of staff availability. The impact of a less-known observer should also be considered when discussing the reliability of this measure. Due to ethical reasons, discussed in *Section 3.7.5. Ethical considerations*, the participants could not be blinded to the observations, which increased the likelihood of a 'Hawthorn effect[5] and participant bias to occur. The customisation period also aimed

[5] Hawthorn effect: defined as a participant's behaviour changing due to participation in an intervention (Cook & Campbell, 1979, Cohen et al, 2011)

to mitigate these potential effects with observers being instructed to be as unobtrusive as possible, however observer effects cannot be completely eradicated due to the nature of the measure used.

Collection of data at two/three points in time

The SCI and BS measures were collected at two/three points in time in order to enhance understanding of possible effects of the intervention within the participants' main contexts (home and school). The SCI scores strength in answering research question three, generalisation of the intervention, is limited due to it being based on parent and teacher perceptions as well as it being collected at two/three points in time and not repeated (Kazdin, 2003). The BS scores strength in answering research question four is also limited due to the self-reported nature of the data and it being collected at two/three points in time (Kazdin, 2003). This is due to the potential impact of history, testing and maturation which are not related to the Lego® Therapy intervention impacting on the scores and reducing their internal validity (Cook & Campbell, 1979; Cohen et al, 2011). These measures cannot control for these threats, as described in *Section 3.7.2. Internal Validity*, and thus cannot be presented as showing a causal relationship between variables.

Self-reported data

The SCI used self-reported data to explore parent and teacher perceptions of the participants' social communication skills, whilst the BS used self-reported data to see the participants' views of their sense of school belonging. There are many biases in this type of data that requires acknowledgment. Child self-reports have been critiqued due to the possibility that their self-awareness may be limited to more here and now views as opposed to more general views across a period of time (Wriglesworth, Humphrey, Kalambouka & Lendrum, 2010). Given the age and needs of the participants this may have limited their ability to make representational views of their sense of school belonging, which may impair the reliability of the BS measure. Adult self-reports about a child have also been critiqued due to them being influenced by the individualised experience the adult has had which may impair the reliability of their data (Wriglesworth et al, 2010). Further threats to the reliability of this type of measure exist, including the participant's responses being biased due to demand characteristics.

Missing data

As discussed in *Section 5.4.1. Design, Return to baseline phase* data was missing over the summer (for School 1) and Christmas (for School 2) holidays. This break in data collection was between the Intervention and Return to Baseline phase, which potentially impairs the reliability of the data in the Return to Baseline phase for all the participants and thus the overall impact of the intervention. For participants in School 2 some data was missing within the Baseline phase due to half-term and pupil absences. This break in data collection was between the Baseline and Intervention phase and therefore potentially weakens the reliability of the Baseline for School 2 participants.

5.4.3. Intervention

Treatment integrity

The researcher gathered treatment integrity checks every other week. This showed a high level of treatment integrity within both the schools' Lego® Therapy clubs following the training provided by the researcher. As discussed in *Section 3.6.2. Intervention* the training was based upon the researcher's local authority official Lego® Therapy training rather than the official training manual which is due to be released in July 2014 (LeGoff et al, 2014, in press). The overall reliability of the training could have been enhanced by the training offered being fidelity checked.

Lego® as a medium

The use of Lego® as a medium is central within the Lego® Therapy intervention, however it is queried as to whether using the premise of the approach (the communication roles; Engineer, Supplier and Builder) would be of benefit with other mediums. For example, other building activities including PlayMobil®, Meccano® or Duplo®. It may also be applicable to extend the approach to more practical building activities, such as assembling furniture, in order to promote social and independence skills. The use of other mediums may widen the benefit that the approach could have for children and/or adults with more severe language needs or with poor fine motor skills, which may be restrictive with the use of Lego®. It may also support the engagement of children in a social communication intervention that are less motivated by Lego® itself.

5.4.4. Visual analysis

Within *Section 4.2. Analysis of results* the researcher presents the debate around the most appropriate ways of analysing SCED data. It is important that the results are understood with the limitations of the analysis procedures in mind. For example, visual analysis being seen as less objective than other approaches such as statistical analysis (Kazdin, 2003). Attempts were therefore made to counteract these potential criticisms, for example by gaining a high level of inter-rater reliability for the SCED graphs and findings. This cannot, however, counteract all the criticisms of this approach and it is acknowledged that there is a degree of subjectivity in the approach (Deprospero & Cohen, 1981; Ottenbacher, 1986).

5.4.5. Researcher role

The researcher came to this research from a post-positivist epistemological stance, which aims to develop an objective, tangible and measureable view of knowledge and therefore establish cause and effect relationship of an intervention (Mertens, 2005; Robson, 2011). Attempts were made to restrict the researcher's subjectivity and influence on the outcome measurements by;

- using a previously developed and piloted coding system,
- developing inter-observer agreement for the observation measures,
- gathering inter-rater agreement for the SCED graphs,
- and training the SENCo's to gather the pre, post and delayed measures with the teachers, parents and participants.

The impact of the researcher may have been reduced further if the video observations for School 2 could have been gathered by another member of staff.

5.5. Future research

Within *Chapter 2, Literature Review* a systematic review of the literature exploring social communication interventions was conducted which highlighted reliable and valid ways of assessing intervention effectiveness. As discussed within *Section 2.7. Lego® Therapy and current evidence base* the current evidence base for Lego® Therapy was fairly limited. The present study aimed to enhance this through adding the reliable and valid research methods found in the SLR to Lego® Therapy research. Whilst this research does add to the limited evidence base, further research is still required in order to enhance understanding of the effectiveness of the intervention. A number of extensions of the research could be considered and will be discussed below.

Design

This research highlights the value of developing in-depth understanding of the effectiveness of Lego® Therapy at an individual level, due to the varying responses to intervention shown within the cases included in this study. The SCED design used within this research could be enhanced by having the Return to Baseline phase without a large gap occurring between the phases in order to enhance the reliability of the findings. A further way of enhancing the design presented in this research would be to employ a multiple-baseline SCED, adding further rigour to the process and enhance reliability of the findings (Kazdin, 2003). Gaining perceptions of school staff and parents views within the participant's context provided additional information not captured in the SCED measures. The use, however, of qualitative methods to gather these views could have opened up the research further and extended understanding in this area (Robson, 2011).

Intervention length

The research could be extended by measuring the effectiveness of the intervention over a longer period of time. Close monitoring of the impact of the intervention over a longer period of time could give additional understanding as to the optimum length of the intervention. This could guide future practice and present clearer optimum lengths of intervention for schools to use as a guideline.

Population

The current research extended the previous Lego® Therapy research which just focused on the effectiveness of this approach for children with formal diagnoses of autism. As advocated by LeGoff et al (2010) this research extended this to children with identified social communication needs, however it may be of interest to explore its effectiveness for other groups of children with additional needs in the domain of social or friendship development. For example, children who are looked after by the authority, with global delay or medical difficulties. Within the researcher's local authority secondary schools have begun using the approach and so further evaluation of its application in secondary settings would extend our understanding of the suitability of the intervention for this population.

Generalisation

The current research explored the generalisation of the intervention onto perceptions of participant's social communication skills by their parents and teachers within the school and home context. In order to develop more rigorous measure of generalisation future research could employ the repeated measures within the different contexts, such as other areas within the school (e.g. playground observations) or within group activities in the home setting. These types of observations were not feasible for the researcher in this project but would extend understanding of research question two.

Other variables

This research explored key factors of social communication (amount of communication, turn taking skills, effectiveness and mode of communication). A number of other factors, however, could be explored in order to extend understanding of the impact of Lego® Therapy on social communication. For example, function of communication, length of communication and missed opportunities for communication (i.e. when no response is given to another peers initiations) might be used in future research. This type of information may help in developing more accurate understanding of the overall effectiveness of the intervention. Qualitative information could also be explored, for example the participant's views of the intervention and its impact on their skills and peers views of the child's engagement with them and belongingness within the school.

5.6. Implications of the findings

This research has contributed to the literature around the effectiveness of Lego® Therapy, specifically focusing on six pupils who were identified as having social communication difficulties. The research provided an in-depth exploration of the impact of the intervention for these pupils and seeks to add to the developing evidence base and inspire future research. The research findings therefore do have implications at a variety of levels, which will be discussed here.

Individual/child level

The research showed that this type of intervention can have moderate effects on the positive development of social communication skills for some of the focus pupils. This further highlights the individual nature of children's social communication needs and their response to intervention (I Can, 2012). The research therefore somewhat advocates the naturalistic social communication intervention, Lego® Therapy, for children with social communication needs, however would suggest that close monitoring of the appropriateness of the intervention is required. This is to monitor progress and ensure the intervention is not negatively impacting upon the child's skills, as was shown in William's case. Some children may find the attention of having an explicit programme, even when this aims to be somewhat naturalistic, a negative experience.

School level

Schools planning to develop the Lego® Therapy intervention for their pupils with social communication needs will have to be aware of the close monitoring of skill development required, as well as the importance of monitoring pupil enjoyment of being within the group. Other factors that may need to be considered when determining the appropriateness of the group are the pupil's interest in the activities ensuring the use of Lego® and the models constructed are of interest to the pupil and group. Dynamics within the group will also need to be considered in order to ensure the potential effectiveness of the approach. As discussed, the length of the intervention will also need to be considered. Without the restraints of a research project time-line, and with the close monitoring advocated, schools will need to calculate how much time they could give over to the Lego® Therapy intervention. This research proposes that an intervention length of longer than six weeks is required, however as is illustrated in this research the optimum length of the intervention is likely to be very individualistic.

Close monitoring will be needed to identify when effectiveness has peaked and the ceiling effect has been reached for the individual.

EP profession level

This research highlights the ongoing need to develop evidence-based practice within education, as well as the key role of EPs in this process due to their understanding and training within varying research methods for different purposes and contexts (Stobier & Waas, 2002). The research gives support for EPs discussing the suitability and effectiveness of Lego® Therapy at group or individual level when working with schools. As discussed, EPs will also need to ensure that schools are aware of the close monitoring required to assess how appropriate the intervention is at an individual level. EPs should also be able to give guidance to school and families onto appropriate reliable and valid measures to assess the overall effectiveness of the intervention.

Local authority level

Lego® Therapy began within the researcher's local authority due to their role in implementing the National Autism Standards (AET, 2012a), as discussed in *Section 1.2. Researcher personal and professional interest*. This research highlights the potential effectiveness of the intervention for children with autistic type tendencies, and extends the potential population it may be effective for to include children with broader social communication needs, as promoted by LeGoff et al (2010). The authority, therefore, may wish to consider extending the target population it currently advocates the intervention to be used with. The local authority will also need to be aware of and promote the close monitoring of this intervention in order to ensure its appropriateness at an individual level.

5.7. The researcher's reflections

The research project provided the researcher with an opportunity to work closely with schools to develop, monitor and review an intervention. The 'real world' nature of this type of research was apparent throughout the study and led to a number of key reflections.

Engaging with stakeholders

A key aspect to the planning and development of the research project was to engage with stakeholders. This began by engaging with the researcher's ECPS to ensure the project held meaning to the service and addressed current issues within the local authority. Engagement with those who were advocating the intervention was also important, the QEST, which provided the researcher with the background context and understanding of how widespread the intervention was within the authority. This understanding gave support to the contribution this research made for the local authority, to be discussed further in *Section 6.3. Unique contribution of the research.* The need to fully engage with the schools that volunteered to be a part of the research was integral to this project. The need for the staff members to gain ownership of the intervention and for their role to be recognised within the research project was of crucial importance. Initial meetings and training supported this, as well as the researcher attending the first intervention sessions and regularly reviewing the measures with staff.

Challenges faced within the research

As the project began and throughout the process, the researcher became aware of aspects of the school system which restricted the schools' ability to engage with the research project. In terms of giving time for the intervention, once a set day and time was established, generally schools were able to commit to this time and implementation occurred. However, with some of the additional aspects of the research project, such as obtaining the observational measures, schools had less flexibility due to other duties, some of which were not pre-planned, such as covering for TA absence. In order to support the schools to engage with the project the researcher was required to take measures for one of the schools to ensure these could be completed reliably. This added to the need to work closely with staff and build positive rapport with them within the planning and training stages of the project.

Need for joint development of evidence-based practice

Engagement within the research project highlighted to the researcher the on-going need to develop evidence-based practice within education, but also the joint aspects of this (Fox, 2002; Stobier & Waas, 2002). Working with other teams within the local authority, such as the ECPS, QEST, or schools directly in developing and conducting a research project was shown to be an integral part of the role. One in which the researcher aims to continue to develop within their role as an EP.

6. CHAPTER 6 - CONCLUSION

6.1. Introduction to Chapter 6

This chapter aims to summarise the main findings from the research as well as its unique contribution to literature and educational practice.

6.2. Main findings

This study evaluated the effectiveness of the Lego® Therapy intervention on the social communication skills and sense of school belonging of six participants with social communication needs.

Outcomes from the ABA SCED showed that the majority of the participants (five out of six) showed an improvement in at least one of the social communication skills measured (amount of communication, turn-taking or effectiveness of communication). The discussion highlighted the variability in skill development as due to the individual characteristics of the participant's social communication needs and response to the naturalistic peer-mediated approach (I Can, 2012; McConnell et al, 2002). It was suggested that skill development possibly required a longer intervention length and further research was needed to explore optimum intervention length.

Maintenance of the positive skill development was shown for three of the participants. Maintenance for some of the participants was discussed as potentially due to the features of Lego® Therapy, including rehearsal, feedback and reinforcement, which led to successful skill maintenance (Stanton-Chapman et al, 2008). Lack of maintenance for some participants was discussed as potentially due to the impact of the summer and Christmas holidays, as well as the participant's skills not having fully developed within the intervention in order for them to maintain after this break from support (Brown et al, 2008).

The parent and teacher reports suggested improvements in their perceptions of the participant's social communication skills within the school environment (for five participants) and home environment (for three participants). Of the participants that could be measured (three) no maintenance of this increase was held after the intervention was removed. The discussion suggested the generalisation of skill into school and home settings being due to the level of social communication skill development within the intervention and its naturalistic characteristics (Rule et al,

1998), however queried the reliability of this measure due to potential observer bias (Wriglesworth et al, 2010).

The child reports suggested a high level of sense of school belonging for all the participants prior to the intervention. An increase was shown for one participant, no change was shown for two participants and a slight decline shown for three participants. Of the participants that could be measured (three) an increase post intervention was seen and no change shown for one participant. The discussion suggested the high level of sense of school belonging prior to the intervention potentially being due to the growing inclusive ethos of schools and children's wish to have peer affiliation (Wolfberg et al, 1999). It also suggested social communication skill development within the intervention potentially led to some of the participants becoming preferred communication partners by their peers, enhancing their sense of school belonging (Black, 1992; Black and Hazen, 1990). The reliability of the measure was queried due to a potential ceiling effect being made and weaknesses in self-report measures (Wriglesworth et al, 2010).

A number of limitations to the research have been highlighted which need to be considered when interpreting the findings summarised above. Limitations of particular note were the generalisability of the findings due to the SCED and stability of the baseline phases for Faisal, Taimoor and Chloe. Missing data over the summer and Christmas holiday reduced the inferences that can be made about the maintenance of effect of the intervention.

Despite the limitations, the study does suggest the potential positive impact of Lego® Therapy on the participant's social communication skills, adding to the growing evidence base of the effectiveness of this intervention. Further exploration of the optimum length of intervention is required, along with more rigourous exploration of the generalisation of skills from the intervention would be beneficial in future research.

6.3. Unique contribution of the research

This research aimed to develop the growing evidence base for the effectiveness of Lego® Therapy within a school context due to the limited number of studies exploring the impact of the intervention and only one other study (Andras, 2010) evaluating its effectiveness within the school context. Previous studies have solely focused upon the effectiveness of the intervention onto children with formal diagnoses of autism despite the creator advocating its use for the wider population of children with social communication needs (LeGoff, 2010). This research therefore extended understanding of the interventions application to this wider population of children, including those at pre-diagnosis of autism or with varying social communication needs not linked to autism.

This was the first study to apply a more detailed exploration of the intervention by not using group designs but focusing on single-cases and applying experimental rigour to this through the use of a SCED. This led to understanding of the individual nature of children's response to the Lego® Therapy intervention. As advocated by the literature evaluating social communication interventions, as discussed in *Section 2.5. Systematic literature review*, video observations were used as the main measure of communication which enabled a detailed and piloted communication coding system to be used. This had not been done in any other evaluations of Lego® Therapy and adds a lot more weight to the evidence within this research, in contrast to more general observations that have been critiqued for their weaknesses in reliability (Robson, 2011). The coding system used enabled broader aspects of communication to be explored, including the amount of communication, role in turn taking, mode of communication and effectiveness of the communication. This level of detail explored has not previously been used in other Lego® Therapy research. Also measures of perception of change within different contexts have not been used before and so add a further dimension to existing research.

6.4. Conclusion

Lego® Therapy is growing in its application across schools in the UK and this study has expanded its growing evidence base. Further research of the interventions effectiveness is required in order to parallel the amount it is being implemented across our schools. The research suggests this is an area worthwhile continuing researching as it showed Lego® Therapy can have a positive impact on children's social confidence and independence.

7. REFERENCES

Primary References

Adams, C. (2001) Clinical diagnostic studies of children with semantic–pragmatic language disorder. *International Journal of Language and Communication Disorders, 36*, 289–306.

Adams, C., Lockton, E., Gaile, J., Earl, G., & Freed, J. (2012) Implementation of a manualized communication intervention for school-aged children with pragmatic and social communication needs in a randomized controlled trial: The Social Communication Intervention Project. *International Journal of Language & Communication Disorders, 47,* (3), 245-256.

Alvarez, A. & Philips, A. (1998) The importance of play: A child psychotherapist's view. *Child Psychology and Psychiatry Review, 3,* 99–103.

American Psychiatric Association (APA) (2013) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V-TR) (5th Edition) Washington, DC: American Psychiatric Association.

Andras, M. (2012) The value of Lego® Therapy in promoting social interaction in primary aged children with autism. *Good Autism Practice, 13,* (2), 18 – 25.

Andrews, R. (2005) The place of systematic reviews in education research. *British Journal of Educational Studies, 53,* (4), 399–416.

Attwood, A. J. (1998) *Asperger's syndrome: A guide for parents and professionals.* London: Jessica Kingsley.

Autism Education Trust (AET, 2012a) *National Autism Standards for Schools and Educational Settings.* London: Autism Education Trust.

Autism Education Trust (AET, 2012b) *About AET.* Retrieved from http://www.autismeducationtrust.org.uk/about-aet.aspx.

Baer, D.M. (1977). Perhaps it would be better not to know everything. *Journal of Applied Behavior Analysis, 10,* (1), 167 - 172.

Baird, G., Simonoff, E., Pickles, A., Chandler, S., Loucas, T., Meldrum, D. & Charman,

T. (2006) Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: the Special Needs and Autism Project (SNAP). *Lancet, 368*, 210–215.

Barlow, D. H., & Hersen, M. (1973) Single-case experimental designs: Uses in applied clinical research. *Archives of General Psychiatry, 29,* 319 – 325.

Barlow, D. H. & Hersen, M. (1984) *Single Case Experimental Designs – Strategies for Studying Behaviour Change.* New York: Pergamon Press.

Barlow, D.H., Nock, M.K., & Hersen, M. (2009) *Single Case Experimental Designs: Strategies for Studying Behavior Change* (Third Edition). Boston: Pearson Education.

Baxendale, J., Lockton, E., Adams, C., & Gaile, J. (2013) Parent and teacher perceptions of participation and outcomes in an intensive communication intervention for children with pragmatic language impairment. *International Journal of Language & Communication Disorders, 48,* (1), 41-53.

Berk, L. (2000). *Child Development* (5th ed.). Boston: Allyn & Bacon.

Bishop, D. V. M. (2000) Pragmatic language impairment: a correlate of SLI, a distinct subgroup, or part of the autistic continuum? In D. V. M. Bishop and L. B. Leonard. *Speech and Language Impairments in Children: Causes, Characteristics, Intervention and Outcome.* Hove: Psychology Press.

Bishop, D. V. M. & Adams, C. (1989) Conversational characteristics of children with semantic–pragmatic disorder. II: What features lead to a judgment of inappropriacy? *British Journal of Disorders of Communication, 24,* 241–263.

Bishop, D. V. M., Chan, J., Adams, C., Hartley, J. & Weir, F. (2000) Conversational responsiveness in specific language impairment: evidence of disproportionate pragmatic difficulties in a subset of children. *Development and Psychopathology, 12,* 177–199.

Black, B. (1992). Negotiating social pretend play: communication differences related to social status and sex. *Merrill-Palmer Quarterly, 38*, 212–232.

Black, B., & Hazen, N. L. (1990). Social status and patterns of communication in acquainted an unacquainted preschool children. *Developmental Psychology, 26,* (3), 379–387.

Boaz, A., Ashby, D. and Young, K. (2002) *Systematic Reviews: What have they got to offer evidence based policy and practice*? Queen Mary University of London: ESRC UK Centre for Evidence Based Policy and Practice.

Bodrova, E, & Leong, J. (2003). Building language and literacy through play. *Scholastic Early Childhood Today, 18,* (2), 34–8, 40–3.

Botting, N. & Adams, C. (2005) Inferential and semantic abilities in children with communication disorders. *International Journal of Language and Communication Disorders, 40,* 49–66.

Botting, N., Crutchley, A. & Conti-Ramsden, G. (1998) Educational transitions of 7-year-old children with SLI in language units: a longitudinal study. *International Journal of Language and Communication Disorders, 33,* 177–197.

Brinton, B., Fujiki, M., & Higbee, L. (1998). Participation in cooperative learning activities by children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 41,* 1193–1206.

Brinton, B., Fujiki, M., & McKee, L. (1998). The negotiation skills of children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 41,* 927–940.

Brinton, B., Fujiki, M., Spencer, J. C., & Robinson, L. A. (1997). The ability of children with specific language impairment to access and participate in an ongoing interaction. *Journal of Speech, Language, and Hearing Research, 40,* 1011–1025.

British Psychological Society (2009) *Code of Ethics and Conduct. Guidance published by the ethics committee of the British Psychological Society*. Leicester: BPS.

Brossart, D.F., Parker, R.I., Olson, E.A., & Mahadevan, L. (2006). The relationship between visual analysis and five statistical analyses in a simple AB single-case research design. *Behavior Modification, 30,* (5), 531-563.

Brown, W. H., Odom, S. L., & Conroy, M. A. (2001). Strategies and tactics for promoting generalization and maintenance of young children's social behavior. *Research in Developmental Disabilities, 15,* (2), 99–118.

Brown, W. H., Odom, S. L., McConnell, S. R., & Rathel, J. M. (2008). Peer interaction interventions for children with developmental difficulties. In W. H. Brown, S. L. Odom, & S. R. McConnell. *Social competence of young children: Risk, disability, and intervention.* Baltimore: Brookes.

Buggey, T. (2009) *Seeing is Believing: Video Self-Modelling for People with Autism and Other Developmental Disabilities.* Bethesda: Woodbine House.

Carter, S. M., & Little, M. (2007) Justifying knowledge, justifying method, taking action: Epistemologies, Methodologies, and Methods in Qualitative Research. *Qualitative Health Research, 17,* (10), 1316 – 1328.

Centre for Evidence Informed Policy and Practice in Education (EPPI-Centre) (2011) What is a Systematic Review? Retrieved from http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=67.

Children Act (2004) London: HMSO.

Cohen, J. (1960) A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20*, 37-46.

Cohen, L., Manion, L., & Morrison. (2011) *Research Methods in Education.* (7th Edition) Oxon: Routledge.

Craig, H. K., & Gallagher, T. M. (1986). Interactive play: The frequency of related verbal responses. *Journal of Speech and Hearing Research, 29*, (3), 375–383.

Creswell, J. W. (2003) *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* (2nd Edition) Thousand Oaks: Sage.

Dane, A. U., & and Schneider, B.H. (1998) Program integrity in primary and early secondary prevention: are implementation effects out of control? *Clinical Psychology Review, 18,* (1), 23 - 45.

Davis, C. A., Brady, M. P., Hamilton, R., McEvoy, M. A., & Williams, R. E. (1994).

Effects of high probability requests on the social interactions of young children with severe disabilities. *Journal of Applied Behavior Analysis, 27,* (4), 619–637.

Davies, H. T. O., Nutley, S. M., & Smith, P.C. (2000) *What works? Evidence- based policy and practice in public services*. Bristol: Policy Press.

Delprato, D. J. (2001). Comparisons of discrete-trial and normalized behavioral language intervention for young children with autism. *Journal of Autism and Developmental Disorders, 31*, (3), 315–325.

Department for Children, Schools & Families (DfCSF, 2008) *Better Communication: An action plan to improve services for children and young people with speech, language and communication needs.* Nottingham: DfCSF.

Department for Education and Standards (DfES, 2003). *Every Child Matters.* London: HMSO.

Department for Education and Skills (DfES, 2005) *Excellence and Enjoyment: Social and Emotional Aspects of Learning (guidance).* Nottingham: DfES.

Department of Education (DoE, 2001) *Educational Provision and Support for Persons with Autistic Spectrum Disorders: the Report of the Task Force on Autism.* Bangor, Co Down: DoE.

DeProspero, A., & Cohen, S. (1981) Inconsistent visual analyses of intrasubject data. *Journal of Applied Behavior Analysis, 12,* (4), 573 – 579.

Dodge, K. A., Pettit, G. S., Gregory, S., McClaskey, C. L., & Brown, M. M. (1986) Social competence in children. *Monographs of the Society for Research in Child Development, 51,* 1 – 85.

Evans, I. M., Salisbury, C. L., Palombaro, M. M., Berryman, J., & Hollowood, T. M. (1992). Peer interactions and social acceptance of elementary-age children with severe disabilities in an inclusive school. *Journal of the Association for Persons With Severe Handicaps, 17,* 205- 212.

Fink, A. (2005). *Conducting Research Literature Reviews – From internet to paper.* Sage: London.

Fox, M (2002) The education of children with special educational needs: evidence or value driven? *Educational and Child Psychology, 19,* (3), 42-53.

Frederickson, N. (2002) Evidence-based practice and educational psychology. *Educational and Child Psychology, 19,* 3, 96-111.

Frederickson, N., & Dunsmuir, S. (2009) *Measures of Children's Mental Health & Psychological Wellbeing: A Portfolio for Education and Health Professionals.* London: GL Assessment.

Frederickson, N., Simmonds, E., Evans, L. & Soulsby, C. (2007) Assessing Social & Affective Outcomes of Inclusion. *British Journal of Special Education, 34,* (2), 105 – 115.

Fujiki, M., Brinton, B., McCleave, C. P., Anderson, V. W., & Chamberlain, J, P. (2013) A social communication intervention to increase validating comments by children with language impairment. *Language, Speech, and Hearing Services in Schools, 44,* (1), 3- 19.

Gertner, B. L., Rice, M. L., & Hadley, P. A. (1994). Influence of communicative competence on peer preferences in a preschool classroom. *Journal of Speech and Hearing Research, 37,* (4), 913–923.

Gilliam, J. E. (1995) *Gilliam Autism Rating Scale* (GARS). Austin, TX: Pro-Ed.

Gisev, N., Bell, J.S., Chen, T.F. (2013). Interrater agreement and interrater reliability: Key concepts, approaches, and applications. *Administrative Pharmacy, 9*, (3), 330-338.

Goleman, D. (1996). *Emotional intelligence: Why it can matter more than IQ*. London: Bloomsbury.

Goncu, A. (1999). Children's and researcher's engagement in the world. In A. Goncu. *Children's engagement in the world: Sociocultural perspectives.* New York: Cambridge.

Goodenow, C. (1993) The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in Schools,*

30, 79 – 90.

Gough, D. (2007) Weight of Evidence: a framework for the appraisal of the quality and relevance of evidence. *Research Papers in Education, 22,* (*2*), 213 – 228.

Gray, C. (1991) *What Are Social Stories*? Retrieved from http://www.thegraycenter.org/social-stories/what-are-social-stories.

Guldberg, K. (2010) Educating children on the autism spectrum: preconditions for inclusion and notions of 'best autism practice' in the early years. *British Journal of Special Education, 37*, (4), 168 – 174.

Hart, C. H., Ladd, G. W., & Burleson, B. R. (1990) Children's expectations of outcomes of social strategies: Relations with sociometric status and maternal disciplinary styles. *Child Development, 61*, 127–137.

Hart, J. E. (2011) Creating social opportunities for students with autism spectrum disorder in inclusive settings. *Intervention in School and Clinic, 46,* (5), 273-279.

Harrower, J. K., & Dunlap, G. (2001) Including children with autism in general education classrooms. *Behavior Modification, 25,* (5), 762 – 784.

Health Professions Council (HPC, 2008). *Standards of conduct, performance and ethics.* London: HPC.

Higgins, J. P. T., & Green, S (2011) *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0. The Cochrane Collaboration, 2011. Retrieved from www.cochrane-handbook.org.

Horner, R., Carr, E., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005) The use of single-subject research to identify evidence-based practice in special education, *Exceptional Children, 71,* (2), 165-179.

Howlin, P. R., Gordon, K., Pasco, G., Wade. A., & Charman, T. (2007) The effectiveness of Picture Exchange Communication System (PECS) training for teachers of children with autism: a pragmatic, group randomised controlled trial. *Journal of Child Psychology and Psychiatry, 48,* (5), 473–481.

I CAN (2012) *About Speech, Language & Communication Needs.* Retrieved from

http://www.ican.org.uk/What_is_the_issue/About%20SLCN.aspx.

Jacobson, N. S., & Follette, W. C. (1984) Psychotherapy Outcome Research: Methods for Reporting Variability and Evaluating Clinical Significance. *Behavior Therapy, 15,* 336 – 352.

Jones, C. D., & Schwartz, I. S. (2004) Siblings, peers, and adults: differential effects of models for children with autism. *Topics in Early Childhood Special Education Winter, 24,* 187-198.

Kaale, A., Smith, L., & Sponheim, E. (2012) A randomized controlled trial of preschool-based joint attention intervention for children with autism. *Journal of Child Psychology and Psychiatry, 53,* (1), 97–105.

Kamps, D. M., Kravits, T., Gonzalez Lopez, A., Kemmerer, K., Potucek, J., & Harrel, L. G. (1998). What do the peers think? Social validity of peer-mediated programs. *Education and Treatment of Children, 21,* 107-134.

Kaczmarek, L. A. (2002). Assessment of social communicative competence: An inter-disciplinary model. In H. Goldstein, L. A. Kaczmarek, & K. M. English. *Promoting social communication: Children with developmental disabilities from birth to adolescence.* Baltimore, MD: Brookes.

Kazdin, A. E. (2003) *Research Design in Clinical Psychology.* (4th Edition) Boston: Allyn & Bacon.

Khun, T. (1962) *The Structure of Scientific Revolution.* Chicago: University of Chicago Press.

Kratochwill, T., Hitchcock, J., Horner, R., Levin, J., Odom, S., Rindskopf, D., & Shadish, W. (2010) *Single-Case Designs Technical Documentation.* Retrieved from http://ies.ed.gov/ncee/wwc/pdf/wwc_scd.pdf.

LeGoff, D. (2004) Use of LEGO as a Therapeutic Medium for Improving Social Competence, *Journal of Autism and Developmental Disorders, 34,* (5), 557-571.

LeGoff, D., Krauss, G. & Allen Levin, S. (2010) LEGO®-based Play Therapy for Autistic Spectrum children. In Drewes, A. and Schaefer, C. *School-based play*

therapy (2nd Edition). Hoboken: Wiley & Sons

LeGoff, D. & Sherman, M. (2006) Long-term outcome of social skills intervention based on interactive LEGO play, *Autism, 10,* (4), 317-329.

LeGoff, D. B., Gomez De La Cuesta, G., Krauss, G. W., & Baron-Cohen, S. (2014, to be published) *How to Build Social Competence through LEGO Clubs for Children with Autism and Related Conditions.* London: Kingsley.

Levinson, S. C. (1983). *Pragmatics.* Cambridge, England: Cambridge University Press.

Lord, C., & Pickles, A. (1996). Language level and nonverbal social-communicative behaviors in autistic and language delayed children. *Journal of the American Academy of Child and Adolescent Psychiatry, 35,* 1542–1550.

Lord, C., Risi, S., Lambrecht, L., Cook, E.H., & Leventhal, B.L. (2000) The Autism Diagnostic Observation Schedule – Generic: A standard measure of social and communication deficits associated with the spectrum of autism. *Journal of Autism and Develop- mental Disorders, 30,* 205–223.

Loveland, K. A., & Tunali-Kotoski, B. (2005). The school-age child with an autistic spectrum disorder. In F. R. Volkmar, R. Paul, A. Klin, & D. Cohen. *Handbook of Autism and Pervasive Developmental Disorders* (3rd Edition). New York: John Wiley.

Manolov, R. & Solanas, A. (2008) Comparing N = 1 Effect Size Indices in Presence of Autocorrelation. *Behaviour Modification, 32,* 6, 860-875.

McConnell, S. R. (2002). Interventions to facilitate social interaction for young children with autism: Review of available research and recommendations for educational intervention and future research. *Journal of Autism and Developmental Disorders, 32,* (5), 351–372.

McConnell, S. R., Missall, K. N., Silberglitt, B., & McEvoy, M. A. (2002). Promoting social development in preschool classrooms. In M. E. Shinn, H. E. Walker, & G. Stoner. *Interventions for Academic and Behavior Problems II: Preventive and Remedial Approaches.* Bethesda, MD: National Association of School Psychologists.

McCormick, S. (1995). What is single-subject experimental research? In S. B. Neuman & S. McCormick. *Single-subject experimental research: Applications for literacy.* Newark: International Reading Association.

Mentis, M. (1994). Topic management in discourse: Assessment and intervention. *Topics in Language Disorders, 14,* 29 – 54.

Mertens, D. M. (2005) *Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative and Mixed Methods.* (2nd Edition) London: Sage.

Mundy, P., & Sigman, M. (2006). Joint attention, social competence, and developmental psychopathology. In D. Cicchetti & D.J. Cohen. *Developmental Psychopathology* (2nd Edition). Hoboken, NJ: Wiley & Sons.

National Research Council. (2001). *Educating children with autism.* Washington, DC: National Academy Press.

Neuman, S. B. & McCormick, S. (1995) *Single Subject Experimental Research. Applications for Literacy.* Newark: International Reading Association.

National Institute of Neurological Disorders and Stroke (NINDS, 2009) *Autism Fact Sheet.* Bethesda: NINDS.

Ninio, A., & Snow, C. E. (1999). The development of pragmatics: Learning to use language appropriately. In W. C. Ritchie & T. K. Bhatia. *Handbook of Child Language Acquisition.* San Diego, CA: Academic Press.

Odom, S. L., Hoyson, M., Jamieson, B., & Strain, P. S. (1985). Increasing handicapped pre-schoolers' peer social interactions: Cross-setting and component analysis. *Journal of Applied Behavior Analysis, 18,* 3-16.

Odom, S. L., McConnell, S. R., & Brown, W. H. (2008). Social competence of young children: Conceptualization, assessment, and influences. In W. H. Brown, S. L. Odom, & S. R. McConnell. *Social competence of young children: Risk, disability, and intervention.* Baltimore, MD: Brookes.

O'Leary, Z. (2004) *The Essential Guide to Doing Research.* London: Sage.

Ottenbacher, K. J. (1986) Reliability and accuracy of visually analyzing graphed data from single- subject designs. *American Journal of Occupational Therapy, 40,* (7), 464 – 469.

Owens, G. Granader, Y. Humphrey, A. and Baron-Cohen, S. (2008) LEGO Therapy and the Social Use of Language Programme: An Evaluation of Two Social Skills Interventions for Children with High Functioning Autism and Asperger Syndrome, *Journal of Autism Developmental Disorders, 38*, 1944-1957.

Parker, R. I., Cryer, J., & Byms. (2006) Controlling baseline trend in single-case research. *School Psychology Quarterly, 21,* 418 – 443.

Parker, R. I., Hagan-Burke, S., & Vannest, K. J. (2007) Percent of all nonover- lapping data PAND: An alternative to PND. *Journal of Special Education, 40*, 194-204.

Parsonson, B., & Baer, D. (1978) The analysis and presentation of graphic data. In T. Kratochwill, *Single-subject Research: Strategies for Evaluating Change.* New York: Academic Press.

Pawson, R. (2006) *Evidence-based Policy: A Realist Perspective.* London: SAGE.

Reason, R. & Morfidi, E. (2001) Literacy difficulties and single-case experimental design. *Educational Psychology in Practice, 17,* (3), 227 – 244.

Rice, M. L., Sell, M. A., & Hadley, P. A. (1991). Social interactions of speech- and language-impaired children. *Journal of Speech and Hearing Research, 34,* (6), 1299–1307.

Richards, S. B., Taylor, R. l., & Ramasamy, R. (1997) Effects of subject and rater characteristics on the accuracy of visual analysis of single subject data. *Psychology in the Schools, 34*, 355-362.

Rinaldi, W. (2004) *Social Use of Language Programme. Infant and Primary School Teaching Pack.* Cranleigh: Wendy Rinaldi.

Risley, T.R., & Wolf, M. M. (1972) Strategies for analyzing behavioral change over time. In J. Nesselroade & H. Reese. *Life-span Developmental Psychology.*

Methodological Issues. New York: Academic Press.

Rizvi, S. L. and Nock, M. (2008) Single-case experimental designs for the evaluation of treatment for self-injurious and suicidal behaviors. *Suicide and Life Threatening Behavior, 38,* 5, 498-510.

Robson, C. (2011) *Real World Research.* (3rd Edition) West Sussex: Wiley & Sons.

Rogers, B. (2004) *Behaviour Recovery* (2nd Edition) London: Chapman.

Ross, S. G. (2012). *Measuring response to intervention: Comparing three effect size calculation techniques for single-case design analysis.* Doctor of Philosophy Dissertation, North Carolina State University. Retrieved from http://www.lib.ncsu.edu/resolver/1840.16/7817.

Roth, A. & Fonagy, P. (1996). *What Works for Whom: A critical Review of Psychotherapy Research*. London: Guilford.

Romski, M. A., & Sevcik, R. (1996). *Breaking the Speech Barrier: Language Development Through Augmented Means.* Baltimore: Brookes.

Rule, S., Losardo, A., Dinnebeil, L., Kaiser, A., & Rowland, C. (1998). Translating research on naturalistic instruction into practice. *Journal of Early Intervention, 21,* 283–293.

Rydell, A. M., Hagekull, B., & Bohlin, G. (1997) Measurement of two social competence aspects in middle childhood. *Developmental Psychology, 33,* (5), 824 – 833.

Shavelson, R., & Towne, L. (2002) *Scientific Research in Education.* Washington: National Academy Press.

Simpson, R. L., de Boer-Ott, S. R., & Smith-Myles, B. (2003) Inclusion of learners with autism spectrum disorder in general education settings. *Topics in Language Disorders, 23,* (2), 116 – 133.

Sparrow, S. S., Balla, D. A., & Cicchetti, D. V. (1984) *Vineland Adaptive Behavior Scales*. Circle Pines, MN: American Guidance Service.

Spears, R., Tollefson, N., & Simpson, R. (2001). Usefulness of different types of assessment data in diagnosing and planning for a student with high-functioning autism. *Behavioral Disorders, 26,* (3), 227–242.

Stanton-Chapman, T. L., Denning, C. B., & Jamison, K. R. (2008) Exploring the effects of a social communication intervention for improving requests and word diversity in preschoolers with disabilities. *Psychology in the Schools, 45,* (7), 644-664.

Stanton-Chapman, T. L., Denning, C. B., & Jamison, K R. (2012) Communication skill building in young children with and without disabilities in a preschool classroom. *The Journal of Special Education, 46,* (2), 78-93.

Stanton-Chapman, T. L., & Snell, M. E. (2011) Promoting turn-taking skills in preschool children with disabilities: The effects of a peer-based social communication intervention. *Early Childhood Research Quarterly, 26,* (3), 303-319.

Stoiber K.C., & Waas, G.A. (2002) A contextual and methodological perspective on the evidence-based movement within school psychology in the United States, *Educational and Child Psychology, 19,* (3), 7-21.

The Telegraph (2007) (online) Lego's Grown-up Fans Build Global Fellowship. Retrieved from http://www.telegraph.co.uk/news/worldnews/1555834/Legos-grown-up-fans-build-global-fellowship.html.

Thunberg, G., Ahlsen, E., & Sandberg, A. D. (2007) Children with autistic spectrum disorders and speech- generating devices: Communication in different activities at home. *Clinical Linguistics & Phonetics, 21,* (6), 457–479.

Timler, G. R., Olswang, L. B., & Coggins, T. E. (2005). Social communication interventions for preschoolers: Targeting peer interactions during peer group entry and cooperative play. *Seminars in Speech and Language, 26,* 170–180.

Todman, J., & Dugard, P. (2001) *Single-case and Small n Experimental Designs: a Practical Guide to Randomization Tests.* Mahwah, NJ: Erlbaum.

University of Nottingham (2013). *University of Nottingham Code of Research Conduct and Research Ethics*. University of Nottingham: Nottingham.

Walberg, J. L., & Craig-Unkefer, L. A. (2010) An examination of the effects of a social communication intervention on the play behaviors of children with autism spectrum disorder. *Education and Training in Autism and Developmental Disabilities, 45,* (1), 69-80.

Wechsler, D. (1991) *Wechsler Intelligence Scale for Children–Third Edition*. SanAntonio, TX: Psychological Corporation.

Whitehouse, A. J. O., Watt, H. J., Line, E. A. & Bishop, D. V. M. (2009) Adult psychosocial outcomes of children with specific language impairment, pragmatic language impairment and autism. *International Journal of Language and Communication Disorders, 44,* 511–528.

Winter, S. (1997) Of time and content coverage in instruction: lessons from paired reading: a reply to Topping. *Educational Psychology in Practice, 13,* (2), 87 – 95.

Wolfberg, P. J., Zercher, C., Lieber, J., Capell, K., Matias, S., Hanson, M., & Odom, S. L. (1999) "Can I play with you?" Peer culture in inclusive preschool programs. *Journal of the Association for Persons with Severe Handicaps, 24*, (2), 69 – 84.

Wriglesworth, M., Humphrey, N., Kalambouka, A. & Lendrum, A. (2010) A review of key issues in the measurement of children's social and emotional skills. *Educational Psychology in Practice*, *26,* 2, 173-186.

Yoder, P. J., & Lieberman, R. G. (2010) Brief report: Randomized test of the efficacy of Picture Exchange Communication System on highly generalized picture exchanges in children with ASD. *Journal of Autism and Developmental Disorders, 40,* (5), 629-632.

Secondary References

Achenbach, T. M. (1997). *Guide for the caregiver–teacher report form for ages 2–5*. Burlington, VT: Department of Psychiatry, University of Vermont. **Cited in** T. L., Stanton-Chapman., & M. E., Snell. (2011) Promoting turn-taking skills in preschool children with disabilities: The effects of a peer-based social communication intervention. *Early Childhood Research Quarterly,* 26, (3), 303-319.

Cook, T. D. & Campbell, D. T. (1979) *Quasi-Experimentation: Design and Analysis Issues for Field Settings.* Chicago, IL: Rand McNally. **Cited in** C. Robson. (2011) *Real World Research. (3rd Edition)* West Sussex: Wiley & Sons.

Craig-Unkefer, L. A., Williams, C., & Kaiser, A. P. (1998). *The peer language and behavior code: Manual and coding protocol.* Unpublished manuscript. Vanderbilt University. **Cited in** J. L. Walberg. & L. A. Craig-Unkefer. (2010) An examination of the effects of a social communication intervention on the play behaviors of children with autism spectrum disorder. *Education and Training in Autism and Developmental Disabilities, 45,* (1), 69-80.

Gresham, F. M., & Elliott, S. N. (1990). *Social skills rating system manual.* Circle Pines, MN: American Guidance Service. **Cited in** T. L., Stanton-Chapman., & M. E., Snell. (2011) Promoting turn-taking skills in preschool children with disabilities: The effects of a peer-based social communication intervention. *Early Childhood Research Quarterly,* 26, (3), 303-319.

Hart, C. H., & Robinson, C. C. (1996). *Teacher Behavioral Rating Scale*. Unpublished teacher questionnaire. **Cited in** M. Fujiki., B. Brinton., C. P. McCleave., V. W. Anderson., & J. P., Chamberlain. (2013) A social communication intervention to increase validating comments by children with language impairment. *Language, Speech, and Hearing Services in Schools, 44,* (1), 3- 19.

Lincoln, Y.S. and Guba, E.G. (2000) *Paradigmatic controversies, contradictions, and emerging confluences.* In N.K Densin and Y.S Lincoln (Eds). *Handbook of qualitative research* (2nd Edition). Thousand Oaks, CA: Sage. **Cited in** D. M. Mertens. (2005) *Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative and Mixed Methods*. (2nd Edition). London: Sage.

Scott, A., Shaw, M., & Joughin, C. (2001). *Finding the evidence: A gateway to the literature in child and adolescent mental health* (2nd ed.). London: Gaskell (Royal College of Psychiatrists). **Cited in** N. Frederickson. (2002) Evidence-based practice and educational psychology, *Educational and Child Psychology, 19,* (3), 96-112.

Skinner, B, F. (1974) *About Behaviourism.* London: Cape. **Cited in** C. Robson. (2011) *Real World Research*. 3rd Edition. Oxford: Blackwell.

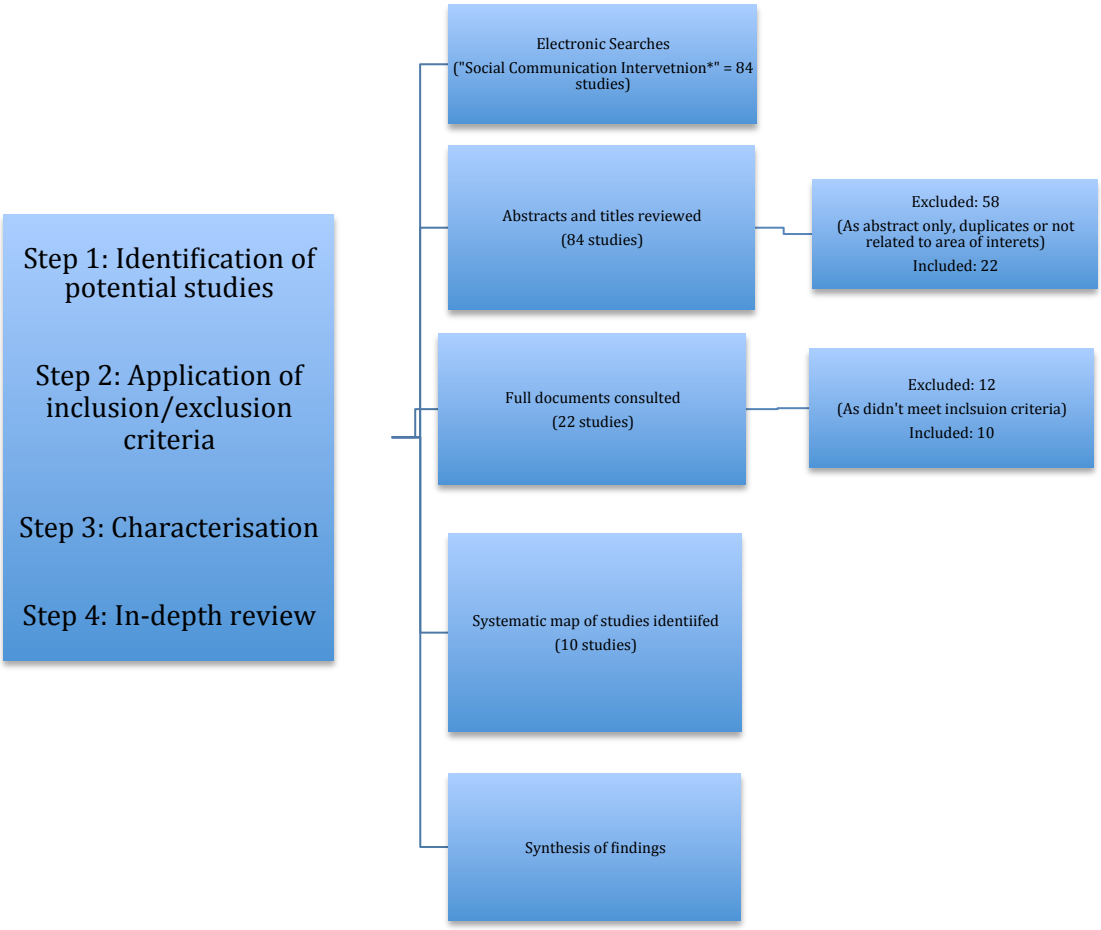
Stanton-Chapman, T. L., Kaiser, A. P., Vijay, P., & Craig-Unkefer, L. (2003). *The peer language and behavior code.* Unpublished manuscript, Vanderbilt University, Nashville, TN. **Cited in** T. L. Stanton-Chapman, C. B. Denning, & K. R. Jamison. (2008) Exploring the effects of a social communication intervention for improving requests and word diversity in preschoolers with disabilities. *Psychology in the Schools, 45,* (7), 644-664.

Taylor, G. & Burden, B. (2000). *The positive power of friendship: An illuminative evaluation of the circle of friends approach within the primary and secondary school phases.* Unpublished. Calouste Gulbenkian Foundation. **Cited in** N. Frederickson (2002) Evidence-based practice and educational psychology, Educational and Child Psychology, 19, (3), 96-111.

Zimmerman, I. L., & Pond, R. E. (2002). *Preschool language scale-4, revised.* Columbus, OH: Merrill. **Cited in** T. L., Stanton-Chapman., & M. E., Snell. (2011) Promoting turn-taking skills in preschool children with disabilities: The effects of a peer-based social communication intervention. *Early Childhood Research Quarterly,* 26, (3), 303-319.

8. APPENDICES

Appendix I: Flowchart of the screening and searching process used for the systematic literature review



Appendix II: Record of search strategy used for the systematic literature review

Electronic searches

Search strategy	Search terms used
PsychINFO (searched April 2014) Key word searches (in reference, titles and abstract)	Social communication, "social communication", social skills, "social skills", autism, auti*, social communication difficulties, social communication and intervention, "social communication" and intervention, "social skills" and intervention", "social communication intervention", "social skills intervention", "social communication intervention*", "social skill* intervention"
ASSIA (searched April 2014) Key word searches (in reference, titles and abstract)	Social communication, "social communication", social skills, "social skills", autism, auti*, social communication difficulties, social communication and intervention, "social communication" and intervention, "social skills" and intervention", "social communication intervention", "social skills intervention", "social communication intervention*", "social skill* intervention"
Wiley (searched April 2014) Key word searches (in reference, titles and abstract)	Social communication, "social communication", social skills, "social skills", autism, auti*, social communication difficulties, social communication and intervention, "social communication" and intervention, "social skills" and intervention", "social communication intervention", "social skills intervention", "social communication intervention*", "social skill* intervention"

Appendix III: Systematic map of studies used for the in-depth review of the systematic literature review (Page 1 of 7)

Author **Date** **Country**	**Intervention & implantation (length, ran by)**	**Location**	**Sample & Selection procedure**	**Study design and Measures used**	**Control/Comparison Group**
Howlin et al **2007** **UK**	Picture Exchange Communication System 2 day PECS workshop 6 half-day training sessions Expert consultations over 5 months	School	84 primary school children (mean age 6.8 years)	Design: RCT Research Question (RQ): Effectiveness of intensive intervention training on pupil social communication outcomes. Measures: Pre & post filming & coding within intervention session Standardised assessments o expressive and receptive language	Yes

Stanton-Chapman et al **2008** **America**	multicomponent social communication intervention (thematic play) Twice a week (25 minutes)	Pre-school	8 pre-school children with disabilities	Design: Multiple baseline SCED RQ: Does the intervention promote language learning and peer-directed **social** interactions? Measures: 10 minutes of video of the participants in paired play activities within the session	No
Walberg & Craig-Unkefer **2010** **America**	Intervention based on dramatic play and role-playing games (Plan-play-report format)	School	6 children (5 – 8 years old) Screening process (explicit inclusion/exclusion criteria)	Design: SCED multiple baseline design RQ: Intervention have an effect on the play behaviours of the participants?	No

				Measures: observed the sessions and coded the children's behaviours according to the Peer Play Code	
Yoder & Lieberman **2010** **America**	Two social communication interventions – PECS & Prelinguistic Milieu Teaching 20 minutes sessions three times per week for 6 months	University Clinic	30 pre-school children with autism (18 – 60 months old)	Design: RCT RQ: Examining the efficacy of the PECs approach, in comparison to the PMT approach Measures: Pre, post (6months) Early Social Communication Scales-Abridged	Yes
Stanton-Chapman & Snell **2011**	**Social communication intervention** that targeted initiations, responses, and turn-taking skills, and taught children to repair	Pre-school	10 pre-schoolers (4 years old) with disabilities Screened from a sample of 20 pupils	Design: Multiple baseline SCEDs RQ: Intervention have impact upon turn taking skills?	No

America	and revise and to avoid interruptions and overlaps 4/5 times per week for 20-25minutes			Measures: Child Behavior Checklist and the Social Skills Rating System Preschool Language Scale-4	
Adams et al **2012** **UK**	Intensive manualized social communication intervention (SCIP) (20 sessions, 3 sessions a week)	Clinic	88 pragmatic language impairment (PLI) or social communication disorder with or without ASD (5:11 – 10:8)	Design: Single blind RCT Parallel group RQ: Evaluate the effectiveness of SCIP for children who have PLI with or without features of ASD Measures: Pre, post and follow up (six months) measures of	Yes

				structural language ability, narrative ability, pragmatic functioning and social communication (parent narrative reports, blind-rated perceptions of conversational competence & teacher-reports of classroom learning skills)	
Kaale, Smith & Sponheim **2012** **Norway**	Manualised Joint Attention intervention (8 weeks, twice daily 5 times per week)	Pre-school	61 pre-school children (24 – 60 months old)	Design: RCT RQ: Effectiveness of manualised joint attention intervention on children's joint attention Measures: - pre & post blinded independent testers using Early Social Communication Scale	Yes

				- video tapes of preschool teacher–child and mother–child play at baseline and post-intervention	
Stanton-Chapman et al **2012** **America**	Social communication intervention targeting peer-directed initiations and responses (Using thematic play) (4/5 sessions 25 minutes sessions per week for)	Pre-school classroom in mainstream primary school	8 children (3-5 years old) with or without disabilities 18 children screened based on Teacher form of the *Child Behavior Checklist* (CTRF; Achenbach, 1997) and the teacher form of the *Social Skills Rating System* (SSRS; Gresham & Elliott, 1990). Children were assessed on the *Preschool Language Scale–4* (PLS-4; Zimmerman & Pond,	Design: Multiple baseline design RQ: What are the effects of the social communication intervention on the number of peer directed initiations that received an immediate peer response (either verbal or nonverbal)? Measures:	No

			2002).	Pre, & post measures of language, behaviour, pragmatic and social skills Repeated measures: observation	
Baxendale et al **2013** **UK**	Social Communication Intervention Project (SCIP) 18 – 20 sessions Level of support varied	School	8 children (aged 5:11 - 10:8) with communication disorders characterized by persistent needs in pragmatics and social use of language Purposive sampling methods	Design: Exploratory, Qualitative Interpretive approach RQ: Parent and teacher perceptions of process and outcomes of SCIP. Measures: Semi-structured interviews of parent & teacher perceptions	No

Fujiki et al **2013** **America**	Individualized social communication training program focusing on three areas of deficiency (identified by observation & teacher report) Weekly (15 – 30 min) sessions over 10 weeks	School	4 children (7:0 = 9:4) with language impairment (Met strict inclusion criteria) from a sample of 8 children	Design: SCED RQ: Increase in production of validating comments following intervention? Measure: Social competence (pre & post) - Peer acceptance (Hart, Ladd & Burleson, 1990) -Teacher Behaviour Rating Scale (Hart & Robinson, 1996). Repeated measures: Video observation & rating of frequency of validating and negative comments	No

Appendix IV: School Information sheet & Consent Letter (For head teacher, class teacher & facilitator) (Page 1 of 6)

Sarah Boyne Tel: Email:

Dear Sir/Madam,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on Lego® Therapy whilst on placement with X Council (supervised by Dr Nick Durbin, Joint Programme Director, University of Nottingham). This aims to understand the effectiveness of the social communication intervention, Lego® Therapy, on primary-aged children with social communication difficulties' social confidence and independence.

Lego® Therapy is a child-led and peer-based intervention that aims to support children's collaboration and interactions whilst engaging in the construction play activity (LeGoff et al, 2010). It was developed by Dr Daniel LeGoff, a US Psychologist, in 2004, after observing two of his clients interacting together through the medium of Lego®. There has been a limited number of studies evaluating its effectiveness and so this study aims to add to the research base. An information sheet of *'What is Lego® Therapy?'* is attached to this letter.

The study will form part of my course requirements, whilst being of interest to me and the Local Authority. Due to your involvement with the education of young people I am writing to ask for your consent to be involved with this study.

Appendix IV: School Information sheet & Consent Letter (For head teacher, class teacher & facilitator) (Page 2 of 6)

The study would require staff to identify three children who have a primary need of social communication difficulties, enjoy Lego® and are receiving no other intervention focusing on social communication development. Informed consent to take part in the study would then be gathered from parents/guardians of the identified children. Staff will be trained in the approach and a Lego® Therapy group(s) of three children (per group) and one facilitator for thirty minutes per week will be set up.

Lego® Therapy usually runs for six to eight weeks, and its effectiveness will be measured weekly through gathering up to ten minutes of video footage of the participants within their classrooms on a camera tripod or by the facilitators. (Informed consent for videoing and incidental videoing of peers in the classroom and teaching staff will also be gathered). Observational measures will need to be taken for around two weeks prior to the intervention, during it and four to six weeks after. I will also ask the facilitator to complete a short questionnaire with the participant, their class teacher and parent/guardian prior to and after the intervention and at the end of the study.

I appreciate the time constraint and demands on school staff, and that the study requires commitment from the school. I aim to support the school staff in terms of setting up the sessions and conducting the pre, post and delayed measures to reduce these demands.

I have an enhanced CRB disclosure form and can assure you that all of the work will be carried out professionally in line with the ethical guidelines of the British Psychological Society. All data obtained will be anonymised, stored securely and confidentially during the study. All raw data will be destroyed two years after the completion and publication of the research. I would also ensure that parents were fully informed and had given consent for their child to participate in the study.

If you are happy to participate in this study, please sign and return the consent form attached as soon as possible (before Xth April 2013).

Even if you consent to participating now but feel you would like to withdraw from the study at a later stage, you can withdraw from the study at any time. On completion of the study I will be happy to offer feedback both in person and by means of an Executive Summary of the study for all those involved.

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below.

Thank you in anticipation,

Yours sincerely,

Sarah Boyne

Doctorate in Educational Psychology Student

Sarah Boyne
Trainee Educational Psychologist

Dr Nick Durbin
Joint Programme Director, D.App.Ed.Psy

Appendix IV: School Information sheet & Consent Letter (For head teacher, class teacher & facilitator) (Page 4 of 6)

What is Lego® Therapy?

Lego® Therapy is:

- a social development programme for children with social communication difficulties, including Autistic Spectrum Condition.
- A collaborative play therapy in which children work together with Lego® models, focusing on what they 'can do' rather than 'can't do'

What does Lego® Therapy look like?

- sessions last around 30 minutes
- groups of 3 children with an adult to facilitate
- initial sessions will help the children to identify group rules (how to work as a team, language to describe the Lego® bricks, which models to build and what to do if there is any confusion or potential misunderstandings)
- each child has a clearly defined job which rotates every 5/10 minutes of;
    1. Engineer – read the Lego® instructions
    2. Supplier – finds the Lego® bricks
    3. Builder – builds the model
- at the end of the session the children will have some time to play/photograph their model
- an adult (Teaching Assistant) facilitates the group through guiding the process and prompts the children to problem solve, such as supporting their description of the pieces required to build the model

If you require any further information or would like to discuss the Lego® Therapy intervention further please feel free to contact me or my supervisor using the details given at the end of the letter.

Appendix IV: School Information sheet & Consent Letter (For head teacher, class teacher & facilitator) (Page 5 of 6)

CONSENT FORM (staff)

The evaluation of Lego® Therapy upon the social confidence and social independence of primary-aged children with social communication difficulties

Investigators: Sarah Boyne and Dr Nick Durbin
School of Psychology, University of Nottingham.

Name of staff _____ School_____

Role _____ Year Group _____

Gender M/F Class teacher _____

School Address _____

Contact telephone number_____

Please circle as necessary.

Have you read and understood the participant information sheet?

YES/NO

Have you been given an opportunity to ask questions and discuss the study?

YES/NO

Have any questions been answered satisfactorily?

NOT APPLICABLE/YES/NO

Appendix IV: School Information sheet & Consent Letter (For head teacher, class teacher & facilitator) (Page 6 of 6)

Have you received enough information about the study?

YES/NO

Do you understand that you are free to withdraw from the study:

at any time? YES/NO

without giving a reason? YES/NO

Do you agree to taking part in this study, by setting up a Lego® Therapy group, completing a short questionnaire (pre, post, delayed) and conducting weekly classroom filming prior, during and post intervention?

YES/NO

This study has been explained to me to my satisfaction, and I agree that I will take part. I understand that I am free to withdraw consent at any time".

(Staff)

Signature: Date:

Name:

(Researcher use only)

I have explained the study to …… and they have given their informed consent to for X school to participate.

Signature of researcher: Date

Appendix V: Parent information sheet/informed consent (Page 1 of 6)

Sarah Boyne Tel: Email:

Dear Parent/Guardian,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on Lego® Therapy whilst on placement with X Council (supervised by Dr Nick Durbin, Joint Programme Director, University of Nottingham). This aims to understand the effectiveness of the social communication intervention, Lego® Therapy, on primary-aged children with social communication difficulties social confidence and independence.

Lego® Therapy is a child-led and peer-based intervention that aims to support children's collaboration and interactions whilst engaging in the construction play activity (LeGoff et al, 2010). It was developed by Dr Daniel LeGoff, a US Psychologist, in 2004, after observing two of his clients interacting together through the medium of Lego®. There has been a limited number of studies evaluating its effectiveness and so this study aims to add to the research base. An information sheet of *'What is Lego Therapy?'* is attached to this letter.

The study will form part of my course requirements, whilst being of interest to me and the Local Authority. Due to your child's attendance at X school I am writing to ask for consent for your child to be involved with this study. The staff at (X school) have identified that this intervention may be suitable for your child due to their social communication difficulties, enjoyment of Lego® and because

they are receiving no other intervention focusing on social communication development at present.

My aim is to gather informed consent of your child's participation from yourself (through this letter), staff will be trained in the approach and a Lego® Therapy group of three children (per group) and one facilitator for thirty minutes per week will be set up.

Lego® Therapy usually runs for six to eight weeks, and it's effectiveness will be measured weekly through gathering up to ten minutes of video footage of your child within their classroom on a camera tripod or by the facilitators. (Informed consent for videoing and incidental videoing of peers in the classroom and teaching staff will also be gathered). Observational measures will need to be taken for around two weeks prior to the intervention, during it and four to six weeks after. I will also ask the facilitator to complete short questionnaires with your child, their class teacher and yourself prior to and after the intervention and at the end of the study.

I have an enhanced CRB disclosure form and can assure you that all of the work will be carried out professionally in line with the ethical guidelines of the British Psychological Society. All of your child's information will be confidential and names will not be included in the final report write up. All raw data will be destroyed up to two years after the completion and publication of the research. The finished results of the study will be made available to you and the school.

If you are happy for your child to participate in this study, please sign and return the consent form attached as soon as possible (before Xth April 2013). I would also be very grateful if you could discuss this with your child and ask them to sign the attached letter if they agree to be involved in the Lego® Therapy group and filming within the classroom.

Even if you consent to participating now but feel you would like to withdraw your child from the study at a later stage, you can withdraw from the study at any time without giving a reason.

Appendix V: Parent information sheet/informed consent (Page 3 of 6)

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below.

Thank you in anticipation,

Yours sincerely,

Sarah Boyne

Doctorate in Educational Psychology Student

Sarah Boyne	Dr Nick Durbin
Trainee Educational Psychologist	Joint Programme Director, D.App.Ed.Psy

Appendix V: Parent information sheet/informed consent (Page 4 of 6)

What is Lego® Therapy?

Lego® Therapy is:

- a collaborative play therapy in which children work together with Lego® models, focusing on what they 'can do' rather than 'can't do'
- a social development programme for children with social communication difficulties.

What does Lego® Therapy involve?

- sessions last around 30 minutes
- groups of 3 children with an adult to facilitate
- initial sessions will help the children to identify group rules (how to work as a team, language to describe the Lego® bricks, which models to build and what to do if there is any confusion or potential misunderstandings)
- each child has a clearly defined job which rotates every 5/10 minutes of;
    4. Engineer – read the Lego® instructions
    5. Supplier – finds the Lego® bricks
    6. Builder – builds the model
- at the end of the session the children will have some time to play/photograph their model
- an adult (Teaching Assistant) facilitates the group through guiding the process and prompts the children to problem solve, such as supporting their description of the pieces required to build the model

If you require any further information or would like to discuss the Lego® Therapy intervention further please feel free to contact me or my supervisor using the details given at the end of the letter.

Appendix V: Parent information sheet/informed consent (Page 5 of 6)

CONSENT FORM (parent/guardian)

The evaluation of Lego® Therapy upon the social confidence and social independence of primary-aged children with social communication difficulties

Investigators: Sarah Boyne and Dr Nick Durbin
School of Psychology, University of Nottingham.

Name of pupil _____ School_____

Date of birth_____ Year Group _____

Gender M/F Class teacher _____

Address _____

Home telephone number_____

Please circle as appropriate.

Have you read and understood the participant information sheet?

YES/NO

Have you been given an opportunity to ask questions and discuss the study?

YES/NO

Have any questions been answered satisfactorily?

NOT APPLICABLE/YES/NO

Have you received enough information about the study?

YES/NO

Do you understand that you are free to withdraw your child from the study:

at any time? YES/NO

without giving a reason? YES/NO

Appendix V: Parent information sheet/informed consent (Page 6 of 6)

Do you agree to your child taking part in this study?

YES/NO

Does your child agree to take part in this study?

YES/NO

Do you agree to your child's teacher completing a questionnaire about any changes since beginning Lego® Therapy? Any completed questionnaires will be made anonymous, locked away and destroyed up to two years after publication of the research.

YES/NO

Do you agree to your child being filmed for up to 10 minutes a week within their classroom? All data will be kept securely on a password protected computer, anonymised and locked away. All footage will be analysed by the researcher and a co-researcher, then destroyed up to two years after publication of the research.

YES/NO

"This study has been explained to me to my satisfaction, and I agree that my child and I will take part. I understand that I am free to withdraw consent at any time".

(Parent)

Signature: Date:

Name:

(Researcher use only)

I have explained the study to …… and they have given their informed consent to participate.

Signature of researcher: Date:

Appendix VI: Participant consent (Page 1 of 2)

Child consent letter

To, _____

X school are starting a new group called Lego® Therapy.

In Lego® Therapy children:

Build Lego Talk to each other

Help each other Make rules Follow rules

Lego® Therapy will run once a week for 30 minutes with Y facilitator.

There will be three pupils in a Lego® Therapy group.

Would you like to be a part of the group?

Yes No

If you choose to be a part of the group but don't enjoy it, tell Y (facilitator) and you can leave the group.

If you don't choose to be a part of the group that is ok.

Appendix VI: Participant consent (Page 2 of 2)

Y (facilitator) will be doing some filming with a camera in the classroom to learn about how you and other children in your class work and play.

Is it ok for Y facilitator to film you and the other children in your classroom?

Yes No

If you choose to be filmed in your classroom but don't enjoy it, tell Y (facilitator) and you won't be filmed.

Appendix VII: Lego® Therapy Training (Page 1 of 5)

Lego Therapy

Sarah Boyne
Trainee Educational Psychologist

What is Lego Therapy?

- Social development programme for children with social communication difficulties, including Autism
- Child-led & peer-based intervention utilizing natural interest in construction play
- Collaborative play therapy
  - children work together with Lego models

- Emphasis on
  - social identity development
  - Common purpose and shared interest in Lego play
  - Socially isolated children can feel part of the group
  - Emphasis on 'can do' rather than 'can't do'

Why Lego Therapy?

- Many approaches are difficult to implement and do not fully engage the pupils
- Children with Autism have little intrinsic motivation to learn social skills
- Children with Autism can often find it difficult to generalise the skills they have learnt in group sessions to other social situations

---

Why does Lego engage children?

- Lego is a systematic toy that appeals to children (and adults, with or without autism)
- Children with autism often display good systemising skills
- Kinaesthetic
- Multi-sensory
- Uses a natural interest to build skills

What resources are needed?

- Initially, small kits and a 5 minute sand-timer
- Camera to record the made models
- Facilitator
  - Adult should prompt children to problem solve
  - E.g. 'We just had a problem, what was the problem?' NOT, 'it's not nice to snatch'
  - Children to approach the adult to resolve conflict – the adult should prompt children to resolve their own conflicts

What does Lego Therapy involve?

- Sessions last up to 30 minutes
- Groups of 3 children with an adult to facilitate
- Each child has a clearly defined job
  - Engineer – reads the instructions
  - Supplier – finds the bricks
  - Builder – builds the model

Level 1 – Individual Lego Therapy

- Learn the basic skills of Lego building
- Set building with an adult
  - Follow simple set directions with adult help
- Learn the basics of turn taking, joint attention, sharing

Level 2 – Collaborative Building

✧ Focus of this project

- Set building in small groups
- Requires close adult supervision
- Increase complexity of the sets as children build reciprocally

---

Level 3 – Freestyle building

- Designing and making your own creations for non-specific Lego pieces
- Start only after consistent turn taking and collaboartion at level 2
- Adult helper can steer a parit of children towards possible projects
- May need to organise Lego pieces into containers/sorting trays

---

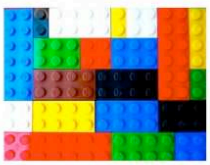
Initial 'setting up' session

- Develop Lego group rules
  - Group name; 'Lego Club'
  1. Build things together
  2. If you break it you have to help fix it or ask for help
  3. Rotate roles – 5 minutes using the sand timer
  - Discuss language to use for the bricks and create a word bank
  - Discuss Lego Therapy roles
  - Lego building (rotating roles every 5 minutes)
  - Lego building recording (take pictures of the models)

Describing the bricks

- How would you describe the bricks?



Lego Therapy sessions

- After initial set up session, each sessions should involve:
  - Recap of Lego Therapy roles & rules
  - Choosing of Lego model to build
  -Lego building (rotating roles every 5 minutes)
  - Lego playing & model recording (pictures of the models)

- Thank you & have fun!
- Any questions?

References

- Andras, M. (2012) The value of Lego® Therapy in promoting social interaction in primary aged children with autism. *Good Autism Practice, 13,* (2), 18 – 25.
- Attwood, A. J. (1998) *Asperger's syndrome: A guide for parents and professionals.* London, UK: Jessica Kingsley.
- Delprato, D. J. (2001). Comparisons of discrete-trial and normalized behavioral language intervention for young children with autism. *Journal of Autism and Developmental Disorders, 31*, (3), 315–325.
- LeGoff, D. (2004) Use of LEGO as a Therapeutic Medium for Improving Social Competence, *Journal of Autism and Developmental Disorders, 34,* (5), 557-571.

Appendix VIII: Whole class consent for filming (parent version) (Part 1 of 4)

Sarah Boyne Tel: Email:

Dear Parent/Guardian,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on Lego® Therapy whilst on placement with X Council (supervised by Nick Durbin, Joint Programme Director).
Lego® Therapy is a child-led and peer-based intervention that aims to support children's collaboration and interactions whilst engaging in the construction play activity (LeGoff et al, 2010).

The study will form part of my course requirements, whilst being of interest to me and the Local Authority. Due to your child's attendance at X school and X class I am writing to ask for consent for filming of the participants in the study in your child's classroom.

To evaluate the effectiveness of the approach for the participants a tripod camera is to be set up within the classroom to capture the children engaged in a small group task. This will be for up to ten minutes per week per participant for around twelve weeks. As the filming will take place within the classroom environment that your child will be in, the footage may capture your child in the background or interacting with the participants.

Appendix VIII: Whole class consent for filming (parent version) (Part 2 of 4)

I have an enhanced CRB disclosure form and can assure you that all of the work will be carried out professionally in line with the ethical guidelines of the British Psychological Society. No information will be taken of your child and all video footage will be stored securely on a password-protected computer in a locked cupboard and destroyed up to two years after the research is published.

If you are happy for filming to take place within your child's classroom and for them to potentially be incidentally filmed, please sign and return the consent form attached as soon as possible (before Xth March 2013). If you do not wish for your child to be incidentally filmed within the classroom, please indicate this on the consent form. If you do not wish to consent then I will speak with school staff to ensure that your child is not in the small group task with the participants, when filming is occurring and that the small group is away from your child's working area.

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below.

Thank you in anticipation,

Yours sincerely,

Sarah Boyne

Doctorate in Educational Psychology Student

Sarah Boyne Dr Nick Durbin

Appendix VIII: Whole class consent for filming (parent version) (Part 3 of 4)

CONSENT FORM (parent/guardian)

The evaluation of Lego® Therapy

Investigators: Sarah Boyne and Dr Nick Durbin
School of Psychology, University of Nottingham.

Name of pupil _____ School_____

Year Group _____ Class teacher _____

Please circle as appropriate.

Have you read and understood the whole class information sheet?

YES/NO

Have you been given an opportunity to ask questions and discuss the study?

YES/NO

Have any questions been answered satisfactorily?

NOT APPLICABLE/YES/NO

Have you received enough information about the study?

YES/NO

Do you agree to filming being made within your child's classroom environment during this research? All data will be kept securely on a password protected computer, anonymised and locked away. All footage will be analysed by the researcher and a co-researcher, then destroyed up to two years after the research is published.

YES/NO

Appendix VIII: Whole class consent for filming (parent version) (Part 4 of 4)

"This study has been explained to me to my satisfaction, and I agree that filming can take place within my child's classroom".

(Parent)
Signature: Date:

Name:

(Researcher use only)
I have explained the study to …… and they have given their informed consent to participate.
Signature of researcher: Date:

Appendix IX: Whole class consent for filming (school staff version) (Part 1 of 4)

Sarah Boyne Tel: Email:

Dear Sir/Madam,

I am a Trainee Educational Psychologist at the University of Nottingham, undertaking a research study on Lego® Therapy whilst on placement with X Council (supervised by Nick Durbin, Joint Programme Director).
Lego® Therapy is a child-led and peer-based intervention that aims to support children's collaboration and interactions whilst engaging in the construction play activity (LeGoff et al, 2010).

The study will form part of my course requirements, whilst being of interest to me and the Local Authority. Due to your teaching role within X school and X class I am writing to ask for consent for filming of the participant's in the study in your classroom.

To evaluate the effectiveness of the approach for the participant's a tripod camera is to be set up within the classroom to capture the children engaged in a small group task. This will be for up to ten minutes per week per participant for around twelve weeks. As the filming will take place within the classroom environment that you work in, the footage may capture you in the background or interacting with the participants.

I have an enhanced CRB disclosure form and can assure you that all of the work will be carried out professionally in line with the ethical guidelines of the British Psychological Society. No information will be taken of you and all video footage will be stored

securely on a password-protected computer in a locked cupboard and destroyed up to two years after the research is published.

If you are happy for filming to take place within your classroom environment, please sign and return the consent form attached as soon as possible (before Xth April 2013). If you do not wish to be incidentally filmed within the classroom, please indicate this on the consent form. If you do not wish to consent then I will speak with the School SENCo to discuss arrangements for you to not be involved in the small group tasks whilst the filming is occurring and to ensure that this group is away from your working area.

If you require any further information on the study, please feel free to contact me or my supervisor using the details given below.

Thank you in anticipation,

Yours sincerely,

Sarah Boyne

Doctorate in Educational Psychology Student

Sarah Boyne Dr Nick Durbin

Appendix IX: Whole class consent for filming (school staff version) (Part 3 of 4)

CONSENT FORM (staff

The evaluation of Lego® Therapy

Investigators: Sarah Boyne and Dr Nick Durbin
School of Psychology, University of Nottingham.

Name of staff _____ School_____

Year Group _____ Class teacher _____

Please circle as appropriate.

Have you read and understood the whole class information sheet?

YES/NO

Have you been given an opportunity to ask questions and discuss the study?

YES/NO

Have any questions been answered satisfactorily?

NOT APPLICABLE/YES/NO

Have you received enough information about the study?

YES/NO

Do you agree to filming being made within your classroom environment during this research? All data will be kept securely on a password protected computer, anonymised and locked away. All footage will be analysed by the researcher and a co-researcher, then destroyed up to two years after the research is published.

YES/NO

Appendix IX: Whole class consent for filming (school staff version) (Part 4 of 4)

"This study has been explained to me to my satisfaction, and I agree that filming can take place within my classroom".

(Staff)

Signature: Date:

Name:

(Researcher use only)

I have explained the study to …… and they have given their informed consent to participate.

Signature of researcher: Date:

Appendix X: Participant/school debrief materials

Debrief to young people: Done verbally by the researcher & facilitator to each Lego® Therapy group, after the study ended, for 5 – 10 minutes. The children were presented with an attendance certificate & thanked for their participation.

Debrief to parents: Done by a letter from researcher to parents giving details of the results of the evaluation and signposting to further information (for example contacting me or viewing the finished thesis).

Debrief to school: Through meeting with the researcher and having access to a copy of the final thesis.

Debrief to local authority: Through a presentation at a 'Professional Development Meeting' once the thesis has been passed, and providing a copy of the final thesis.

Appendix XI: Lego® Therapy Project – Classroom observation record

Pupil initial: 4 **School: 2**

Date	**Observation time** (Start/Finish)	**Location & lesson** (Brief lesson summary)	**Activity engaged in/environment set-up** (group work, facilitator initials, student initials, task description)	**Additional comments** (external impacts on engagement – health, emotions	**Filming conducted by (initial)**
26/9/13	14:00 – 14:30	History	Discussion of letter written in the history class	None	SB
4/10/13	14:00 – 14:30	Literacy	Story reading and questions	None	SB

Appendix XII: Communication Coding Scheme, original & revised versions (Thunberg et al, 2007) (Page 1 of 5)

Thunberg et al's (2007) ORIGINAL Communication Coding Scheme

The fundamental unit of coding in the modified CCS scheme is labelled a communicative event. A communicative event is best described as a contribution that can be transferred through different modes, for example, pointing and eye contact. The communicative event may in reality also have different communicative functions. Since most contributions fill many different functions at the same time, some of which cannot even be observed externally, the coding in this scheme refers to the function judged to be the main one. The choices can therefore be seen as categories, not traits. Without this categorization, both coding and interpretation of results would most probably be too complex and unreliable.

Degree of engagement

refers to the participant's interest and attention during the observation occasion as a whole. It is coded on the following scale:

5	interested and highly attentive to most of the activity
4	interested and attentive to most of the activity
3	sometimes loses interest and attention
2	interested and attentive only for shorter periods
1	uninterested and inattentive most of the time

Role in turn-taking

Response	was used when the communicative event was based on the presence of a preceding communicative event by a partner. The response should be related to the preceding partner communication semantically and/or pragmatically.
Initiation	was used when the participant's communication event was not preceded by a partner communication linked in any way to the participant's event.

Mode

is to be regarded as a trait and several modes can therefore be coded for one contribution.

Physical manipulation	an act of physically leading or guiding the adult/peer in some way to gain an outcome. This could also mean looking fixedly at something in order to get it or direct attention to it. Looking fixedly at another person's face is, however, coded as eye contact (see below).
Eye contact	the child clearly directing his eye gaze towards another person's face/eyes.
Gesture	a point, reach, or similar movement made with the hands; a head nod; or a head shake to indicate something to another person. Pointing is defined as a decisive directive movement of a hand or finger towards a person or object. Pointing is classified as a subgroup of gesture and coded with a P in the scheme. A sign is defined as a conventionalized gesture (as it seems to be perceived by the partner and/or the coder), most often being used as an AAC method to support speech. Sign is also considered as a subgroup of gesture and marked with an S in the scheme.
Graphic representation	pointing, holding up, staring at or handing over a graphic representation, not combined with SGD activation. A graphic representation could be a photo, picture, symbol or written word.
SGD+graphic	activation of a Speech-Generating Device (SGD). Sometimes function buttons on the children's SGDs use speech output. In some cases, these buttons also convey a choice, for example of activity, and can therefore be seen as communicative at the same time. These speech output contributions are consequently coded in the scheme.
Vocalization	a sound or sequence of sounds that is not intelligible to the coder as a spoken word.
Speech	a sound sequence that is understood by the coder to be a word or phrase.

Appendix XII: Communication Coding Scheme, original & revised versions (Thunberg et al, 2007) (Page 2 of 5)

Communicative Function

how the participant used the mode pragmatically. The choices should, as mentioned above, be seen as categories, not traits. The chosen category thus refers to the deemed main function.

Answering question	responding to a question or a comment from a partner.
Affirming statement or comment	agreeing with a contribution or confirming a contribution or behaviour by the partner.
Negating statement or comment	objecting to the behaviour or verbalization/vocalization of a partner; for example, declining an object, action or event; or denying the existence of something.
Attention directing	engaging the attention of a partner toward oneself or another person, object or event.
Commenting previous contribution	communicating about what a partner has said, other than affirming or negating.
Commenting something other	communicating about an object, person or event other than the previous contribution.
Requesting	asking for an item, action or location, or for someone to do something.
Asking question	asking for information or a comment from a partner.
Greeting	using a salutation at meeting or departing.
Imitating	exactly or partially repeating what a partner has said or done via speech or gesture.
Naming	identifying an object, person or quality spontaneously or in response to 'What's this?' or 'What are these?' questions.
Naming action	identifying an event or action spontaneously or in response to 'What's happening?' or 'What is/are he/she/it/they doing?' questions.

Effectiveness

the participant's ability to make him/herself understood and/or attract attention.

Effective	A contribution was coded as *effective* when the partner's response praised, repeated, commented on, expanded or answered the participant's communication.
Not clearly effective	Contributions classified as *not clearly effective* were those that met with a negative response by the partner (e.g., rejecting the response mode of the communication message), were uninterpretable, or resulted in a response unrelated to the original event. Cases where the adult does not judge the child's contribution to be good enough, although he/she obviously understands its content, are also classified in this category. In these cases, the purpose almost always seems to be to 'train' the child by making him/her try again, expand or imitate, and in most cases with a better speech output in view.
Unsuccessful	*Unsuccessful* contributions occurred when the partner did not receive the message, failed to respond to the message or did not interpret the message as communication.

REVISED Communication Coding Scheme used within this study

The fundamental unit of coding is labelled a communicative event. A communicative event is best described as a contribution that can be transferred through different modes, for example, pointing and eye contact. The communicative event may in reality also have different communicative functions. Since most contributions fill many different functions at the same time, some of which cannot even be observed externally, the coding in this scheme refers to the function judged to be the main one. The choices can

therefore be seen as categories, not traits.

For each communicative event please tick the participant's;

Role in turn-taking

Response*:* was used when the communicative event was based on the presence of a preceding communicative event by a partner. The response should be related to the preceding partner communication semantically and/or pragmatically.

Initiation: was used when the participant's communication event was not preceded by a partner communication linked in any way to the participant's event.

Mode

is to be regarded as a trait and several modes can therefore be coded for one contribution.

Eye contact*:* the child clearly directing his eye gaze towards another person's face/eyes.

Gesture: a point, reach, or similar movement made with the hands; a head nod; or a head shake to indicate something to another person. Pointing is defined as a decisive directive movement of a hand or finger towards a person or object..

Graphic representation*:* pointing, holding up, staring at or handing over a graphic representation. A graphic representation could be a photo, picture, symbol or written word.

Vocalisation*:* a sound or sequence of sounds that is not intelligible to the coder as a spoken word.

Speech: a sound sequence that is understood by the coder to be a word or phrase.

This is split further into: **one word utterance**

2/3 words

flowing speech (4 or more words)

Communication function

how the participant used the mode pragmatically. The choices should, as mentioned above, be seen as categories, not traits. The chosen category thus refers to the deemed main function.

Answering question: responding to a question or a comment from a partner.

Affirming statement or comment*:* agreeing with a contribution or confirming a contribution or behaviour by the partner.

Negating statement or comment: objecting to the behaviour or verbalization/vocalization of a partner; for example, declining an object, action or event; or denying the existence of something.

Attention directing*:* engaging the attention of a partner toward oneself or another person, object or event.

Commenting previous contribution*:* communicating about what a partner has said, other than affirming or negating.

Commenting something other*:* communicating about an object, person or event other than the previous contribution.

Requesting: asking for an item, action or location, or for someone to do something.

Asking question: asking for information or a comment from a partner.

Appendix XII: Communication Coding Scheme, original & revised versions (Thunberg et al, 2007) (Page 5 of 5)

Greeting: using a salutation at meeting or departing.

Imitating: exactly or partially repeating what a partner has said or done via speech or gesture.

Naming: identifying an object, person or quality spontaneously or in response to

'What's this?' or 'What are these?' questions.

Naming action*:* identifying an event or action spontaneously or in response to 'What's happening?' or 'What is/are he/she/it/they doing?' questions.

Effectiveness

the participant's ability to make him/herself understood and/or attract attention.

Effective: A contribution was coded as effective when the partner's response praised, repeated, commented on, expanded or answered the participant's communication.

Not clearly effective*:* Contributions classified as not clearly effective were those that met with a negative response by the partner (e.g., rejecting the response mode of the communication message), were uninterpretable, or resulted in a response unrelated to the original event. Cases where the adult does not judge the child's contribution to be good enough, although he/she obviously understands its content, are also classified in this category. In these cases, the purpose almost always seems to be to 'train' the child by making him/ her try again, expand or imitate, and in most cases with a better speech output in view.

Appendix XV: Lego® Therapy session log

School: 2

Date & Time	Length of session (mins)	Facilitator initials	Participant role order (initials)	What was built?	Attitude/approach to group (per participant)	External influences (illness, upset)
14.11.13	30 minutes (13:30 – 14:00)	SENCo	Engineer 1 C 2 W 3 J 4C 5W Supplier 1 W 2 J 3 C 4 W 5 J Builder 1 J 2 C 3 W 4 J 5 C	Club House with garden	C – very excited to come to the group -very good descriptions given of the pieces J – slightly nervous at the start of the group - lots of directional pointers, 'put this here', 'like this' W – engaged, using descriptors such as 'vertical' - appeared somewhat bored when he wasn't the builder or engineer	None

Appendix XVI: Treatment fidelity checks

School: 2 **Date:** 21/11/13

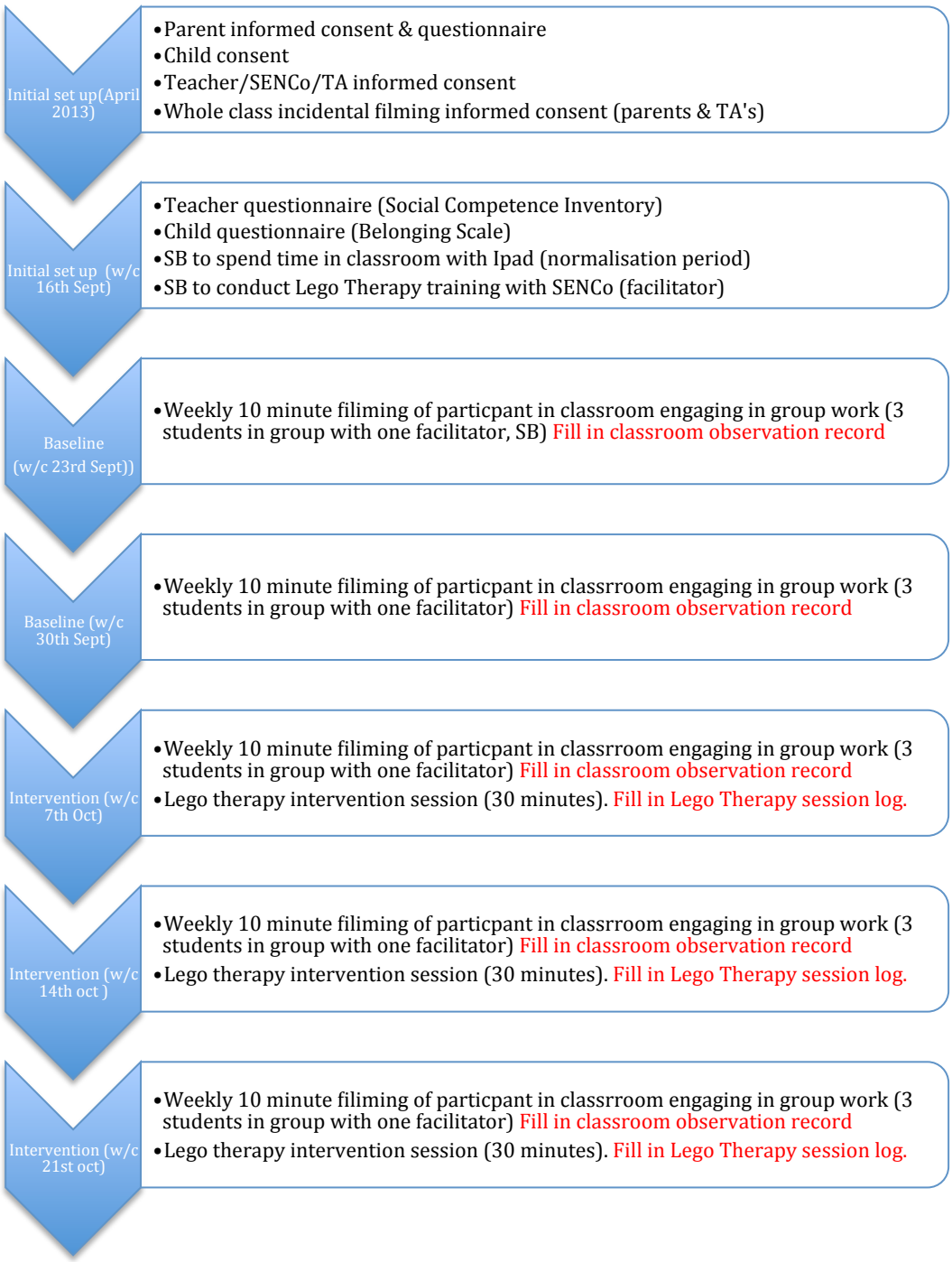
Participant Numbers: 4, 5, 6 **Facilitator initials:** SENCo

Start time & end: 13:50 – 14:20

Did the session include:	**Tick=yes, Cross=No**	**Additional comments**
A clear group name	✓	
Recap of Lego® Therapy rules	✓	
Recap of Lego® Therapy roles (displayed in area)	✓	
Discussion/awareness of key language (displayed in area)	✓	
Choice given & made by group members of Lego build	✓	
Roles given per group member	✓	
Rotation of roles every 5 minutes	✓	
Facilitator present throughout	✓	
Facilitator support language use	✓	'What colour would you call that?' 'How could you describe that?'
Facilitator support children to problem solve/conflict resolution	✓	'Does he need to put that somewhere?' 'Take them out of the container and spread the bricks out to have a look.'
Recording of session		
Lego® build recorded (photos)	✗	
Session reviewed with participants	✓	
Session log completed	✓	

Appendix XVII: Example summary of expectations for schools (Page 1 of 2)

Lego® Therapy Research Project overview



Appendix XVII: Example summary of expectations for schools (Page 2 of 2)

SB will be available via telephone or email throughout the study.

SB to come in to set up initial sessions & review how sessions are going every other week.

SB to hold a closing session with the facilitator and the pupils to present them with a Lego® Therapy certificate.

Appendix XVIII: Ethics Approval Letter (Page 1 of 2)

School of Psychology
The University of Nottingham
University Park
Nottingham
NG7 2RD
T: +44 (0)115 8467403 or (0)115 9514344

AS/hcf

Ref: 303R

Sunday, February 09, 2013

Dear Sarah,

Ethics Committee Review

Thank you for submitting an account of your proposed research 'Does Lego® Therapy have a positive effect upon the social confidence and social independence of primary-aged children with social communication difficulties?'.

That research has now been reviewed by the Ethics Committee and I am pleased to tell you that your submission has met with the committee's approval.

Final responsibility for ethical conduct of your research rests with you or your supervisor. The Codes of Practice setting out these responsibilities have been published by the British Psychological Society and the University Research Ethics Committee. If you have any concerns whatever during the

conduct of your research then you should consult those Codes of Practice.

Independently of the Ethics Committee procedures, supervisors also have responsibilities for the risk assessment of projects as detailed in the safety pages of the University website. Ethics Committee approval does not alter, replace, or remove those responsibilities, nor does it certify that they have been met.

Yours sincerely

Dr Alan Sunderland
Chair, Ethics Committe

Appendix XIX: Inter-Observer Script for video observation coding (Page 1 of 2)

Thank you for volunteering to inter-rate the video observations within this study, focusing on developing children's social communication.

You have been given 3 video clips for one of the participants in the study.

Please read the following coding system and have this by your side as you watch the video clip.

Attached is a scoring sheet. For every communication event please tick the corresponding box (Direction, Mode, Function & Effectiveness).

You do not have to watch the whole video clip, below will indicate how long you need to watch and score the video for and the start and end points of the video.

Participant number:

Video: A –

B –

C –

Appendix XIX: Inter-Observer Script for video observation coding (Page 2 of 2)

Coding Scoring Sheet:

	1	2	3	4
Role in turntaking				
Initiation				
Response				
Direction				
Peer				
Adult				
Mode				
Phys Man				
Eye contact				
Gesture				
Graphic				
VOCA+graphic				
Vocalisation				
Speech: one word utterance				
Speech: 2/3 words				
Speech: flowing speech				
Function				
Answering question				
Affirming statem/com				
Negating statem/com				
Attention directing				
Commenting prev contr				
Commenting other				
Requesting				
Asking question				
Greeting				
Imitating				
Naming				
Naming action				
Effectiveness				
Effective				
Not clearly effective				
Unsuccessful				

Appendix XX: Inter-Rater Script for SCED graph visual analysis (Page 1 of 2)

Please look at each of the graphs and the corresponding visual analysis and complete on the accompanying record sheet your responses to the following question:

"How certain or convinced are you that the child's x underwent a practical and notable improvement during each of the phases?"

x = total communication, initiation, response, effective communication or not clearly effective communication

The record sheet requires you to consider the change between the baseline and intervention, the intervention and follow up and the baseline and follow up:
A= change between baseline and intervention
B= change between intervention and follow up
C= change between baseline and follow up
In brackets, next to each observational measure indicates the direction of change showing an improvement.

Please mark your response on the rating scale from 1(not at all convinced), 2(unsure), 3(it is possible), 4(reasonably certain) to 5 (very convinced), 3 times (for each phase change) for each graph. You can return to previous graphs and adjust your responses if appropriate.

Appendix XX: Inter-Rater Script for SCED graph visual analysis (Page 2 of 2)

Participant: Ali

Phase	Observation measure	Rater A	Rater B
A	Total Communication (increase)	3	3
	Role in turn taking		
	Initiation (increase)	1	1
	Response (increase)	4	4
	Effectiveness		
	Effective (increase)	3	3
	Not clearly effective (decrease)	2	2
B	Total Communication (increase)	1	1
	Role in turn taking		
	Initiation (increase)	3	3
	Response (increase)	1	1
	Effectiveness		
	Effective (increase)	1	1
	Not clearly effective (decrease)	1	1
C	Total Communication (increase)	1	1
	Role in turn taking		
	Initiation (increase)	2	2
	Response (increase)	1	2
	Effectiveness		
	Effective (increase)	1	1
	Not clearly effective (decrease)	1	1