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**Lego Therapy: Developing social competence in children with  
Asperger syndrome through collaborative Lego play**

Submitted by Elinor Brett (600035760) to the University of Exeter as a thesis for  
the degree of Doctor of Educational Psychology in Educational Child and  
Community Psychology

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## Research Overview

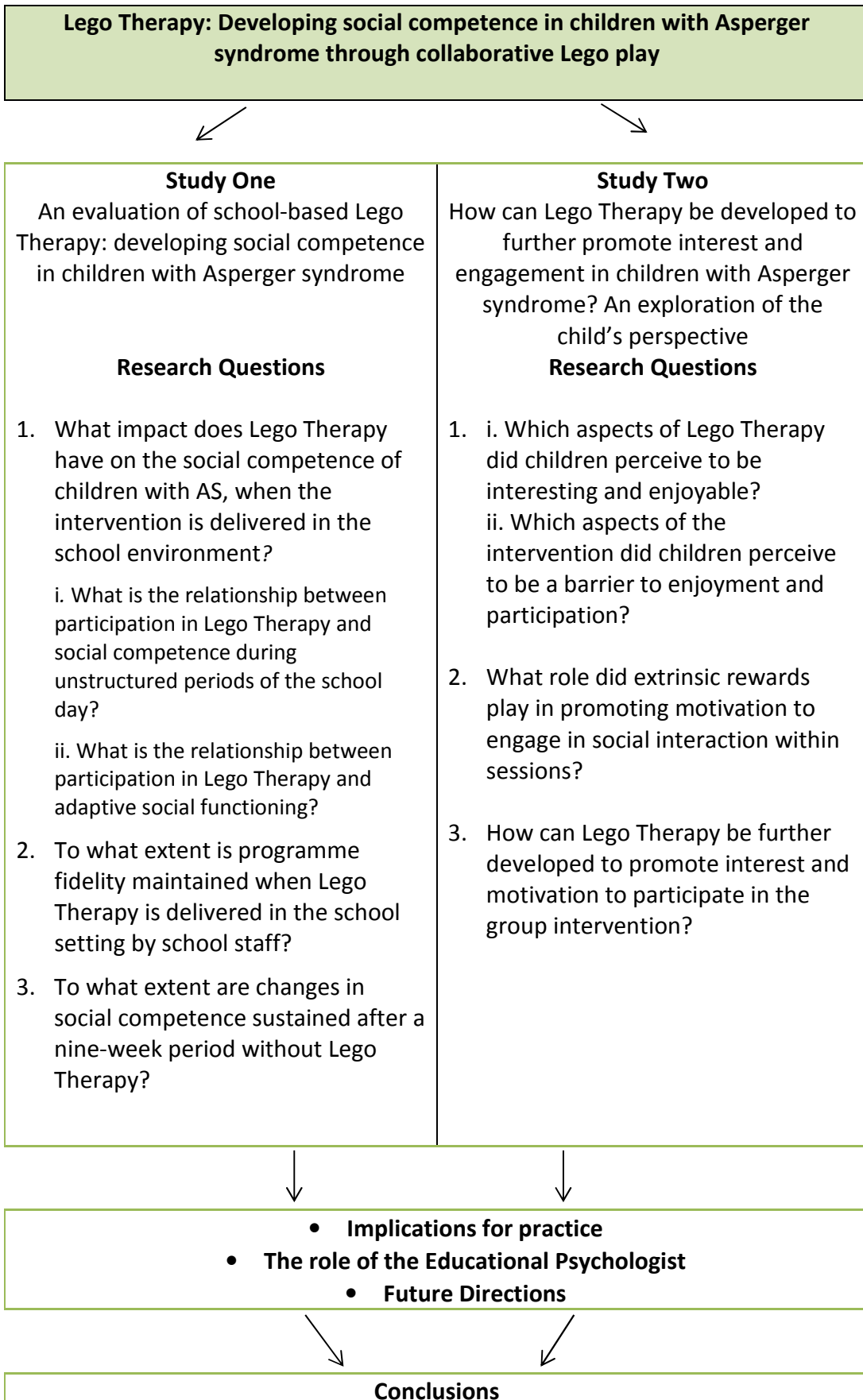
This two part study evaluates and explores Lego therapy as an intervention to promote social competence in children with Asperger syndrome. The first study employs a quasi-experimental design to evaluate changes in social competence, after participation in an 8 week school-based Lego therapy intervention. It also considers whether gains remain after a period without intervention and the degree to which programme fidelity is maintained when Lego therapy is delivered by school staff.

The second study explores the children's perspectives after participation in Lego therapy, using semi-structured interview methods. This study aims to identify factors associated with interest and engagement, and the role played by extrinsic rewards in promoting engagement. Programme adaptations to foster interest and engagement in Lego therapy are suggested.

Both studies identify implications for Educational Psychologists and suggest future directions for the intervention.



## Visual Representation of the Two Part Study



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## Research Context

The social difficulties experienced by children with Autism Spectrum Conditions (ASC) can be a barrier to their inclusion in mainstream education (Greenway, 2000). Consequently, schools and Educational Psychologists play an important role in promoting the development of social competence in children with ASC..

Existing clinic-based research suggests Lego therapy is associated with increases in social competence in children with autism and Asperger syndrome.

Researchers have also suggested that Lego therapy would be an appropriate intervention to implement in school. Lego therapy is currently used in schools in the local authority in which this study is conducted, as an intervention to support social development. However, research has not been conducted to explore whether Lego Therapy is effective when the intervention is delivered by school staff in the school environment. The feasibility of the intervention when delivered by school staff has also not been explored. This study explores changes in social competence in children with Asperger syndrome, after participation in a school-based Lego therapy intervention. The study aims to fill the gap in the literature and provide research evidence to inform decisions when implementing Lego therapy in schools. Findings presented in this study will be of interest to school staff and Educational Psychologists seeking to implement interventions to support the social inclusion of children with Asperger syndrome in mainstream schools.

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## Frequently Used Abbreviations

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### Abbreviation

<b>AS</b>	Asperger Syndrome
<b>ASC</b>	Autism Spectrum Condition
<b>ASD</b>	Autism Spectrum Disorder
<b>DSM-IV-TR</b>	Diagnostic and Statistical Manual of mental disorders, fourth edition, text revision
<b>DSM V</b>	Diagnostic and Statistical Manual of mental disorders, fifth edition
<b>GARS</b>	Gilliam Autism Rating Scale
<b>HFA</b>	High Functioning Autism
<b>ICD-10</b>	International Classification of Diseases
<b>SCQ</b>	Social Communication Questionnaire
<b>TRF</b>	Teacher Rating Form
<b>VABS</b>	Vineland Adaptive Behaviour Scales

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## Study One

### **An evaluation of school-based Lego Therapy: developing social competence in children with Asperger syndrome**

#### **1.1 Abstract**

Children with Asperger syndrome and high functioning autism typically experience difficulty with social interaction and social communication, hence the development of social competence is important to promote social inclusion. A quasi-experimental baseline design was employed to measure changes in social competence following participation in Lego therapy. Fourteen children with Asperger syndrome participated in an eight week Lego therapy intervention in nine schools. Social competence was measured through observations of social interaction on the school playground and adaptive socialisation and communication. Statistically significant increases were observed in adaptive socialisation and play following participation in Lego Therapy. No significant differences were found in communication, median duration of interactions or frequency of self-initiated social interactions. Measures of social competence were completed again following a period without intervention, to establish whether increases in social competence were sustained. Aspects of social competence decreased following a period without intervention, however, decreases were not significant. Programme fidelity was measured by adherence to fundamental aspects of the intervention and a measure of inter-rater reliability. Adherence ranged between 63-100% for aspects of the intervention, and between 82-97% for schools delivering the intervention. Implications for

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practice were highlighted, and included the need to encourage generalisation of skills from Lego therapy into the wider school environment, and a need for on-going support for school staff when the intervention is delivered in schools. Alternative ways of promoting social competence within an inclusive school environment were discussed.

## **1.2 Introduction**

### **1.2.1 Background**

This study was conducted in a local authority where Lego therapy is delivered in both school and clinical settings as an intervention to develop social competence in children with Asperger syndrome (AS). This is the first of two studies exploring Lego therapy as an intervention for children with AS. This study evaluates the impact of Lego therapy on social competence, and considers whether Lego Therapy can effectively be implemented in school settings.

### **1.2.2 Selected Literature**

The literature review first explores the need for social interventions for children with AS. Existing research relating to social skills interventions is briefly considered in order to identify important aspects of such interventions. Debates in the literature relating to the concept of social competence are explored. Finally, previous studies relating to Lego Therapy are outlined and critiqued, and the proposed study is described.

The search engines and terms used are shown in Table 1. Various terms were combined in multiple searches, and articles were selected if search terms featured in the title or abstract of papers.

Table 1: Search engines and search terms

Search Engines	Search Terms
<ul style="list-style-type: none"> <li>• Psycinfo</li> <li>• APA PsycNET</li> <li>• EBSCO</li> <li>• Education Research Complete</li> <li>• Google Scholar</li> <li>• Web of Knowledge</li> <li>• The Journal of Autism and Developmental Disorders</li> </ul>	Autism; ASC; ASD; Asperger; High functioning autism; Social skills; Social Competence; Social Development; Social skills intervention; Social skills programme; Lego therapy; Lego club; Lego play therapy; Intrinsic motivation; Systemizing; and Systemising.

It is estimated that just over 1.5% of children meet the diagnostic criteria for ASC in the local authority in which this study was conducted. Baron-Cohen et al. (2009) conducted a study to measure the prevalence of ASC in children aged 5-9 years old in the local authority, and estimated prevalence to be 157 children in every 10,000.

Children with ASC, including AS, typically experience difficulty with understanding social behaviour; understanding and using communication; and flexibility in thought and behaviour (Frith, 2003). The DSM-IV-TR diagnostic criteria for ASC encompasses difficulties with social communication, social interaction and social imagination (APA, 2000). These three social difficulties correspond with the triad of impairments, proposed by Wing and Gould (1979).

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The social difficulties experienced by children with ASC and AS are a barrier to inclusion in a mainstream educational setting (Greenway, 2000). Koegel, Koegel, Frea, and Fredeen (2001) advocate the inclusion of children with developmental delays in mainstream education settings. However, they argue that inclusion in mainstream settings alone does not result in social competence.

The prevalence of ASC, the social difficulties associated with ASC, and the resulting impact on social inclusion suggest that interventions to develop social competence are valuable and worthwhile. It is important that evidence-based methods for developing social competence and promoting inclusion of children in mainstream settings are established. Interventions designed to develop social competence in children with ASC and AS include social stories, social skills training and a circle of friends. A detailed exploration of existing interventions can be found in the literature review (see Appendix 47 for a comprehensive literature review). There is a substantial amount of published literature on social skills interventions for children with ASC, however, the effectiveness of interventions varies between research studies. Meta-analyses show minimal positive effects and question the effectiveness of social skills interventions for children with ASC (Bellini, Peters, Benner, & Hopf, 2007; Rao, Beidel, & Murray, 2008). Furthermore, existing research studies exploring social skills interventions are mired with methodological difficulties, including small sample sizes; lack of control measures; variable effectiveness; contradictory findings; and a lack of follow up data (Rao et al., 2008).

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Interventions to develop social skills and social competence commonly focus on modifying the social deficits associated with AS and HFA. Children with Asperger syndrome exhibit many strengths, and educational interventions should utilise a child's strengths, talents and interests to develop areas of difficulty (Bianco, Carothers, & Smiley, 2009). Focusing on a child's passion and interest enhances opportunities to teach academic and social skills due to increased interest and motivation in the child (Bianco et al., 2009). This idea was supported by Winter-Messiers et al. (2007), who developed a strength-based model of Asperger syndrome. Winter-Messiers (2007) interviewed children with Asperger syndrome about their special interests. Children used more appropriate verbal and non-verbal communication, and increased levels of social interaction when talking about their area of special interest. This suggests that special interests could be utilised to help to develop areas of difficulty. The authors argued that teachers should value and utilise the child's special interests (Winter-Messiers, 2007).

A review of the literature highlights a clear need for evidence-based interventions to develop social competence in children with autism and Asperger syndrome. The research suggests that evidence for social skills interventions is mixed, and methodological weaknesses are common. Strength-based research suggests that interventions will be more successful if the child's strengths and interests are considered. Lego therapy is an intervention which utilises the inherent strengths and interests often found in children with Asperger syndrome (Owens, Granader, Humphrey, & Baron-Cohen, 2008). Lego therapy, and the theory that underpins it, will now be considered.



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### **1.2.3 An Overview of Lego Therapy**

Lego therapy is an intervention designed to promote social competence in children with ASC, and was first described by LeGoff (2004). Lego therapy enables children to engage in collaborative Lego play with a small group of peers while receiving facilitation from an adult. The presence of rules and roles are crucial components to promote appropriate social interaction in group members. Each child plays the role of an 'engineer', a 'supplier' or a 'builder' and together they follow pictorial instructions to build a Lego model. The assignment of roles allows the children to practice social interactions in a safe environment, and encourages the development of skills essential for social interaction. Lego therapy aims to develop turn-taking skills, joint attention, problem solving and communication in group members (LeGoff, 2004). A further element of Lego therapy is 'freestyle' building, in which the children design and build an object together. Freestyle building encourages communication of ideas, perspective taking and compromise (LeGoff, 2004).

### **1.2.4 Current Research in Lego Therapy**

LeGoff (2004) investigated the effect of individual and group Lego therapy on social competence in children with ASC. Children participated in 90 minutes of group Lego therapy and 60 minutes of individual Lego therapy for 12 or 24 weeks, in a clinic. Improvements in the frequency and duration of social interaction and decreases in aloofness were found at both 12 and 24 weeks, and no improvements were noted during a waiting list period. This suggests that Lego

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therapy is a promising intervention for developing social competence in children with ASC, when delivered in a clinical setting.

LeGoff and Sherman (2006) conducted a further study to investigate whether the gains in social competence would be sustained over a longer period, and whether they would affect a wider range of social behaviours in different contexts. Social competence was measured over a three year period, while participants were receiving Lego therapy, and compared to social skills interventions that did not use Lego. Children in the comparison group received both individual and group therapy on a weekly basis. The Vineland Adaptive Behaviour Scales Socialisation Domain (VABS-SD, Sparrow, Balla, & Cicchetti, 1984) and Gilliam Autism Rating Scale, Social Interaction scale (GARS-SI, Gilliam, 1995) were completed to obtain pre and post measures of socialisation and autistic behaviours. LeGoff and Sherman (2006) found that the Lego group made significantly greater gains on both the VABS-SD and GARS-SI than the comparison group. They concluded that participants receiving Lego therapy showed a greater improvement in social competence and a reduction in autistic behaviours over a 3 year period. The generalisation of behaviours from the therapy setting to the natural setting was assumed from the adaptive behaviour scores obtained on the VABS-SD. However, no observations of the child's behaviour in the natural environment were conducted to validate this assumption.

Owens et al. (2008) compared Lego therapy to the Social Use of Language Programme (SULP), in children with high functioning autism (HFA) and Asperger syndrome (AS). Both interventions occurred for an hour per week for 18 weeks in

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a clinical setting, and unlike LeGoff (2004), no individual therapy sessions were provided in this study. A no-intervention control group was established, with children matched on age, IQ, verbal IQ and autism symptom severity. Social competence was measured through changes on the GARS-SI and VABS, and systematic observations in the playground. Playground observations were conducted to measure generalisation of social skills from the clinic to the school environment. Observation data measured the frequency of self-initiated social contact with peers and the duration of all interactions. The Lego group showed a significant improvement in the scores on the GARS-SI following intervention, suggesting that autism specific social difficulties reduced following Lego therapy. The children receiving the Lego therapy intervention also showed significantly lower levels of 'maladaptive behaviour' on the VABS post intervention. Significant improvements were seen in the Sulp group on the communication and socialisation domains of the VABS, whereas no significant differences were seen in the Lego or control groups. Direct observations of behaviour in the playground showed a small but significant increase in the duration of interactions for the Lego group, suggesting there was evidence of some generalisation from Lego therapy to the school playground. However, it is important to note that no data were collected to allow for comparison to the control group on this measure. The authors concluded that both Lego therapy and Sulp have potential benefits for improving social behaviour in children with ASD, and both have the potential to be used as an intervention within schools. LeGoff and Sherman (2006) also suggested that Lego therapy has the potential to be adapted to use in school settings. Adaptations to enable Lego therapy to be

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implemented in school were not suggested, and the application of Lego therapy to the school environment has yet to be researched. This study aims to address the current gaps in the research literature.

### **1.2.5 Theoretical Basis**

#### **1.2.5.i Lego Therapy**

LeGoff (2004) found that children were highly motivated to participate in Lego therapy and described how Lego therapy was inherently rewarding for children with ASC. However, at the time LeGoff (2004) was not certain why children with ASC were so attracted to Lego, and recommended that future research should investigate this further. Owens et al. (2008) explained the motivation to engage with Lego through Baron-Cohen's hyper-systemizing theory (Baron-Cohen, 2006). Baron-Cohen (2006, 2008) suggested that children with ASC have a strong drive to systemize. The purpose of systemizing is to predict patterns and changes in lawful events (Baron-Cohen, 2008), and thus children with ASC are attracted to objects that are predictable. The systemizing mechanism enables an individual to look for input-operation-output relationships and to detect laws and patterns from these relationships (Baron-Cohen, 2006). Owens et al. (2008) suggested that Lego appeals to a drive to systemize because it is a predictable and systematic toy.

#### **1.2.5.ii Social Competence**

Despite widespread use of the terms 'social competence' and 'social skills' in the literature, there is considerable disparity in the conceptualisation and definition of the terms (Dirks, Treat, & Robin Weersing, 2007). Spence (2003) provided a

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differentiation between 'social skills' and 'social competence'. Spence (2003) described how the term 'social skills' refers to the verbal and non-verbal skills required for social interaction, such as eye contact, turn taking, joining in conversations and selecting appropriate topics for conversation. There is a lack of consensus about the skills that are included within the term social skills, particularly with regard to more complex social behaviours (Rao et al., 2008). This leads to difficulties making comparisons between empirical research studies and some social behaviours are difficult to operationalize (Rao et al., 2008). Spence (2003) argued that the term 'social competence' refers to the positive outcomes that are achieved as a result of an interaction with others, for example, sustained and reciprocal interactions. However, the concept of 'competence' and the skills associated with competence are difficult to define (Waters & Sroufe, 1983). Sroufe, Cooper, DeHart, Marshall, and Bronfenbrenner (1996) define social competence as *"a child's ability to engage and respond to peers with positive feelings, to be of interest to peers and be highly regarded by them, to take the lead as well as follow, and to sustain the give-and-take of peer interaction."* (p.378), whereas Waters and Sroufe (1983, p 79) define social competence as an *"ability to generate and coordinate flexible, adaptive responses to demands and to generate and capitalize on opportunities in the environment"*. Dirks et al. (2007) also described an inconsistency between the theory, measurement and models of intervention in social competence, and argued that measurement and intervention do not reflect theory.

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A general consensus in definitions in the literature is that social competence can be characterised by the effective use of social skills to result in positive social outcomes (Korinek and Popp, 1987). Korinek and Popp (1997) argue that social skills are required for social competence, but competence is not achieved unless skills are applied to appropriate situations.

There are two general models applied to the conceptualisation of social competence in the literature. Social competence is commonly described within a 'molar' or 'molecular' approach (Waters & Sroufe, 1983). A molar approach considers social competence as an integrative concept relating broadly to social effectiveness (Waters & Sroufe, 1983). Behaviours such as co-operation with peers could be considered to reflect a molar approach (Lord et al., 2005). A molecular approach considers competence as the presentation of specific characteristics. The presence of social skills such as eye contact could be considered to reflect a molecular model of social competence (Lord et al., 2005). An advantage of the molar approach to conceptualising social competence is that social competence is considered as an integrative concept, requiring the appropriate selection and coordination of responses for a specific environment (Waters & Sroufe, 1983). A challenge associated with a molar approach is that competence is difficult to operationalize. Operationalizing social competence requires careful identification and measurement of behaviours required to determine effectiveness (Waters & Sroufe, 1983). The operationalization of social competence within a molecular model is easier because it requires the identification and measurement of specific skills or behaviours rather than an

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integrative construct. Waters and Sroufe (1983) argued that an assessment of competence through the measurement of specific skills disregards the wider construct of competence, and assessments of competence should have relevance beyond the presentation of specific skills in specific situations.

Current research in Lego Therapy operationalizes social competence as the motivation to initiate social contact with peers, the ability to sustain an interaction with peers, and a reduction in aloofness and rigidity (LeGoff, 2004; Owens et al., 2008), and thus reflects a molar concept of social competence. The operationalization of competence within this model is challenging due to the difficulties associated with identifying behaviours and outcomes required for social effectiveness. LeGoff (2004) clearly and explicitly described the operationalization of social competence. Multiple measures of social competence were obtained and a construct analysis was conducted to ensure that the three aspects of measurement reflected the construct of social competence. A coding schedule was developed by Owens et al. (2008) to increase consistency and objectivity in observations. The coding schedule also enables the research to be replicated within the same conceptualisation of social competence. The coding schedule measures effectiveness in interactions with peers on the playground and the operationalization of such measures has been clearly described in the observation schedule.

Previous studies explored whether social competence increased following Lego therapy, through a measurement of success in social interactions outside of the Lego Therapy sessions (LeGoff, 2004; Owens et al., 2008). Social competence is

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therefore operationalized through the generalisation of skills to the playground. The study did not measure whether Lego Therapy was associated with the development of specific target skills within sessions, or the process in which skills were generalised and applied to social interactions on the playground. The research therefore presumed that social skills were required for effective social interactions, but conclusions cannot be drawn about how social skills increased competence. The operationalization of competence adopted by LeGoff (2004) and Owens et. al (2008) assumed that an increase in competence would be reflected in the desire to initiate social interactions and the ability to maintain interactions, however, the process was not explored in the research. Lord et al. (2005) recommended that research designs should initially focus on measuring changes in specific target behaviours, and then study the relationship between target behaviours and more conceptual outcomes, such as social competence. Lord et al. (2005) argued that research focusing on general changes is difficult to interpret without evidence of the links between changes in specific behaviours and more general outcomes. Lord et al. (2005) suggested that longitudinal studies would be beneficial to explore the development of more general outcomes from changes in specific behaviours. However, Lord et al. (2005) also recognised that measurement of specific behavioural outcomes may have less relevance and meaning than measurement of competence as a wider construct.

### **1.2.6 Definition of Terms**

**Social Competence:** This study intends to operationalize social competence as an integrated construct rather than through the measurement of specific social



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skills. Measures of social competence will therefore aim to reflect effectiveness in social responses (Waters & Sroufe, 1983). The decision to focus on effectiveness was made because social effectiveness can be considered to be a more meaningful outcome than the development of specific social skills (Lord et al., 2005). Furthermore, the development of competence cannot be assumed from the development of skills alone (Dirks et al., 2007). Performance of individual skills without effectiveness in interactions lacks relevance and meaning, and thus challenges the social validity of the intervention.

The benefits of a more in depth analysis of the process of developing social competence are recognised; specifically the process in which social skills learnt in sessions are applied on the playground to result in increased competence. However, the depth of analysis required for such exploration is beyond the scope of the present study. Similar to research by LeGoff (2004), this study will focus on social competence rather than social skills and LeGoff's operationalization of competence will be used. LeGoff (2004) defines social competence as consisting of three component skills: initiation of social contact with peers, to reflect motivation for social contact; duration of social interaction, to reflect development of social skills required to sustain interactions; and decreases in autistic aloofness and rigidity. The validity of the construct has been tested and the operationalization of playground observation measures are clearly outlined in Owen et al's (2004) observation coding schedule.

**Autism Spectrum Condition:** The term 'Autism Spectrum Condition' (ASC) is used as an alternative to Autism Spectrum Disorder (ASD) in this study. Although 'ASD'

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is commonly utilised in literature, ASC is considered to be less stigmatising as it emphasises strengths rather than difficulties (Baron-Cohen et al., 2009).

**Autism:** Autism was previously classified as a Pervasive Developmental Disorder on the DSM-IV-TR (APA, 2000), a term encompassing Autistic Disorder (AD), Childhood Disintegrative disorder, Asperger's Disorder and Pervasive Developmental Disorder not otherwise specified (PDD-NOS). The DSM IV-TR has recently been replaced by the DSM V, in which the four separate disorders have been merged into one single category of diagnosis, Autism Spectrum Disorder (APA, 2013). The DSM V positions ASD on a continuum from mild to severe, with degree of severity specified alongside a diagnosis (APA, 2013). This study was conducted before the release of the DSM V, and is thus based upon the diagnostic categories stipulated by the DSM IV-TR (APA, 2000). This study focuses specifically on high functioning autism and Asperger's Disorder, although the term Asperger syndrome (AS) will be used as an alternative to Asperger's Disorder. The term Asperger syndrome is commonly found in research and will be used to maintain consistency.

**Asperger syndrome:** Asperger syndrome is distinguished from autism (including high functioning autism) by the presence of early language development (APA, 1994). A diagnosis of Asperger syndrome requires single words to have been used at the age of 2, and at the age of 3 the child must have been able to speak in phrases (APA, 1994). High functioning autism is not an official diagnostic category but is a term used to describe individuals with Autism who have an IQ

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above 70 (Carpenter, Soorya, & Halpern, 2009). Therefore, children with HFA may have experienced delays in language development in early childhood.

### **1.2.7 Research Aims**

This study explores the impact of Lego therapy on social competence in children with Asperger syndrome. Specifically, it aims to evaluate the effect of Lego therapy on adaptive communication and socialisation, and social interactions during unstructured periods of the school day. As Lego therapy has previously only been conducted in clinics, this study also aims to explore whether programme fidelity can be maintained when the intervention is implemented in schools. Finally, it aims to investigate whether gains in social functioning and social interaction are maintained. Findings will be used to inform implications for practice when implementing a Lego therapy intervention in a school setting.

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### 1.2.8 Research Questions

1. What impact does Lego therapy have on the social competence of children with AS, when the intervention is delivered in the school environment?
  - 1.i. What is the relationship between participation in Lego therapy and social competence during unstructured periods of the school day?
  - 1.ii. What is the relationship between participation in Lego therapy and adaptive social functioning?
2. To what extent is programme fidelity maintained when Lego therapy is delivered in a school setting by school staff?
3. To what extent are changes in social competence sustained after a nine-week period without Lego therapy?

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### 1.3. Method

#### 1.3.1 Research Design

The study utilised a within-subjects baseline design and was quasi-experimental.

Participants participated in a 9 week baseline period before the intervention commenced.

The ontological assumptions were informed by a post-positivist paradigm. A post-positivist paradigm seeks to discover an objective reality, but recognises that the background knowledge, theories, hypotheses and values held by the researcher can influence and bias their interpretation of the data gathered (Reichardt & Rallis, 1994). Consequently an objective reality cannot wholly be known. A post-positivist paradigm recognises that research evidence is fallible, and therefore seeks to ensure that methods hold reliability and validity (Robson, 2011). Within a post-positivist paradigm, the construction of knowledge occurs through the combination of research evidence and socio-political factors (Robson, 2011). A post-positivist paradigm aims to discover theories through which the social world can be understood, and seeks to uncover a truth.

However, post-positive paradigms recognise that reality can only ever be known imperfectly because of the limitations of the researcher (Robson, 2011). It is therefore assumed that a single study is not sufficient to discover and represent a truth, however, knowledge can start to be known if related studies identify the same phenomena. Establishing measures to control for the impact of the researcher are therefore important to reduce bias and increase objectivity.

Robson (2011) highlighted the difficulties associated with establishing measures

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to control for methodological limitations when conducting real world research, and recognised that the degree of control preferred in post-positivist paradigms is not often feasible.

One such measure that was not considered to be appropriate or feasible in this study was the use of a matched control group. The decision was made to not establish a matched control group in this study for reasons relating to sampling and ethical considerations. There were insufficient responses from schools to enable participants to be appropriately matched on key characteristics. Such characteristics include age, language ability, autism severity and other diagnoses (see Appendix 4 for participant characteristics). It may have been possible to establish a matched control group from children in schools that did not wish to implement Lego therapy. However, this would raise ethical concerns because children with AS are often already receiving social skills support. Enabling children to continue receiving social skills support would confound findings because children would be receiving differing levels of support. It would not be ethical to request that access to social skills support is limited whilst children are participating in the control group. Ethical concerns associated with a no-intervention control group were also raised by Lord et al. (2005). A baseline period was employed rather than a matched control group to explore changes to social competence during an equivalent period of time without intervention.

### **1.3.2 Sampling and Participants**

All primary schools in the local authority were contacted by the researcher, with the exception of 13 schools that were already known to be running Lego therapy

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groups. A total of 133 primary schools in the local authority were initially contacted by email (see Appendix 1). Every effort was therefore taken to establish a large and representative sample within the local authority. Thirty schools expressed an interest in the project, and of these, nine schools had children that were suitable for the purposes of the research. A total of 15 participants were selected across the local authority. One participant moved school during the intervention period so data for that individual were excluded from the analysis. Inclusion criteria can be found in Appendix 2.

Changing the inclusion criteria to include a wider range of social communication needs may have resulted in a larger sample size and thus increased the statistical power of the sample size. However, the decision was made to maintain the original criteria because the outcomes of Lego therapy are affected by language ability. LeGoff (2004) found that children with speech and language difficulties responded less positively to the intervention. Children with communication difficulties should therefore remain separate in research because language ability moderates the effect of the intervention. Rao et al. (2008) argued that social skills training should be tailored to meet the needs of subgroups within Autism Spectrum Conditions, and advised against using mixed samples of children with ASC in treatment groups.

In order to obtain information about participant eligibility, parents of participants were asked to complete a background questionnaire (see Appendix 3) and a Social Communication Questionnaire (Rutter, Bailey, & Lord, 2003).

Characteristics of the sample are outlined in Table 2 (See Appendix 4 for raw data and SPSS output.)

Table 2: Sample characteristics

<b>Sample characteristics (n=14)</b>	
<b>Age in months</b>	
Mean	108.86
Median	113.50
Range	51
Standard Deviation	16.00
<b>National Curriculum Year</b>	
2	1
3	5
4	1
5	5
6	2
<b>Social Communication Questionnaire score</b>	
Mean	22.86
Median	24.0
Range	18
Standard deviation	5.72
<b>Diagnosis</b>	
Asperger syndrome	10
Asperger syndrome and dyspraxia	2
Asperger syndrome and ADHD	2
<b>Other social skills intervention at the time the research commenced</b>	
Yes	0
No	14
<b>Ability to speak in phrases</b>	
Yes	14
No	0
<b>Gender</b>	
Male	13
Female	1

The sample consisted of 13 males and 1 female. The ratio of male to female participants in this study was higher than ratios suggested in estimates of prevalence. Fitzgerald and Corvin (2001) suggested that Asperger syndrome is 5 times more common in boys than girls. It is possible that there is a degree of



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sampling bias evident in results. Schools may have been more likely to suggest participants for the research if the children had an interest in Lego, and girls with Asperger syndrome may have had less of an interest in Lego.

### **1.3.3 Procedures**

Schools that expressed an interest in participating in the study were sent a letter outlining proposed dates for data collection (see Appendix 5). Schools approached the parents of suitable participants to gain consent for the child to participate in the intervention and the research project. The researcher provided the school with a letter (see Appendix 6) and background information to share with parents, including details about Lego therapy and an outline of what participation in the project would entail (see Appendix 7). Parents were given a consent form (see Appendix 8), a background questionnaire (see Appendix 3) and a Lifetime Social Communication Questionnaire to complete (Rutter et al., 2003). Schools were also given a consent form to sign and return (see Appendix 9).

#### **1.3.3.i Lego Therapy**

Advice and guidance was sought from Owens, (personal communication, 24<sup>th</sup> November 2011 and 6<sup>th</sup> February 2012) to ensure that Lego therapy sessions were delivered in a manner consistent with previous research. Owens assisted in the development of the training manual and training sessions, and information from the manual is detailed throughout the following section. Other than the location, only two adaptations to the programme were made. The first was a reduction from 60 to 45 minutes for each of the sessions. The duration of sessions was reduced to ensure consistency with the duration of Lego therapy

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sessions currently occurring in schools the local authority and to minimise disruption to learning and time spent away from peers. The second adaptation related to the 'Lego Points' given in sessions. LeGoff (2004) and Owens et al. (2008) enabled children to exchange Lego points for tangible rewards, such as small Lego sets or games. The decision was made to remove this from the programme when delivering sessions in schools, in order to minimise financial costs for schools.

The Lego therapy sessions occurred once per week in school. The intervention period lasted nine weeks, although only eight sessions were delivered in this time as the half term holidays fell within the intervention period. Children also attended an introductory session prior to the first session. This purpose of this session was to familiarise children with each other and prepare them for the sessions. Children also learnt the group rules and Lego terminology in this session.

Lego therapy sessions consisted of two sections; 30 minutes building sets with instructions and 15 minutes freestyle building. When building sets with instructions children played according to one of three roles, the engineer, builder or supplier. The engineer read the instructions and described how to build the set. The supplier was required to pick out the correct pieces when instructed by the engineer, and the builder was required to follow the engineer's instructions to put the model together. During the freestyle building children were able to build models of their own design, although they were required to build freestyle

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projects collaboratively. Lego rules were also established and referred to throughout sessions. The Lego rules were:

1. Build things together.
2. If it gets broken, fix it or ask for help.
3. If someone else is using a piece, ask first (don't take it).
4. Use indoor voices.
5. Use polite words.
6. Sit nicely (keep your hands and feet to yourself)
7. Tidy up and put things back where they came from.
8. Do not put LEGO® in your mouth.

The programme also included a Lego reward structure. The reward structure was designed to promote prosocial behaviour and group cohesion, and included certificates and Lego points. Lego points were designed to be given to reward positive social behaviour, including building together during free style building. Lego points were given through Lego stickers, and children were given a reward chart on which to place Lego points that they had collected. The Lego Therapy intervention provided five certificates; Lego Helper for helping others during sessions, Lego Builder for successfully building a moderate sized set together, Lego Creator to reward building together in free style building, Lego Master to reward for children that co-ordinate the construction of a freestyle project, and Lego Genius for creating, scripting and filming a Lego film. Lego Master and Lego Genius were not expected to be achieved within the timeframe available for the intervention in this study.

#### 1.3.3.ii The role of Teaching Assistants (TAs) in promoting social competence

A Teaching Assistant (TA) was present in each session to facilitate collaborative play and appropriate social interaction. TAs played the role of the 'activity leader'

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The role of the activity leader is to promote the development of specific skills, use the rules to address difficulties in the group, and facilitate the development of positive social behaviour and communication in group members. The Lego rewards system and Lego rules are also designed to help facilitation.

Whilst previous research found increases in social competence following participation in Lego Therapy, the mechanisms for change were not explored or specified (LeGoff, 2004). Lord et al. (2005) suggested that a longitudinal study would be an appropriate way to explore mechanisms for change in social competence, and thus is outside of the scope of this study. The mechanisms for change detailed throughout the following section are suggested on the basis of previous research and information provided by Owens (first author, Owens et al. 2008). Information was provided by Owens to inform the training for TAs (personal communication, 24<sup>th</sup> November 2011 and 6<sup>th</sup> February 2012).

There is considerable debate in the literature about whether the social difficulties associated with ASC are a consequence of a deficit in social skills, or a lack of motivation to perform social skills (Bellini, 2008). Lego Therapy focuses on both teaching social skills and increasing motivation to participate in social interactions within the sessions. Mechanisms for change in social competence in this study relate to developing social cognition, teaching skills required for positive social interaction, and promoting motivation to engage in interactions within the sessions.

#### Development of social cognition through facilitation

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The facilitation guidelines given to the activity leader (see Appendix 10) aimed to develop social cognition. Bellini (2008) argued that social cognition is an important aspect of successful social interaction, and outlined three fundamental components; knowledge, perspective taking, and self-awareness. Knowledge of appropriate interaction was developed in Lego sessions through direct teaching of social skills when difficulties arose, and through role playing and practicing appropriate interaction. Knowledge was reinforced throughout sessions by the activity leader highlighting and praising positive behaviours. Children were also taught skills to help them manage disagreements and methods of establishing a compromise. Perspective taking was facilitated by the activity leader through questioning and highlighting the presence of social difficulties. Activity leaders were encouraged to help children think about the thoughts and perspectives of others and to encourage children to think about how their actions might have affected other children in the group. Self-awareness was promoted through the activity leader highlighting the presence of a social problem, and asking children to identify what the problem was.

### Social skills development

Bellini (2008) argued that children with ASC often have the desire to interact with peers but lack the skills to do so successfully. Bellini (2008) recommended that intervention programmes should focus on directly teaching skills before expecting children to practice them in interactions. Incidental teaching of specific skills was an important part of Lego Therapy. Specific skills were taught, modelled and facilitated by the activity leader in sessions. Skills promoted in

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building with instructions included joint attention, collaboration, communicating ideas, compromise, joint problem solving, turn taking, sharing and listening. Skills promoted in 'Freestyle' building included communicating ideas, taking other's ideas into account, perspective taking, compromise, praising and accepting others ideas, and joint decision making. Lego Therapy addresses a range of social skills required for successful social interactions, and provides the opportunity to practice skills within small group. The development of competence from teaching skills within sessions can be explained within a skill deficit hypothesis (Dirks et al., 2007). This hypothesis suggests that children do not have the skills required for success in social functioning, and competence improves when skills are taught and practiced (Dirks et al., 2007).

#### Motivation to engage in social interactions

Chevallier, Kohls, Troiani, Brodtkin, and Schultz (2012) suggested that individuals with ASC do not typically experience social rewards from social interaction, and thus do not have an intrinsic drive to seek social interaction. Interventions designed to develop social competence should therefore focus on developing motivation to engage in social interaction. LeGoff (2004) suggested that methods to teach social skills to children with ASC are not engaging, so motivating children to participate can be challenging. Lego therapy is thought to be inherently interesting to children with ASC because it appeals to a drive to systemise (Owens et. al , 2008). LeGoff (2004) described how children were highly motivated to participate in Lego therapy believed Lego therapy was inherently rewarding for children with ASC. However, whilst children may be motivated to

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engage in Lego play, they may be less motivated to engage in pro social behaviour. A reward structure was also incorporated into the intervention to further motivate children to engage in pro social behaviours. LeGoff (2004) provided Lego points and certificates to reward positive social behaviour. LeGoff (2004) suggested that group members eventually became motivated to engage in positive social behaviour for group approval, and did not require tangible rewards to promote positive behaviour.

### 1.3.3.iii Training

Teaching Assistants (TAs) were trained in how to implement Lego therapy by the researcher. A training booklet was compiled by the researcher, using information available in previous research (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008), and through personal communication with Owens (24<sup>th</sup> November 2011 and 6<sup>th</sup> February 2012) . See Appendix 10 for the booklet used in training sessions. The researcher also observed a Lego therapy training session in a local school to ensure that the training delivered to school staff was both accurate and suitable.

The training was approximately 2 hours in duration and occurred in schools. The researcher also attended the first Lego therapy session in each school to demonstrate how to run a session and to answer any further questions. At the end of this session TAs were asked whether they felt they had received sufficient training to be able to run the second session independently. TAs were offered support in implementing the second session if they felt that had not had adequate training. No TAs requested additional support.

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#### 1.3.3.iv Programme Fidelity

The term 'programme fidelity' refers to the degree to which the programme is implemented as it is intended to be (Carroll et al., 2007). TAs were asked to complete a session checklist during each session to encourage fidelity to the programme (see Appendix 11). The session checklist was provided by Owens et al. (2008). The session checklist encouraged programme fidelity because TAs were encouraged to refer to it throughout sessions. They were also asked to ensure that all aspects of the programme had been included in each session. The researcher attended the first, fourth and eighth Lego therapy sessions in each school. This was to ensure that sessions were being delivered appropriately and to address any concerns raised by the TAs. The researcher delivered the first session in conjunction with the TA, in order to model appropriate facilitation and demonstrate how to run a session. In session four, the researcher observed the sessions and further demonstrated facilitation of sessions if required. The session checklist was referred to if there were aspects of the programme that had not been covered. In the eighth session the researcher completed a session checklist (see Appendix 11) to obtain an measure of programme fidelity.

Measuring programme fidelity is important when implementing evidence-based interventions in real world situations because there is a risk that programmes will not be implemented as intended (Carroll et al., 2007; Dusenbury, Brannigan, Falco, & Hansen, 2003). An evaluation of programme fidelity is important in order to determine whether the programme was delivered appropriately (Eames et al., 2008); and when considering conclusions drawn from findings (Carroll et



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al., 2007). Furthermore, previous research studies evaluating social skills interventions have been criticised for not measuring programme fidelity (Forness & Kavale, 1996). A low degree of positive change, despite high programme fidelity, suggests that adaptations to the programme are required (Carroll et al., 2007; Dusenbury et al., 2003). Programme fidelity is of particular importance to this study because the intervention has not been researched outside of clinical settings. Measuring programme fidelity is important to ensure that the intervention is delivered as it is intended to be, and to explore the feasibility of Lego Therapy as school based intervention (Dusenbury et al., 2003). Programme fidelity measures such as checklists are used to reduce programme drift and increase fidelity to an evidence based intervention (Eames et al., 2008).

It is important to consider the relative importance of aspects of the intervention when analysing programme fidelity measures. O'Connor, Small, and Cooney (2007) recognised that programmes are commonly adapted, and some programme adaptations can be beneficial for programme effectiveness.

However, it is important that adaptations are only made to those aspects that have less impact on programme effectiveness (O'Connor et al., 2007). It is therefore important to identify the essential, and less essential, elements of a programme (Carroll et al., 2007). One way of determining the essential aspects of an intervention is to conduct a component analysis, by comparing programme fidelity with outcomes in related studies (Carroll et al., 2007). As programme fidelity has not been measured in previous Lego therapy research, it is not possible to conduct a component analysis. Previous research suggests that

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unacceptable changes include reducing the frequency or duration of sessions, lowering participant engagement, eliminating key messages, removing topics, and delivery from people that are inadequately trained or qualified (O'Connor et al., 2007). O'Connor et al. (2007) suggested that making such changes is likely to reduce the effectiveness of the programme. In the absence of component analysis data, O'Connor's recommendations were used when considering the relative importance of aspects of the intervention.

#### 1.3.3.v Potential constraints of Lego therapy

A consideration of the potential difficulties associated with implementing Lego Therapy in schools is important in order to identify methods to reduce the impact of constraints.

As mentioned in the preceding section, the facilitation provided by the activity leader is important to promote development of social skills and positive social behaviour. This is of particular relevance to this study because Lego Therapy has not been researched in school previously, and is a potential limitation because the qualifications and experience of the TAs differ from those held by activity leaders in previous studies. Furthermore, implementing interventions outside of controlled clinical environments can lead to adaptations to the programme. Although programme fidelity measures were taken to monitor and increase programme fidelity, the measure was a self-report checklist. Self-report measures of programme fidelity can be affected by desirability bias (Dusenbury et al., 2003), so an observation measure was taken to control for this. The

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researcher observed the final Lego session and completed the session checklist. This was to enable inter-rater agreement to be measured.

Strain, Schwartz, and Barton (2011) suggested that the opportunity to regularly interact with typically developing peers is an important component of intervention programmes and recommended that children spend as much time as possible with typically developing peers. A potential limitation of delivering the intervention in schools is that children are required to spend time outside of the classroom, thus reducing the amount of time that they spend with appropriate peers. It is not possible to incorporate typically developing peers into the intervention groups because it would require peers to spend time outside of the classroom to participate in an intervention that is not likely to benefit them. The decision was made therefore to include only children that would potentially benefit from participation in the groups. The intervention also ran for 45 minutes per week rather than an hour, in order to minimise the time that children spend away from typically developing peers.

#### **1.3.4 Data Collection**

Data collection measures adopted in this study are consistent with measures used in related studies (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). Social competence was operationalized by the frequency of self-initiated interactions with peers, median duration of interactions, and adaptive social and communicative functioning. LeGoff (2004) did not obtain measures of adaptive functioning, but instead measured decreases in autistic aloofness and rigidity using the Gilliam Autism Rating Scale (GARS, Gilliam, 1995). The GARS is not

considered to be an appropriate measure for use in research (Mazefsky & Oswald, 2006; South et al., 2002), so measures of autistic aloofness were not taken in this study

Data were collected at four time points. Table 3 outlines the data collection procedures and measures used.

Table 3: Data Collection Procedures

Time	Description	Time Frame	Data collected at week:	Measures collected at each time
1	Start of baseline period	9 weeks	0	<u>Vineland Adaptive Behaviour Scale (VABS):</u>
2	End of baseline period, and start of intervention period	9 weeks	9	<ul style="list-style-type: none"> <li>• Communication Domain (VABS-CD)</li> </ul>
3	End of intervention period, and start of follow up period	9 weeks	18	<ul style="list-style-type: none"> <li>• Socialisation Domain (VABS-SD)</li> </ul>
4	Follow up data collected	9 weeks	27	<u>Playground Observation: 20 minutes in duration</u> <ul style="list-style-type: none"> <li>• Duration of interaction</li> <li>• Frequency of self-initiated interaction</li> </ul>

#### 1.3.4.i Vineland Adaptive Behaviour Scale (VABS) Administration

Participants' class teachers were asked to complete a VABS teacher rating form (TRF) at each time point. The TRF contains detailed instructions about how to complete the scales. The researcher met with teachers at time one to assist with completion and to provide additional instructions, a process which is recommended in the TRF manual (Sparrow, Cicchetti, & Balla, 2006). A script from the TRF manual was followed to provide the additional instructions to

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teachers (Sparrow et al., 2006). The teachers completed the forms independently in the subsequent time points (see Appendices 14 and 15 for the letter and additional instructions accompanying the TRF).

Follow-up data at time 4 were collected in the first few weeks of a new academic year. The TRF is intended to be completed by a teacher who has had regular contact with the pupil for two months prior to completion (Sparrow et al., 2006), so it was important that the participant's previous teacher assisted with completion. The child's current teacher was asked to complete the form in conjunction with the previous teacher.

#### 1.3.4.ii Playground Observation

Observations lasted 20 minutes each and were conducted on the school playground. Systematic observations were conducted, using focal sampling methods and continuous recording. An observation schedule was developed to ensure consistency in observations (see Appendix 16). The observation schedule was adapted from Owens et al. (2008) and was piloted with a child with Asperger syndrome prior to use. The pilot child had been recruited for the research and signed consent had been obtained, however, the school decided they were unable to run the intervention due to staff capacity. The child's parents consented to their child being observed for the purpose of piloting the observation schedule. No changes were made to the observation schedule after the pilot. An iOS application 'ABC Data Pro' was used to record frequency and duration of interactions during the data collection period. Buttons on the application were programmed to enable the researcher to record the duration of

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interactions, to detail whether durations were self-initiated or initiated by another child, and to count the frequency of self-initiated interactions. The application was programmed to allow the recording for exactly 20 minutes, and recording could be paused if the child briefly left the playground. This produced a comma-separated values (csv) file that was exported to Microsoft Excel and SPSS for analysis.

To ensure reliability of observations, a colleague of the researcher conducted three concurrent observations at time 1, and inter-rater agreement was calculated. This was to ensure that the observation schedule was valid and to minimise the effect of observer bias. Observation data were analysed using a two-way Intra-Class Correlation (ICC) to indicate the degree of inter-rater agreement. The ICC was 0.98 ( $p < .001$ ,  $r = .990$ ,  $df = 19$ ,  $N = 20$ ,  $F = 99.87$ ), indicating good to excellent inter-rater agreement (Bennett & Weissman, 2004). See Appendix 17 for the SPSS analysis. It was not feasible to obtain a measure of inter-rater reliability for later observations.

#### 1.3.4.iii Justification of data collection methods

##### The SCQ as a measure to verify a clinical diagnosis of autism

The Social Communication Questionnaire (Rutter, Bailey, Berument, et al., 2003) was used to verify clinical diagnoses of autism. A score of 15 or above was required to verify the clinical diagnosis (Rutter, Bailey, & Lord, 2003). The SCQ was chosen because it can be completed quickly and easily by parents, it is psychometrically associated with the ADI-R (Lord et al., 1994) and has high sensitivity (0.86) and specificity (0.78) (Charman et al., 2007).

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### The VABS as a measure of adaptive behaviour (socialisation and communication)

A range of standardised measures were considered and compared (see Appendix 12). The GARS II (Gilliam, 2006) was considered as an alternative measure for socialisation. Previous studies investigating outcomes of Lego therapy have utilised this scale as a measure of autism specific social skills (LeGoff, 2004; Legoff & Sherman, 2006; Owens et al., 2008). However, it has been suggested that the GARS has questionable psychometric properties, including a high false negative rate (Mazefsky & Oswald, 2006; South et al., 2002). South et al. (2002) recommended that the GARS should be used with caution in clinical settings and research, and LeGoff (2004) suggested the VABS is a more detailed measure of social adaptation, and the VABS was used alongside the GARS in subsequent studies (LeGoff, 2004; Legoff & Sherman, 2006).

The Vineland Adaptive Behaviour Scales (VABS), Second Edition II (Sparrow et al., 2005) was chosen to obtain a measure of adaptive social functioning (Socialisation Domain, VABS-SD) and communication (Communication Domain, VABS-CD).

The VABS-SD was used by LeGoff and Sherman (2006) as a measure of social competence. Subscales also produce standard scores, enabling a comparison of change in play, coping and interpersonal skills alongside adaptive social functioning.

The VABS demonstrates good psychometric properties. The mean Coefficient Alpha for the age range used in this study ranged from 0.83-0.97 (Sparrow,

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Cicchetti, & Balla, 2006), and test-retest reliability yielded a mean correlation of 0.82. However, interrater reliability was lower, at 0.60. Sparrow et al. (2006) suggested that scores reflect disparity in teacher's perceptions and interpretations of behaviours.

#### Systematic observation of interactions in the playground

Merrell (2001) suggested that naturalistic observations scales should be used as the primary measure for assessing social skills in children. The school setting was described as a relevant location for a behaviour observation due to the opportunity for peer interaction in unstructured settings. Structured observations in the school environment were conducted in related studies to obtain a measure of social competence (LeGoff, 2004). Social competence was operationalized through the frequency of self-initiated interactions and the duration of all social interactions during unstructured periods in the school environment (LeGoff, 2004). Bellini (2008) suggested that observations of frequency and duration are appropriate methods of measuring social interactions, although highlighted the importance of measuring both frequency and duration concurrently when measuring interactions. This is because some children may be involved in a large number of interactions but not be able to sustain interactions, or conversely, may engage in few interactions but be able to sustain interactions for a long time. Whilst LeGoff (2004) measured both frequency and duration of interactions, these observations were collected in separate situations. Frequency measures were collected on the playground at lunchtime, whereas duration measures were collected in recreational time after



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school. A difficulty associated with LeGoff's method of observation that social interactions are thought to be affected by contextual factors (Dirks et al., 2007). Pellegrini (2001), when discussing observations of play in pre-school children, suggested that play is affected by contextual factors such as peers and play activities. Merrell (2001) also described how social behaviours in young children are situation specific and thus contextual factors can reduce the reliability of observations. Merrell (2001) suggested that multiple observations of social behaviour may be required to ensure measurements are reliable. However, observational measures are time consuming (White, Keonig, & Scahill, 2007) and it was therefore not feasible to collect multiple measurements in this study. The threat to reliability was addressed through the use multiple measures of social competence completed by multiple informants. Measures of social competence were therefore not solely reliant on the observation measure or the judgement of the researcher. It is recommended that multiple measures with multiple informants are taken alongside observations to increase reliability (Hudley, 2006). Furthermore, the period of observation in this study was twice as long as the observation period of Owens et al. (2008). This was to increase the potential number of interactions included in the data analysis. Despite measures taken to control for extraneous variables, limitations to the method exist and the possible impact of contextual factors on play has not been controlled for. Changes found in social competence on the playground in this study should therefore not be generalised to other settings. It should be noted that this study was conducted within a post-positivist paradigm, and thus the ability to generalise findings between contexts was not sought. This study aims to further knowledge in the

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field by exploring the association between Lego Therapy and changes in social competence.

A challenge associated with the use of observational methods is ensuring that the selected construct is measured appropriately (Lord et al., 2005). After considering existing debates in the social competence literature, the decision was made to operationalize social competence through a measurement of effectiveness in interactions. Initiating and sustaining positive interactions with peers is considered to be an important aspect of social development (Denham, 2006), and was chosen as a measure of social effectiveness in this study. Social competence was measured on the playground rather than in Lego Therapy sessions because the generalisation of skills holds greater social validity than the measurement of specific skills in sessions. It is important to determine behavioural goals that are considered to be relevant and important (Hintze, Volpe, & Shapiro, 2002).

Observational domains that are poorly defined pose a threat to the validity of observations, and behaviours need to be carefully selected and defined (Merrell, 2001). If the behaviours are not clearly defined the observation may not measure the construct as intended and inaccurate conclusions may be reached. Merrell (2001) suggested coding systems are used to increase the validity of observations. One particular difficulty when developing coding systems for recording duration is determining when interactions start and stop. It is important that coding systems to clearly delineate the start and end points (Bellini, 2008) and the coding system should provide clear guidance on how to

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reliably determine when interactions start and end. Hintze et al. (2002) suggested that only observable behaviour characteristics should be included when defining behaviour to be observed, and clear and unambiguous definitions about target behaviours should be provided. Consistency in recording is important to increase reliability and to enable replication, and coding system or observation schedule may help to ensure such consistency (Hintze et al., 2002). However, the time required to develop an appropriate coding system is extensive (Merrell, 2001). The development of a coding system requires the selection of relevant behaviours, selecting and refining an observation schedule, and training observers in the use of the observation schedule (Merrell, 2001). A further disadvantage is that the use of an observation schedule or coding scheme may limit the range of behaviour observed (Dirks et al., 2007). Behaviours observed are limited to a number of predetermined aspects, reducing the ability to record other interesting and relevant information. Whilst this limitation is important, the decision was made to utilise an observation schedule in this study to increase objectivity and reduce bias. An observation schedule developed by Owens et al. (2008) was used in this study because the measurement of frequency and duration of social interaction reflects the concept of social competence adopted in this study. Frequency and duration of social interaction are clearly operationalized in the observation schedule, and can be considered to reflect effectiveness in interaction.

A disadvantage of using observational methods is that they are open to observer bias (Robson, 2011). Furthermore, Dirks et al. (2007) suggested that perceptions

of social competence obtained through observation may vary according to the observer. An observation schedule was utilised to reduce observer bias and subjectivity. As it was not possible to utilise a blind observer in this study, a measure of inter-observer agreement was taken. A second observer was trained in the use of the observation schedule (see Appendix 11), and a proportion of observations were conducted concurrently with the researcher.

### 1.3.5 Data Analysis

Procedures used to analyse data are outlined in Table 4.

Table 4: Details of Data Analysis

Aspect	Measure used	Data analysis
<b>Adaptive functioning: Socialisation</b>	VABS SD: Coping Play Interpersonal skills	Friedman analysis to evaluate differences in means between time 1 (start of baseline), time 2 (end of baseline and start of intervention) and time 3 (post intervention)
<b>Adaptive functioning: Communication</b>	VABS CD: Expressive Receptive Written	Pairwise comparisons (Wilcoxon Signed ranks) between Time 1 and 2; Time 2 and 3; and Time 1 and 3
<b>Maintenance of social interaction</b>	Median duration of interaction in seconds	Effect size calculations for significant findings
<b>Initiation of social interaction</b>	Frequency of self-initiated interactions	Follow up data from Time 4 was analysed in a separate analysis, as the data set at follow up is incomplete due to high levels of attrition in participants.
<b>Reliability of observation data</b>	Inter-rater reliability of observations	Inter-class correlations
<b>Programme fidelity</b>	Session checklists	Descriptive statistics Chi Squared goodness of fit Cohen's kappa

The statistical package SPSS 20 was used to analyse data.

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Follow up pairwise comparisons were conducted using Wilcoxon signed ranks tests. Type 1 errors were controlled for using a Bonferroni correction. A corrected p value of 0.016 was required to assume significance because three pairwise comparisons were conducted each time.

Non-parametric tests were used because some data failed to meet assumptions of normality and histograms revealed that data were not normally distributed (see Appendices 19, 20 and 21). Furthermore, non-parametric tests were used to minimise the chance of making a Type 1 error because the sample size was small (N=14).

### **1.3.6 Ethical Considerations**

Ethical approval was sought from the University of Exeter Board of Ethics (See Appendix 45).

Informed consent was sought from the child's parent or guardian (Appendix 8) and school (Appendix 9). All data were anonymised to protect the identity of the children, and both the Local Authority and participating schools were anonymised when reporting the research. Electronic data were anonymised when inputted and all data were stored on a password protected laptop. Parents were informed that all data would be kept confidential and they could withdraw their child or their data from the study at any time.

### **1.4 Findings**

Findings are presented according the research questions outlined in 1.2.8

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### 1.4.1 Findings for Research Question 1.i

*RQ1.i. What is the relationship between participation in Lego therapy and social competence during unstructured periods of the school day?*

Social competence during unstructured periods of the day was operationalized using data obtained from systematic observations on the school playground. The data gained from the observations were measures of the duration of interactions and frequency of self-initiated interactions. Descriptive statistics are presented in Appendix 19.

The median (Med) and interquartile range (IQR) were used for the analysis.

Means were not used due to outliers in the data, as revealed in box plots (see Appendix 18). SPSS outputs for Friedman and Wilcoxon analyses can be found in Appendix 19.v and 19.vi.

#### 1.4.1.i Duration of interactions

The median duration of interactions increased between time 1 (*Med*=13.80 *IQR*=27.81), time 2 (*Med*=15.07 *IQR*=23.29) and time 3 (*Med*=21.00 *IQR*=15.10).

Friedman analyses indicated that these differences were not significant  $\chi^2$  (*df*=2, *N*=14)=1.71, *p*=.49. Findings suggest that the duration of interactions did not significantly change during either the baseline or the intervention period.

#### 1.4.1.ii Frequency of Self-Initiated Interactions

The frequency of self-initiated interactions decreased between time 1 (*Med*=10 *IQR*=10) and time 2 (*Med*=7 *IQR*=13), and then increased between time 2 (*Med*=7 *IQR*=13) and time 3 (*Med*=11.5 *IQR*=11). Friedman analyses indicated that these

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differences were not significant  $\chi^2$  (df=2, N=14 )=.38, p=.99. The frequency of self-initiated interactions did not significantly change during either the baseline or the intervention period.

An unexpected difference was also seen in the frequency of self-initiated interactions between the start and the end of the baseline period, during which there was no intervention. The frequency of self-initiated interactions decreased between time 1 and time 2.

#### **1.4.2 Findings for Research Question 1.ii**

RQ1.ii. *What is the relationship between participation in Lego therapy and adaptive social functioning?*

Adaptive social functioning was operationalized using standard scores from both socialisation (SD) and communication domains (CD) of the Vineland Adaptive Behaviour Scales II, teacher rating form (VABS II, TRF, Sparrow, Balla, & Cicchetti, 2005). Sub-scale scores, in the form of standard v-scale scores were also included in the analysis.

While there was a total of 14 participants, only 12 participants were included in the analysis of the VABS. Two TRFs were lost in the post, and consequently these children were removed from the analysis for this research question.

See Appendix 20 for SPSS outputs and descriptive statistics for VABS standard scores.

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#### 1.4.2.i Adaptive Socialisation

The mean standard score at time 3 ( $M=85.58$ ,  $SD=13.52$ ) was greater than at time 2 ( $M=78.42$ ,  $SD=10.56$ ), suggesting that mean scores on the socialisation domain increased after Lego therapy. Mean standard scores decreased between Time 1 ( $M=79.75$ ,  $SD=10.56$ ) and Time 2 ( $M=78.42$ ,  $SD=10.56$ ), suggesting that adaptive socialisation changed throughout the baseline period. It was therefore necessary to also explore changes between time 1 and time 2. The mean standard score was higher at the end of the intervention than at the start of the baseline period (Time 1  $M=79.75$ ,  $SD=10.56$ ; Time 3  $M=85.58$ ,  $SD=13.52$ ).

A Friedman analysis reported significant differences in the socialisation domain standard scores  $\chi^2(df 2, N=12) = 8.35$ ,  $p=0.013$ , suggesting that there was a significant difference across time points. A Wilcoxon signed ranks test indicated that there was no significant difference in socialisation standard scores between time 1 and 2 ( $z = -0.82$ ,  $p = 0.227$ ). Socialisation standard scores at time 3, after Lego therapy, were significantly greater than scores at time 2 ( $z = -2.16$ ,  $p=0.014$ ). The effect size for this analysis ( $r=-0.62$ ) was large (Cohen, 1992).

A Wilcoxon signed ranks test indicated that there was also a significant difference in socialisation scores between time 1 and 3 ( $z = -2.56$ ,  $p = 0.004$ ). The effect size for this analysis ( $r=-0.74$ ) was large (Cohen, 1992).

Pairwise comparisons indicate that adaptive socialisation did not significantly change during the baseline period but significantly increased following intervention. There was also a significant increase in mean standard scores between the start of the baseline period and the end of the intervention period,



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suggesting that adaptive socialisation increased through the data collection period.

#### 1.4.2.ii Socialisation Subdomain Standard Scores

##### **Interpersonal:**

The mean standard score decreased throughout the baseline period (Time 1  $M=11.58$ ,  $SD=2.27$ ; Time 2  $M=10.58$ ,  $SD=2.19$ ) then increased following the intervention (Time 2  $M=10.58$ ,  $SD=2.19$ ; Time 3  $M=12.50$ ,  $SD=2.84$ ). The mean standard score was slightly higher at the end of the intervention than it was at the start of the baseline period (Time 1  $M=11.58$ ,  $SD=2.27$ ; Time 3  $M=12.50$ ,  $SD=2.84$ ).

A Friedman analysis indicated that there was a significant difference between standard scores on the interpersonal subdomain  $\chi^2(df\ 2, N=12) = 10.90$ ,  $p=0.002$ . Pairwise comparisons were conducted using Wilcoxon signed ranks tests. There was a significant difference in scores between time 2 and 3 ( $z = -2.53$ ,  $p=0.004$ ). The effect size for this analysis ( $r=-0.73$ ) was large (Cohen, 1992).

The decrease in the mean standard score throughout the baseline period was not significant ( $z = -1.98$ ,  $p = 0.40$ ).

The increase in interpersonal scores between time 1 and 3 was not significant ( $z = -2.12$ ,  $p = 0.027$ ). Although there was a significant increase in interpersonal scores following intervention, the difference between the start of the baseline period and end of intervention period was not significant. This suggests that there was

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no significant increase in interpersonal scores throughout the data collection period.

**Play:**

The mean standard score decreased throughout the baseline period (Time 1  $M=11.0$   $SD=2.17$ ; Time 2  $M=10.58$ ,  $SD=2.19$ ), and increased following the intervention (Time 2  $M=10.58$   $SD=2.19$ ; Time 3  $M=12.25$ ,  $SD=3.04$ ). The mean standard score was higher at the end of the intervention than it was at the start of the baseline period (Time 1  $M=11.0$   $SD=2.17$ ; Time 3  $M=12.25$ ,  $SD=3.04$ ).

A Friedman analysis indicated that there was a significant difference between standard scores on the play subdomain  $\chi^2(df 2, N=12) = 9.31, p=0.007$ .

The Wilcoxon signed rank test indicated that the decrease in scores between time 1 and time 2 was not significant ( $z = -1.13, p = 0.18$ ). The increase in scores between time 2 and time 3 was significant ( $z = -2.53, p = 0.006$ ), and there was a large effect size for this analysis ( $r = -0.73$ ) (Cohen, 1992).

There was also a significant difference in scores between time 1 and 3 ( $z = -2.36, p = 0.012$ ), suggesting that adaptive play was greater following intervention than at the start of the baseline period. The effect size for this analysis ( $r = -0.68$ ) was large (Cohen, 1992).

Findings suggest that adaptive play did not significantly change throughout the baseline period then significantly increased following intervention.

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### **Coping:**

Standard scores on the coping subdomain were greater at time 3 ( $M= 12.50, SD= 2.15$ ) than time 1 ( $M=11.83, SD= 2.36$ ) and time 2 ( $M=11.75, SD=2.00$ ). A Friedman analysis suggested this increase was not significant  $\chi^2(df 2, N=12) = 4.90, p=0.085$ . Lego Therapy was not associated with significant changes in coping.

Mean standard scores for all socialisation subdomains decreased throughout the baseline period then increased following Lego therapy intervention. This reflects the same pattern observed in the frequency of self-initiated interactions.

#### **1.4.2.iii Adaptive Communication**

The mean standard score decreased following intervention (Time 2  $M=94.08, SD=15.79$ ; Time 3  $M= 93.83, SD=10.71$ ), suggesting adaptive communication decreased following intervention. The mean standard score following intervention was slightly higher than at the start of the baseline period (Time 1  $M=93.08, SD= 12.24$ ; Time 3  $M=93.83, SD=10.71$ ). The confidence interval for the communication domain at the 95% level is  $\pm 7$ , so the changes in standard scores are smaller than the confidence interval.

The Friedman analysis indicates that there were no significant difference in scores between times 1, 2 and 3  $\chi^2(df 2, N=12) = 2.09, p=0.38$ . Lego Therapy was not associated with changes in adaptive communication.

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#### 1.4.2.iv Communication Subdomain Standard Scores

**Written Communication** Written communication increased throughout the data collection period (Time 1  $M=16.17$ ,  $SD=2.37$ ; Time 2  $M=16.42$   $SD=3.63$ ; Time 3  $M=16.92$   $SD= 3.02$ ). A Friedman analysis indicates that these differences were not significant  $\chi^2(df 2, N=12) = 0.389$ ,  $p=0.56$ .

**Expressive Communication** Expressive communication increased throughout the baseline period (Time 1  $M=12.75$ ,  $SD=2.09$ ; Time 2  $M=13.25$   $SD=2.66$ ) then decreased following intervention (Time 2  $M=13.25$   $SD=2.66$ ; Time 3  $M=12.17$   $SD=1.99$ ). A Friedman analysis indicates that these differences were not significant  $\chi^2(df 2, N=12) = 0.389$ ,  $p=0.87$ .

**Receptive Communication** Receptive communication decreased throughout the baseline period (Time 1  $M=13.00$ ,  $SD=3.10$ ; Time 2  $M=12.50$   $SD=3.00$ ) then increased following intervention (Time 2  $M=12.50$   $SD=3.00$ ; Time 3  $M=13.33$   $SD=3.08$ ). A Friedman analysis indicated that these differences were not significant  $\chi^2(df 2, N=12) = 1.5$ ,  $p=0.51$

Friedman analyses indicated that there were no significant changes on any of the communication subdomains, suggesting that Lego Therapy is not associated with changes in adaptive communication.

#### 1.4.3 Findings for Research Question 2

*RQ2: To what extent are changes in social competence sustained after a nine-week period without Lego therapy?*

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Wilcoxon signed rank tests were used to analyse differences between time 3 (post intervention) and time 4 (after a 9 week period with no intervention). As the direction of change at follow up is unknown, 2-tailed p values were used to determine significance. The direction of change is unknown because social competence may continue to increase if participants gain skills that they continue to use, or may decrease after a period without intervention. Data were available for a total of seven participants at the follow-up period. See Appendix 22 and for descriptive statistics and SPSS outputs, and Appendix 24 for effect size calculations.

#### 1.4.3.i Frequency of Self-Initiated Interactions

There was no difference in the median frequency of self-initiated interactions between time 3 (*Med*= 11, *IQR*=8) and 4 (*Med*=11, *IQR*=4). This was confirmed with a Wilcoxon signed ranks test ( $z = -0.51$ ,  $p = 0.719$ ).

#### 1.4.3.ii Duration of Interactions

The median duration of interactions increased after a period without intervention (Time 3 *Med*=20.50, *IQR*=16,30; Time 4 *Med*=26.10, *IQR*=17.40). A Wilcoxon Signed ranks test indicated that the increase was not significant ( $z = -0.17$ ,  $p = 0.938$ ).

#### 1.4.3.iii Adaptive Social Functioning

The VABS TRF was not returned for one of the participants so data were available for a total of 6 participants. See Appendix 23 and for descriptive statistics and SPSS outputs.

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#### 1.4.3.iv Adaptive Functioning: Socialisation

The mean socialisation standard score decreased between Time 3 ( $M=83.5$ ,  $SD=17.85$ ) and Time 4 ( $M=80.83$ ,  $SD=7.99$ ), suggesting that gains made began to decrease following a nine-week period without intervention. A Wilcoxon signed ranks test indicated that the decrease was not significant ( $z=0.00$ ,  $p=1.00$ ).

#### 1.4.3.v Adaptive Socialisation Subdomain Standard Scores

**Interpersonal** Mean standard scores decreased between Time 3 ( $M=12.50$ ,  $SD=3.83$ ) and Time 4 ( $M=11.67$ ,  $SD=2.07$ ), however, this decrease was not significant ( $z=-0.137$ ,  $p=0.100$ ).

**Play** Mean standard scores increased slightly between Time 3 ( $M=10.83$ ,  $SD=3.20$ ) and Time 4 ( $M=11.00$ ,  $SD=1.55$ ), however, this increase was not significant ( $z=-0.365$ ,  $p=0.875$ ).

**Coping** There was no change in mean standard scores between Time 3 ( $M=12.33$ ,  $SD=2.25$ ) and Time 4 ( $M=12.33$ ,  $SD=1.97$ ).

#### 1.4.3.vi Adaptive Functioning: Communication

Communication standard scores increased between Time 3 ( $M=91.50$ ,  $SD=13.60$ ) and Time 4 ( $M=94.50$ ,  $SD=11.22$ ). A Wilcoxon signed ranks test indicated that the increase was not significant ( $z=-0.813$ ,  $p=0.50$ ).

#### 1.4.3.vii Adaptive Communication Subdomain Standard Scores

**Expressive** Mean standard scores increased between Time 3 ( $M=11.67$ ,  $SD=2.50$ ) and Time 4 ( $M=14.17$ ,  $SD=1.47$ ), however, this increase was not significant ( $z=-1.62$ ,  $p=0.125$ ).

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**Receptive** Mean standard scores increased slightly between Time 3 ( $M=12.17$   $SD= 3.37$ ) and Time 4 ( $M=12.50$   $SD=2.88$ ), however, this increase was not significant ( $z=-0.743$ ,  $p=0.50$ ).

**Written** Mean standard scores decreased between Time 3 ( $M=17.33$   $SD= 3.01$ ) and Time 4 ( $M=16.17$   $SD=2.48$ ), although this decrease was not significant ( $z = -1.725$ ,  $p= 0.156$ ).

#### **1.4.4 Findings for Research Question 3**

*RQ3: To what extent is programme fidelity maintained when Lego therapy is delivered in a school setting by school staff?*

Frequency data and percentages for items from the session checklist are presented in Table 5 (See Appendix 25 for raw data). Further details about the structure and features of Lego sessions can be found in the training booklet (see Appendix 10). The maximum frequency per item was 72 because nine schools each ran eight sessions.

Table 5: Total frequency of item occurrence

	<b>Total frequency of item occurrence in sessions (N=72)</b>	<b>Percentage of occurrence in sessions (%)</b>
<b>Initial check-in/introductions</b>	71	98
<b>Names recorded</b>	71	98
<b>Rules displayed and mentioned</b>	71	98
<b>Roles assigned and role cards on display</b>	72	100
<b>30 minutes of instruction building</b>	61	84
<b>Minimum of 15 minutes freestyle building</b>	54	75
<b>Children tidy up</b>	59	81
<b>Summary/praise/certificates</b>	52	72
<b>Children working in a group of three</b>	71	98
<b>1 adult per three children</b>	72	100
<b>Children sitting around a table</b>	71	98
<b>Adult facilitating</b>	72	100
<b>Children play according to role</b>	70	97
<b>Children interacting with each other</b>	72	100
<b>Gives praise for good building</b>	72	100
<b>Gives praise for good social skills</b>	72	100
<b>Gets the children to help each other</b>	71	98
<b>Facilitates rather than directs</b>	68	94
<b>Helps children with difficulties</b>	69	95
<b>Highlights presence of a social problem</b>	68	94
<b>Prompts children to come up with solutions</b>	68	94
<b>Gives children opportunity to problem solve</b>	70	97
<b>Asks children to role play positive behaviour</b>	48	66
<b>Reminds children of strategies previously worked on</b>	48	66
<b>Highlights presence of a rule break</b>	61	84
<b>Prompts other children to remind group if a rule has been broken</b>	46	63
<b>Gives praise</b>	71	98
<b>Highlights successes to group</b>	65	90

A Chi Squared goodness of fit test was used to determine whether the observed frequency of item occurrence from the session checklists differed significantly



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from the expected frequency of occurrence (See Appendix 26.i for analysis). The Chi square analysis revealed significant differences between observed and expected values  $\chi^2$  (df =27, N=28) = 42.821,  $p < .05$ .

Data presented in table 8 suggest that there were some aspects of the intervention that were adhered to less frequently than others. A minimum of 15 minutes 'Freestyle' building occurred in 75% of sessions, and 'giving summary, praise or certificates' only occurred in 72% of sessions. The items 'Reminding children of strategies previously worked on' and 'Asks children to role play positive behaviour' occurred in 66% of sessions, and 'prompts other children to remind others if a rule has been broken' occurred least frequently, in 64% of sessions. The remaining aspects occurred in over 80% of sessions.

The importance of aspects of the intervention can be considered according to recommendations made by O'Connor et al. (2007). O'Connor et al. (2007) recommended that the frequency and duration of sessions are not reduced, and aspects of the intervention are not missed out. The first eight items of the session checklist, introductions; names recorded; rules mentioned; roles assigned; 30 minutes of instruction building; 15 minutes of freestyle building; children tidy up, and summary, praise and certificates, could therefore be considered to be important aspects of the programme. Two of these elements, 'minimum of 15 minutes freestyle building' and 'giving summary, praise and certificates' received lower adherence scores, further challenging the programme fidelity. O'Connor et al. (2007) suggested that programmes should not eliminate key messages, and doing so may minimise effectiveness. The item

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'summary, praise and certificates' enabled the delivery of key messages at the end of each session, and thus could be considered to be an important aspect of the intervention (O'Connor et al., 2007).

O'Connor et al. (2007) suggested that lowering participant engagement is another adaptation that is not considered to be acceptable. Factors that contribute to participant engagement were considered in the second study. Key themes from the second study suggest that factors that promoted engagement were freestyle building, the opportunity for positive social interaction, and Lego. Therefore, further items of importance are 'Children interacting with each other', 'Gives praise for good social skills', 'Gets the children to help each', 'Highlights presence of a social problem' and 'Helps children with difficulties'. These items refer to the role of the activity leader in facilitating and encouraging positive social interactions between the children. Barriers to engagement were also highlighted in study two, and included social factors, roles and sets. Items relating to facilitating positive social factors detailed above are of importance to reducing barriers to engagement, and the items 'roles assigned' and 'children play according to roles' are important to ensure that the children get the opportunity to play in all of the roles.

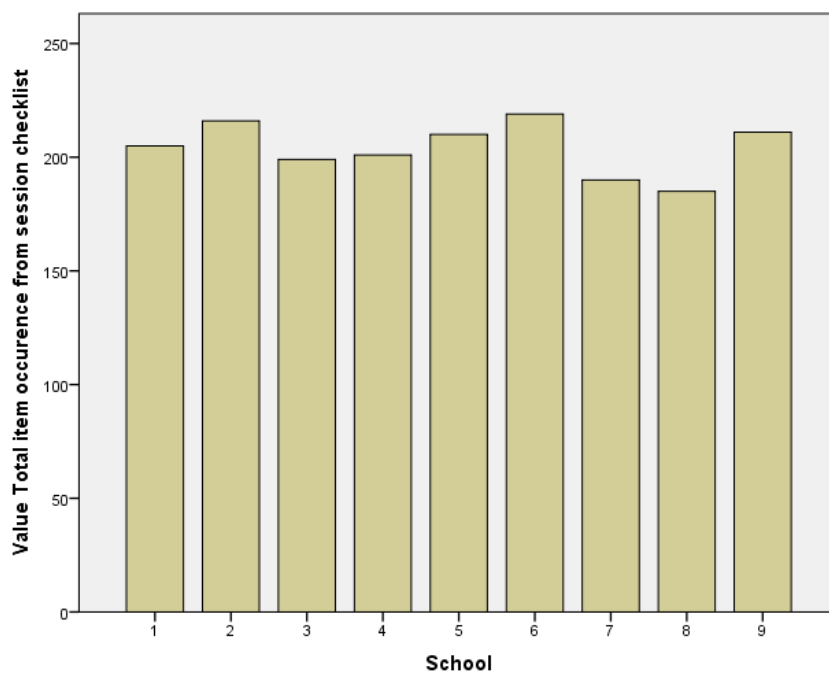
When considering recommendations made by O'Connor et al. (2007), the item 'children sitting around a table' has less relevance and importance to programme fidelity and effectiveness.

Adherence to programme fidelity was also analysed according to school to investigate the extent to which schools maintained programme fidelity (see Appendix 26.ii for analysis)

Table 6: Programme fidelity by school

School ID	Total frequency of item occurrence (Maximum =224)	Percentage of total items present in sessions (%)
1	205	91
2	216	96
3	199	88
4	201	89
5	210	93
6	219	97
7	190	84
8	185	82
9	211	94

Figure 1: Total occurrence of items from the session checklist, by school



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Table 6 and Figure 1 suggest that some schools maintained greater programme fidelity than others. Adherence to the session checklist items ranged from 82.5% of items to 97.7%, suggesting disparity in programme fidelity between schools.

A Chi Squared goodness of fit test was used to determine whether the observed frequency of items for each school differed significantly from the expected frequency (See Appendix 26.ii for analysis). The Chi squared analysis revealed significant differences between observed and expected values  $\chi^2$  (df =8, N=9) = 21.33,  $p < .05$ .

In order to measure inter-rater reliability, session checklists were completed by the researcher during the final session in each school. Session checklists were compared to checklists completed by school staff (see Appendix 27). Data to compute inter-rater agreement were available for only seven schools; in schools two and nine the Lego therapy session times changed at short notice and the researcher could no longer attend. A Cohen's Kappa analysis was conducted to indicate the degree of agreement between the researcher and school staff, and a 'moderate' inter-rater agreement was obtained (Cohen's kappa = 0.57, N=196,  $p < 0.001$ ). Landis and Koch (1977) proposed the following ranges to indicate strength of agreement; 0.01 to 0.20=slight, 0.20 to 0.40=fair, 0.41 to 0.60 = moderate, 0.61-0.80=substantial, 0.80 to 1 =almost perfect.

Inter-rater agreement was also conducted for each school individually. The SPSS output for these analyses can be found in Appendix 28.

Table 7: Cohen’s Kappa measure of inter-rater agreement by school

School	Total frequency of items that occurred in session (researcher rating) N=28	Total frequency of items that occurred in session (school rating) N=28	Cohen’s Kappa	Significance level (p= )	Degree of agreement (Landis & Koch, 1977)
1	26	27	0.65	0.071	Substantial
3	25	25	1.00	0.001	Exact
4	26	28	0.52	0.026	Moderate
5	25	26	0.78	0.008	Substantial
6	27	18	0.13	0.357	Slight
7	26	26	1.00	0.003	Exact
8	23	23	0.76	0.001	Substantial

Table 7 indicates the lowest levels of inter-rater agreement between the researcher and staff member completing session checklists occurred in schools four and six. School four obtained ‘moderate’ inter-rater reliability, however, school six obtained only ‘slight’ agreement. The overall Cohen’s Kappa value of 0.57 is therefore likely to be affected by low levels of agreement between the researcher and school six. Furthermore, Table 7 indicates that school six had the highest frequency of item occurrence compared to the other schools, indicating possible social desirability bias in responses.

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## 1.5: Discussion

### 1.5.1 Discussion of Key Findings

#### i) Research Question One

*What impact does Lego therapy have on the social competence of children with AS, when the intervention is delivered in the school environment?*

Adaptive social functioning was measured using the Vineland Adaptive Behaviour Scales II socialisation domain (VABS-SD) (Sparrow, Balla, & Cicchetti, 2005).

Significant increases in socialisation, play and interpersonal skills were seen after participation in Lego therapy and effect sizes were large. No significant changes were seen throughout the baseline period. However, analysis of findings between the start of the baseline period and following intervention revealed that there was no significant increase in mean standard scores on the interpersonal subdomain, suggesting that there was no increase in interpersonal skills throughout the experimental period. Furthermore, no significant changes were found on the coping subdomain.

Findings relating to the socialisation domain confirm previous findings by LeGoff and Sherman (2006). LeGoff and Sherman (2006) found an increase in the mean standard score of the VABS-SD, after participation in 36 months of Lego therapy. This increase was significantly greater than the control group. However, subdomain scores were not reported in previous research studies so comparisons cannot be made. Owens et al. (2008) also found an increase in the mean standard score of the VABS-SD (Sparrow et al., 1984), although this

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increase was not statistically significant. A fundamental difference between previous research and this study is that the VABS measure in previous research was completed through a semi-structured interview with parents, whereas this study utilised the teacher rating form. Children with ASC typically experience difficulties generalising skills learnt between contexts (Dautenhahn & Werry, 2004; Dodd, 2004). It is possible that skills for social functioning were generalised to the classroom in this study more easily than they were generalised to the home environment in Owen's study. The classroom environment and Lego therapy sessions are more similar than Lego sessions and the home environment, thus increasing the possibility of generalisation of skills into the classroom. This suggests a further advantage of implementing Lego therapy in school settings rather than clinics.

No significant difference was found in adaptive behaviour relating to the Vineland Adaptive Behaviour Scales Communication domain (VABS CD). These findings confirm those found by Owens et al. (2008). This suggests that participation in Lego therapy is not associated with gains in adaptive communication.

No significant changes were seen in the frequency or duration of social interactions during unstructured periods of the school day, suggesting that Lego therapy is not associated with increases in social competence on the playground. Increases found in adaptive socialisation were not seen on the playground, perhaps suggesting that changes seen in adaptive socialisation were not generalised to interactions on the playground.

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Evidence of significant changes to social competence on the playground were found in previous research studies. Owens et al. (2008) found small but significant increases in the mean duration of social interactions after participation in Lego therapy and a non-significant decrease in the frequency of self-initiated interactions. LeGoff (2004) found significant increases in both frequency of self-initiated interactions and duration of interactions after 12 and 24 weeks of intervention.

Whilst significant increases in adaptive socialisation and play were found in this study, results should be interpreted with caution. Decreases between time 1 and 2 were found in the VABS-SD, median frequency of self-initiated interactions, interpersonal skills, play and expressive language, suggesting that the presence of confounding variables that were not controlled for in this study. Although the changes were not significant, the pattern is consistent across many of the different measures of social competence. A baseline period was established to enable a comparison between the intervention period and a period without intervention. The difference expected between the start and end of the baseline period, if any, would be an increase due to maturation and development. It is possible that children's social competence decreased as the year progressed, and participation in Lego therapy reversed the pattern. An alternative explanation is that there is an effect of time. Data at time 2 were collected shortly after the Easter holidays, suggesting social competence may have been affected by the change in routine. It was therefore necessary to compare findings between the start of the baseline period and end of the intervention, on measures that



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showed evidence of significant change. This analysis was conducted to explore whether social competence increased through the entire experimental period. Significant increases were found between the start of the baseline and end of intervention period on measures of adaptive socialisation and play, but not interpersonal skills. Whilst significant findings were found on these measures, the research design employed does not enable conclusions to be drawn about whether such changes might have occurred without intervention. Furthermore, findings highlight the possibility that time of year could have an influence on social competence, suggesting the need for a research design that controls for an effect of time.

#### ii) Research Question Two

*To what extent are changes in social competence sustained, after a nine-week period without Lego therapy?*

The median frequency of self-initiated interactions remained constant at times 1, 3 and 4, suggesting no change in the frequency of self-initiated interaction after participation in Lego therapy. The median duration of interactions increased at follow up, suggesting skills had been sustained and continued to improve.

However, this increase was not significant. Socialisation and interpersonal skills decreased following a period of no intervention, although the decrease was not significant. This perhaps suggests that aspects of social competence began to decline after a period of no intervention, although not to an extent where this was significant. It is possible that skills learnt were not embedded after eight

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weeks of intervention, suggesting that measures should be taken to promote maintenance of skills in the school environment. Greenway (2000) suggested that children with ASC are able to learn the rules of social interaction but struggle to generalise this knowledge to real world situations. An advantage of implementing Lego therapy in schools rather than clinics is that the principles of Lego therapy can be applied outside of sessions to the wider school setting. Further research should seek to explore ways to promote maintenance and generalisation of skills in the school setting, in order to further promote social competence and social inclusion.

This study suffered from high attrition at follow up and data were only available for seven participants. Consequently, gains for follow up participants were considered separately. Similar patterns of change between times 2 and 3 were seen in this group of participants to the main group, increasing the validity of the results. However, results should not be generalised to other populations due to the small sample size. Furthermore, follow up data were collected after the school summer holiday. There are a range of confounding variables associated with school holidays, such as social activities participated in throughout the holiday. These variables could influence measures of social competence and it was not possible to control for these variables.

### iii) Research Question Three

*To what extent was programme fidelity maintained when the intervention was delivered in the school environment by school staff?*

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Interventions are commonly adapted when delivered in new settings (O'Connor et al., 2007) so measures were taken to both monitor and promote programme fidelity in this research study. Analysis of session checklists suggested that adherence to the intervention varied between schools and between aspects of the intervention. Aspects of the intervention that occurred less frequently were 'providing a minimum of 15 minutes of freestyle building', and 'giving a summary, praise or certificates at the end of the session'. Both of these aspects relate to time at the end of the session, and thus it is possible that a shortage of time limited the frequency in which they occurred. Sessions run by Owens et al. (2008) lasted an hour per week, and LeGoff's sessions occurred for 90 minutes per week (LeGoff, 2004). The decision was made to make sessions shorter when delivered in schools to minimise both the time spent out of the classroom and disruption to learning. However, aspects of the programme have been frequently missed, possibly due to a shortage of time. Removing topics and changing the duration of sessions are programme adaptations considered to be risky (O'Connor et al., 2007). It may therefore be necessary to increase the duration of sessions in schools to 60 minutes to ensure that there is sufficient time to incorporate all aspects of the programme. Future programmes should seek to ensure that 'freestyle' building is not reduced and sessions end with a positive summary and praise. It is important that these aspects are included in future Lego therapy programmes to maintain programme fidelity. The second study also highlights the importance of 'freestyle' building in promoting the children's interest and enjoyment in Lego therapy. 'Role playing of strategies' and 'reminding children of strategies previously worked on' also occurred less

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frequently. Both of these aspects enable children to learn and practice social skills required for group situations, yet TAs used these techniques less frequently than others. These aspects should be emphasised in future programmes, perhaps through spending more time on these areas in the training sessions. Future research could seek to gain the perspective of school staff to explore why some aspects were adhered to less frequently. This study did not seek to explore which elements of the intervention were the most effective, and it is possible that the TAs opted not to include aspects of the programme that they considered to be less effective. The perspective of school staff may also inform adaptations to the programme that would increase programme fidelity.

Programme fidelity was measured through analysis of session checklists completed by school staff. However, inter-rater agreement between the school and the researcher varied between schools, with one school obtaining only slight agreement. The discordance between responses may indicate that there was a either degree of response bias in how checklists were completed, or observer bias from the researcher. Additionally, the presence of the researcher in some sessions could have increased compliance to the intervention in observed sessions. Video recording sessions for analysis of programme fidelity would have reduced possible bias and increased the validity of programme fidelity measures.

Findings from this research question should be considered when interpreting findings relating to child outcomes. Outcomes relating to social competence have been compared to findings from previous published research studies, in which Lego therapy was conducted in a clinical setting by psychologists. Although

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programme fidelity was not reported in previous studies, it is possible that programme fidelity was maintained to a greater degree in clinical settings. There may also be a difference between TAs and previous researchers in terms of skills and prior experience, particularly with regard to experience in facilitating group sessions for children with AS. On-going support was provided throughout the programme to develop skills in school staff; however, it was only feasible for the researcher to be present at three sessions in each school.

### **1.5.2 Challenges and Opportunities associated with implementing a clinic based intervention in the school environment**

Implementing clinic based interventions in community settings present challenges in addition to those discussed within the context of programme fidelity. Clinic based social interventions for children with autism typically include other group members with similar social difficulties, and not typically developing peers (Barry et al., 2003). Interventions are also typically delivered in an environment in which social interactions would not occur naturally (Smith & Gilles, 2003). The implementation of clinic based interventions in school has the potential to challenge the social inclusion of children with ASC. Implementing interventions outside of the classroom reduces the time that children spend with typically developing peers, and reduces the opportunity for learning through observation of typically developing peers.

Strain et al. (2011) suggested that the opportunity to regularly interact with typically developing peers is an important component of intervention programmes. Whilst they recognised the need for interventions to promote the

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social inclusion of children with ASC, they argued for the importance of maximising the time that children spend with typically developing peers. Typically developing peers enable modelling of social skills, and the opportunity to practice skills learnt in naturalistic play. Typically developing peers were not included in Lego therapy groups in schools in this study. This was because it would not be ethical to remove typically developing children from learning opportunities in the classroom to attend a group that would not provide social or academic benefit. It may be therefore be beneficial to explore ways of promoting social competence in more naturalistic situations.

A potential advantage of delivering Lego Therapy in schools rather than clinical setting is that there are increased opportunities to promote maintenance and generalisation of skills. Smith and Gilles (2003) highlighted the importance of teaching social skills in the environment in which skills are ordinarily required, particularly for children with social difficulties. Teaching social skills in isolation of the social context leads to potential difficulties with maintenance and generalisation (Smith & Gilles, 2003). The school environment and presence of appropriate peer models provides greater opportunities for promoting the acquisition, maintenance and generalisation of skills (Korinek & Popp, 1997; Smith & Gilles, 2003).

Whilst schools provide more optimal environments for promoting generalisation than clinic based research, opportunities for maintenance and generalisation are not outlined or promoted within the intervention. Lego Therapy, as it is intended to be delivered, does not include methods to enable generalisation of skills.

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Furthermore, in this study the intervention occurred outside of the classroom environment and thus is not dissimilar to a clinical setting. Owens et al. (2008) and LeGoff (2004) evaluated the effectiveness of the intervention in part through a measure of social behaviours on the playground. Such measures required skills learnt in Lego Therapy to be generalised from sessions to the playground. No significant changes in social competence on the playground were found in this study, and generalisation from the Lego Therapy into the wider school environment should therefore not be assumed. In the absence of processes designed to promote generalisation, skills learnt should not be expected to be transferred from Lego therapy sessions to other situations.

Smith and Gilles (2003), following a review of literature relating to social skills development, suggest that that research commonly fails to establish methods to promote the generalisation of skills learnt in interventions into natural social settings. Smith and Gilles (2003) developed a model of social instruction designed to teach social skills in natural environments such as schools, and highlighted processes to increased maintenance and generalisation of social skills. Smith and Gilles (2003) believed that it is beneficial to teach skills within the context, activity and environment in which the child would use the skills, and not in isolation. Smith and Gilles (2003) developed a 'key elements' model to promote social skill acquisition in school environments. The aim of this model is to enable children with social difficulties to identify and respond to a range of naturally occurring social cues, rather than learning to respond appropriately to artificial cues removed from natural context. Use of 'embedded instruction' was

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recommended, in which skills are taught within the context of an activity. The skills are then prompted and reinforced throughout different activities, with different teachers, and in different naturalistic contexts throughout the school. It should be noted that whilst Smith and Gilles (2003) referred to children with autism throughout the paper, the model and literature review related specifically to children with emotional and behavioural difficulties. Korinek and Popp (1997) also recommended integrating social skills teaching with educational activities, and devised a similar method of integrating the instruction of social and academic skills.

### **1.5.3 Methodological Limitations**

Further to the methodological limitations suggested in the preceding sections, there are a number of general limitations associated with this study. This study was quasi-experimental and conducted in the child's natural school environment. Consequently, there are a range of variables that it was not possible to control for. The decrease in measures of social competence at the end of the baseline period suggests that there is a possibility that external factors have had an impact on social competence. Future studies should control for the possible impact of time using multiple baseline designs or matched control groups.

Future studies should also control for, or investigate the effect of the group composition on individual outcomes. Groups in the Owens et al. (2008) study consisted solely of children with a diagnosis of AS or HFA, and groups in LeGoff's (2004) study consisted of children with ASC and AS. There were insufficient responses from schools that had three children with a diagnosis of AS in this



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study, so some Lego groups consisted of children with AS and other children with social communication difficulties. Only the children with a medical diagnosis were included in the study to ensure consistency with previous research. However, the impact of mixed groups is unknown and consequently it is advisable to monitor the possible impact on outcomes.

As the sample consisted of just 14 participants from nine schools, care must be taken when generalising findings to other populations. Children with ASC are a heterogeneous population and findings do not imply that all children with AS will benefit from the intervention. It is important to measure response to the intervention on an individual basis.

There is also the possibility that subjective bias might have confounded results. The children's teachers were aware when the intervention was occurring and this may have influenced responses on the VABS teacher rating form. Also, the researcher conducted the playground observations, and while a number of observations were rated concurrently for inter-observer agreement, the number was small. The researcher was familiar to the children, and thus the presence of the researcher may have changed the children's behaviour. Further research would benefit from a blind observer to minimise subjective bias and the possible impact on the children's behaviour.

#### **1.5.4 Future Directions and the Role of the Educational Psychologist**

Educational Psychologists play a role in supporting the inclusion of children with Asperger syndrome in mainstream schools, and social skills interventions are often recommended as ways to develop socialisation with peers. This study has

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identified some important implications for practice when implementing Lego therapy. Interventions are commonly adapted, both intentionally and unintentionally, when implemented in a new context (O'Connor et al., 2007) and it is important to ensure programme fidelity is maintained in interventions delivered in schools. If Educational Psychologists are to recommend evidence based interventions, it is important that measures are taken to ensure programme fidelity is measured and maintained. Kretlow and Bartholomew (2010) suggested that coaching, modelling, multiple observations and feedback increase the fidelity of evidence based interventions. Such measures could be implemented by Educational Psychologists to increase programme fidelity of evidence based interventions. Educational Psychologists should also play a role in monitoring progress on an intervention in order to identify how long interventions need to last for social skills to be learnt, embedded, generalised and maintained. While this study confirms some of the findings found in previous research (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008), direct comparison is difficult because the duration of the Lego therapy intervention was different in each study. Significant gains in adaptive socialisation were seen in this study after 8 weeks, however, gains began to decrease after the intervention ceased. It is important to develop methods to ensure that skills are embedded and maintained.

Educational Psychologists could play a fundamental role in further developing the programme for implementation in schools, to maximise the generalisation of skills from Lego therapy sessions to the school environment. Educational

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Psychologists are ideally placed to develop the programme in this way because of their knowledge and understanding of both child development and the school environment.

Smith and Gilles' (2003) key elements model could be an alternative way of teaching and promoting generalisation of skills required for social competence through collaborative Lego play. Following such a method, social skills could be taught and appropriate social interaction facilitated through naturalistic play in the school environment. Acquired skills would then be prompted and reinforced across different situations, with a wider range of appropriate peers, and by different adults. This would enable skills to be acquired through more natural play, leading to increased generalisation and an ability to respond appropriately to natural social cues (Smith & Gilles, 2003).

A challenge associated with applying the key elements model to children with AS is that many children with AS are not motivated to engage in social interactions (Chevallier et al., 2012), and existing methods of teaching social skills to children with ASC are not engaging (LeGoff, 2004). An advantage of Lego therapy is that children are more willing to engage in social interaction when it is through the medium of collaborative Lego play (LeGoff, 2004). It could therefore be beneficial to utilise Lego as the medium for initial embedded instruction within a natural school environment. Such an approach may warrant further exploration as a method to develop, maintain and generalise skills required for social competence in the school environment.

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The research design employed in this study did not enable conclusions to be drawn about whether changes in adaptive socialisation and play were greater than they would have been without intervention, and thus it is important to consider alternative ways to research Lego therapy as an intervention. Rao et al. (2008) argued that randomised control trials with comparison groups are required in order to determine if social skills interventions are more effective than no intervention. Rao et al. (2008) also argued that single case efficacy studies should be conducted as a first step before a randomised control trial, in order to develop the intervention and explore outcomes. A working group established by the National Institute of Mental Health (NIMH) provided recommendations for a staged process for evaluating social interventions for ASC (Smith et al., 2007). This model suggests that new interventions should first be developed and evaluated through the use of single case study research. A pilot study should then be conducted to refine the intervention and inform the development of a manual. The manual should be piloted across different sites to explore programme fidelity and implementation, and then a randomised control study should be conducted. If the intervention is effective, the final stage would be to demonstrate effectiveness in community settings (Smith et al., 2007).

Whilst randomised control trials are generally accepted as a method of determining effectiveness of interventions, it is perhaps not the most appropriate method for further research. This study did not provide sufficient evidence to warrant further large scale research in Lego therapy as the intervention is currently designed to be delivered. Findings suggested a need for further development and conceptualisation, particularly in relation to the

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generalisation of skills to natural situations and an exploration of how social skills learnt in sessions increase social competence. This study suggested further ways in which the intervention could be developed to promote maintenance and generalisation of social competence in the school environment, whilst increasing inclusion of children in naturalistic social contexts. A single case study design would be an appropriate way to explore and refine such an intervention. A single case design would enable closer monitoring of outcomes over time, and a comparison of outcomes during the intervention period to the baseline period (Smith et al., 2007). A multiple baseline design would be appropriate to explore and control for the possible impact of time of year on social competence.

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## Study Two:

### **How can Lego therapy be developed to further promote interest and engagement in children with Asperger syndrome? An exploration of the child's perspective**

#### 2.1 Abstract

Lego therapy is thought to be inherently interesting to children with ASC because it is a systematic and predictable medium (Owens et al., 2008), and thus appeals to a drive to systemize (Baron-Cohen, 2008). Children with Autism Spectrum Conditions are rarely consulted in research (Brewster & Coleyshaw, 2011), however, there is a need to elicit the views of the child in order to determine why Lego therapy sustains the interests of children with ASC. This study employs semi-structured interview methods to explore the perspective of the child. 13 children with Asperger syndrome were interviewed following participation in a Lego therapy intervention in school. Emergent themes suggest children were inherently interested in Lego as a medium, and were willing to interact with others through collaborative Lego play. Children spoke positively about building Lego together, although were highly motivated by the opportunity to build alone in 'freestyle' building. Social difficulties within groups, the roles played, and factors relating to the Lego sets were seen as barriers to enjoyment. The role of extrinsic rewards in promoting motivation to engage in social interactions was also explored. Emergent themes suggest children viewed extrinsic rewards positively, but were rewarded inconsistently or inappropriately. They also

expressed a desire for tangible rewards. Implications for the structure and delivery of Lego therapy were suggested.

## 2.2 Introduction

### 2.2.1 Purpose

This is the second study exploring Lego therapy as an intervention for children with Asperger syndrome (AS). The first study evaluated changes in social competence after participation in a Lego therapy intervention in school. This study explores the perspective of the child. This study aims to identify aspects of the intervention that children enjoyed, in order to determine ways to promote interest, enjoyment and motivation to participate. The role of extrinsic rewards in promoting engagement was also explored.

### 2.2.2 Theoretical Assumptions Underlying Lego Therapy

The search engines and terms used are shown in Table 8.

Table 8: Search engines and search terms

Search Engines	Search Terms
<ul style="list-style-type: none"> <li>• Psycinfo</li> <li>• APA PsycNET</li> <li>• EBSCO</li> <li>• Education Research Complete</li> <li>• Google Scholar</li> <li>• Web of Knowledge</li> <li>• The Journal of Autism and Developmental Disorders</li> </ul>	Autism; ASC; ASD; Asperger; high functioning autism; and Lego Therapy, intrinsic motivation; extrinsic reward; external reward; reinforcement; inherent interest; specialist interests; repetitive interest; strengths; perspective of children, researching with children, child views, interviewing children, collaborative group work, cooperative learning

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### 2.2.2.i Motivation to engage in collaborative group work

LeGoff (2004) described how children with Autism Spectrum Conditions (ASC) can lack motivation for tasks which they are not interested in, yet show prolonged focus and drive when engaged in activities that they show an obsessive interest towards. LeGoff (2004) has suggested that methods to teach social skills to children with ASC are not engaging, so motivating children to participate can be challenging. Utilising a child's passion and interest enhances interest and motivation, increasing opportunities to teach academic and social skills (Bianco et al., 2009). Baker, Koegel, and Koegel (1998) found that levels of social interaction in children with ASC increased when children were engaged in games and social interactions that incorporated their interests. Furthermore, Baker et al. (1998) suggested that incorporating children's interests into games created activities that were intrinsically reinforcing.

Lego therapy is thought to be inherently interesting and rewarding to children with ASC. LeGoff (2004), when developing Lego therapy, noticed that children with ASC tended to gravitate towards Lego materials and ignore other available toys. Children did not require prompts or rewards to engage with the materials, thus Lego was chosen as the medium in which to promote and facilitate collaborative play. LeGoff (2004) found that children were highly motivated to participate in Lego therapy and described how Lego therapy was inherently rewarding for children with ASC. However, the study did not seek to understand why children were interested in the intervention. LeGoff (2004) recommended that future research should explore why Lego sustains the interest of children with autism.



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Owens et al. (2008) explained the motivation to participate in Lego therapy groups in terms of Baron-Cohen's hyper-systemizing theory (Baron-Cohen, 2006). The hyper-systemizing theory suggests that we all have a systemizing mechanism but individuals possess the mechanism to differing degrees (Baron-Cohen, 2006). The purpose of systemizing is to predict patterns and changes in lawful events (Baron-Cohen, 2008). Baron-Cohen (2006, 2008) suggested that children with ASD have a strong drive to systemize, and individuals with ASD are thus drawn to things that change in lawful and predictable ways. Owens et al. (2008) suggested that Lego is a predictable, structured and systematic toy so appeals to a drive to systemize. Lego therapy therefore utilises the child's natural strengths and interests to develop motivation to work within a group of peers.

Whilst Lego as a medium may be inherently reinforcing, the social interactions required by participating in Lego therapy may not be perceived as interesting or rewarding. Chevallier et al. (2012) conducted a review of published studies relating to social reward in children and adults with ASC. They concluded that individuals with ASC do not typically experience social rewards from social interaction, and thus do not have an intrinsic drive to seek social interaction. Extrinsic rewards may therefore be beneficial to promote engagement in social interactions.

#### 2.2.2.ii The role of rewards in promoting motivation

An extrinsic reward system is established in the Lego therapy programme, and includes Lego points and certificates to reward positive social behaviour and building (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). The

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reward system in this study was based on the system used in previous studies (LeGoff, 2004; Owens et al. 2008). Children were encouraged to work towards Lego certificates, and certificates were given to both individuals and the whole group. Lego 'creator', 'builder' and 'helper' certificates were given to children in this study. The 'creator' and 'builder' certificates were designed to reward collaborative building in freestyle building and building with instructions respectively, and thus were given to the whole group at the same time. The 'helper' certificate was given to individuals to reward pro social behaviour in individuals. Lego points were given on an ad hoc basis to individual children, to reward positive social behaviour and for building collaboratively in freestyle building. The reward structure promotes positive behaviour in both individuals and the group as a whole.

Slavin, Hurley, and Chamberlain (2003) argued that the effectiveness of collaborative group work could be considered within four theoretical perspectives; motivational perspectives, social cohesiveness, and developmental and cognitive perspectives. The motivational and social cohesiveness perspectives are of relevance to the role of extrinsic rewards in promoting collaborative group work. The motivational perspective posits that cooperative incentives promote motivation in individual group members because individuals are required to work collaboratively in order to receive recognition for achieving group goals. Individual group members are thus motivated to engage in target behaviours in order to achieve group incentives. This perspective is of relevance to Lego Therapy because children are required to work collaboratively to

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complete a Lego model, and some of the rewards are given on a collective group basis rather than individually. Conversely, the social cohesion perspective suggests that group members work collaboratively because they value the group and want to help each other. The importance of individual or group incentives is not emphasised within the social cohesion perspective. Slavin et al. (2003) also concluded that there were some situations where cooperative learning might not benefit from individual or group recognition. This included activities of higher level cognitive demand, activities which were considered to be highly motivating, and activities that were highly structured. Slavin et al. (2003) referred to groups where individuals were highly motivated to obtain success in outcomes and it was clear that collaborative work would help to achieve outcomes. Children may be highly motivated by Lego as a medium, however, it is not known whether they would be motivated to achieve outcomes in collaborative Lego play. It is also not known whether children would perceive there to be benefits of working collaboratively. It is therefore important to consider the value that children placed on rewards in this study, to explore whether rewards were necessary for promoting collaborative work.

There is also considerable debate in the literature about whether extrinsic rewards promote or reduce motivation to engage in tasks. Deci, Koestner, and Ryan (1999) conducted a meta-analysis of 128 studies, to investigate the impact of extrinsic rewards on intrinsic motivation. Deci et al. (1999) concluded that extrinsic rewards inhibit levels of intrinsic motivation experienced, and suggested that extrinsic rewards reduce perceived autonomy and competence. This

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argument is of relevance to this study because Lego is considered to be intrinsically motivating to children with AS, and Lego is perceived to be motivating because children perceive themselves to be competent with Lego.

In contrast to Deci et al. (1999), Cameron and Pierce (2002) argued that extrinsic rewards can promote interest and performance. Cameron and Pierce (2002) suggested that rewards play an important role in developing intrinsic motivation for activities that are not inherently rewarding. They described how activities and behaviours can become interesting to an individual when paired with reinforcement initially. As interest develops, rewards become less important and eventually the behaviour occurs in the absence of extrinsic rewards. This research was conducted with the general population not specifically children with autism, so it cannot be assumed that children with autism will respond to rewards as favourably. However, LeGoff (2004) noted a similar pattern when implementing Lego therapy in children with ASC. LeGoff (2004) initially provided tangible rewards for Lego points, and eventually the points were associated with only social approval. Group members continued to act in a socially appropriate manner without requiring tangible rewards for positive behaviour, and children began to be motivated to achieve social approval within the group.

This study followed the reward structure suggested by LeGoff (2004), although was adapted with regards to tangible rewards. It was not feasible to offer children tangible rewards, such as Lego sets, in schools. This was due to both financial implications for schools and the need to adhere to existing reward systems in schools. Children do not typically have the opportunity to exchange

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token rewards for tangible rewards such as toys in school, and other children may perceive it to be unfair. The value of rewards has not been explored in previous Lego therapy studies and further research in this area is therefore merited. Previous research studies relating to group motivation and reward suggest that key areas to explore include the role of extrinsic rewards on promoting motivation to engage in social interaction, and whether rewards promoted group cohesion and collaboration.

### 2.2.2.iii Contextual Factors in Lego therapy

Collaborative group work is recognised as a method to promote both learning and socialisation in schools (Gillies, 2003). Collaborative group work provides opportunities for listening, perspective taking, sharing of ideas and resolving difficulties (Gillies, 2003). However, the effectiveness of group work is dependent upon a range of contextual factors, and simply grouping children will not necessarily result in improved outcomes (Gillies, 2003). Gillies (2003) argued that group interventions need to be structured in order to promote effective group work. Furthermore, effectiveness in group work is promoted by teaching the group skills required for effective collaboration (Gillies, 2003).

The SPRinG approach is a programme of collaborative group work, designed to promote effective group work in classrooms (Baines, Blatchford, & Chowne, 2007). The programme utilised a relational approach, which posits that skills for effective collaboration need to be developed in group members in order for group work to be effective. A relational approach aims to increase levels of participation in members and create an inclusive culture in the group

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(Blatchford, Baines, Rubie-Davies, Bassett, & Chowne, 2006). Children are encouraged to work together and resolve relational difficulties within the group. The emphasis is therefore placed on developing independence and responsibility in learners rather than receiving direct instruction from a teacher (Baines et al., 2007; Blatchford, Kutnick, Baines, & Galton, 2003). Engaging in situations where conflicts are likely to arise provides the opportunity to manage conflicts (Baines et al., 2007). These principles are of relevance to Lego Therapy because the activity leader is required to facilitate positive social interaction and conflict resolution rather than provide direct teaching. Children are encouraged to solve difficulties with both the task and social relationships, and the activity leader facilitates the discussions within the group rather than giving children the solutions.

A further principle of relevance from the SPRinG approach relates to the classroom organisation. This principle refers to the context of the classroom, and suggests that the classroom layout, seating, and group composition can facilitate effective group work (Baines et al., 2007). Group composition is of particular relevance to the present study. Literature suggests that smaller groups can provide a context within which to develop the social and communication skills required for effectiveness in larger groupings (Baines, Blatchford, & Kutnick, 2003). Gillies (2003) suggested that group effectiveness is enhanced by the creation of small groups of four children or less children. Lego Therapy enables children to work in groups of three children, with facilitation from an adult to promote positive social interaction and manage conflict. Skills to enable effective

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collaboration are taught, facilitated and modelled, and children are encouraged to resolve difficulties together as a group. However, a potential challenge associated with the composition of groups in this study is that children are grouped with others of a similar level of social ability. Strain et al. (2011) suggested that children with ASC benefit from opportunities to take part in inclusive intervention programmes. Strain et al. (2011) argued that it is important for children with ASC to have to opportunity for positive and successful interactions with typically developing peers so that appropriate behaviours can be modelled. Strain (1983) studied the social behaviours in four children with autism, in both interventions with groups of other children with autism and groups with more social peers. The presence of typically developing peers was associated with increases in generalised social behaviours. Strain (1983) suggested that the level of responsiveness and initiations made by typically developing peers was likely to have had a positive impact upon the social behaviours of the children with autism. Conversely, fewer positive social behaviours were seen when participants were grouped with other children with autism. This study utilised only four children, and the children had diagnoses of autism rather than AS. However, this research has particular relevance to the current study because the children in this study were grouped with other children with AS or social communication difficulties. It was not feasible to include socially competent peers in the groups because it would not have been ethical to reduce children's access to curriculum based lessons to engage in an intervention that was not likely to be of benefit to them. It is important to consider this contextual factor, and the possible impact that this may have on

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both the children's perspectives and outcomes. Strain et al. (2011) suggested that typically developing peers play an important role in developing and promoting social behaviours. The intervention may therefore be less effective than it may have been if children were grouped with typically developing peers. Conversely, Lou et al. (1996) suggested that groups may be more intrinsically motivated to work collaboratively when they have a shared interest or goal, and thus a group of children with AS may be a more cohesive group if they have a shared interest in Lego. Lou et al. (1996) suggested that group cohesiveness may be enhanced in homogenous groupings, and group cohesiveness can increase effectiveness in groups.

A further possibility is that friendships may form through weekly participation in groups. The opportunity for children to develop meaningful friendships with typically developing peers has therefore not been realised in the context within which this intervention was implemented. Providing opportunities for socialisation with typically developing peers would promote social inclusion and the opportunity to develop positive social relationships within a group.

Furthermore, the relational approach underpinning the SPRinG approach posits that effectiveness in groups is dependent on the group developing the skills for successful group work (Baines, 2007). It is possible that groups consisting of children with AS will find it considerably more challenging to learn such skills, and thus groups may experience high levels of conflict and lower levels of effectiveness. It is therefore important that the school staff delivering the



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intervention are able to facilitate positive social interactions and manage conflicts

#### 2.2.2.iv The role of the facilitator in promoting successful collaboration and participation

Robinson (2013) described conflict as an important aspect of collaborative work, and suggested that conflict needs to be managed by either the group or a teacher. Conflict is an important element of Lego therapy sessions because it enables children to practice conflict resolution in a safe environment, with facilitation from the activity leader. However, Robinson (2013) suggested that students may hold a more negative perception of collaborative work if conflict is not managed appropriately. Furthermore, conflict resolution could be considered to be a challenge to social cohesion, and thus reduce the effectiveness of group work. It is therefore important to ensure that conflicts are appropriately managed within the groups, and the school staff delivering the programme have a fundamental role to play in this.

A challenge associated with implementing Lego Therapy in schools rather than clinics is that the TAs do not have the same training and qualifications as clinicians. There is a widespread lack of training in teaching assistants (Webster, Blatchford, & Russell, 2013), suggesting a need for TA training in this intervention. Lou et al. (1996) conducted a meta-analysis of studies relating to within class grouping, and concluded the positive effects of group work in the classroom were enhanced when the physical grouping of students was accompanied by changes to instructional methods and materials. Lou et al. (1996) concluded that the training given to teachers moderated the effect of

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grouping. Larger effect sizes were noted in studies where the teacher had undergone more training. The process of grouping children was not sufficient to ensure effectiveness in the collaborative group work. This highlights the need to ensure that school staff receive appropriate training to enable them to facilitate appropriate and positive interactions between group members.

Principles from the relational approach suggest the need to develop independence in resolving difficulties within groups (Baines et al., 2007). Activity leaders in Lego Therapy are requested to facilitate interaction and group problem solving rather than direct. Research into the deployment of Teaching Assistants suggests that TAs interactions with pupils tend to focus on task completion rather than developing skills for learning (Webster et al., 2013). It is possible that TAs may be inclined to focus on success in building the models rather than promoting positive interactions and developing social competence. Facilitation in Lego Therapy may therefore require a pedagogical shift in approach to dealing with difficulties, and it will be necessary to provide training in facilitation as well as delivery of the intervention. The activity leader will play an important role in facilitating positive relationships, developing cohesion between group members, and managing conflicts to promote effective group work. This study will explore the children's perceptions on working collaboratively with other children in the group, including their perceptions on difficulties in the groups.

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### 2.2.3 Including the Perspective of the Child in Research

“We would not think of constructing a case study without collecting the opinions of the adults involved in a situation, so why would we ignore the views of the consumers of education – the children?”(Costley, 2000, p.172)

The United Nations Convention on the Rights of the Child (United Nations, 1989) stipulates that children have the right to express their opinions on matters that directly affect them, and that their opinions should be taken into consideration. Furthermore, the Code of Practice (DfES, 2001) emphasises the importance of exploring the wishes and feelings of children with Special Education Needs (SEN). It also states that children have the right to be involved in making decisions and exercise personal choice.

The perspectives of children with ASC are often not sought in research, especially if the child has communication difficulties (Brewster & Coleyshaw, 2011). While the voice of the child is becoming more prominent in research, there is a lack of relevant research that seeks the perspectives of children with ASC (Preece, 2002; Preece & Jordan, 2010). The few studies published in this field include Preece (2002), Jones et al. (2007) Preece and Jordan (2010), Humphrey and Lewis (2008) Humphrey and Symes (2010) and Beresford, Tozer, Rabiee, and Sloper (2004). Previous research has suggested a number of difficulties associated with seeking the views of children with ASC, and it is important to consider such difficulties so that measures can be taken to overcome barriers to participation. Kelly,

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McColgan, and Scally (2000) argued that it is important that children have the opportunity to present their opinions in research, regardless of the challenges associated with consulting with children with Special Educational Needs (SEN). Research with children requires methods which respect the competencies of children while acknowledging different knowledge and experiences (Oberg & Ellis, 2006).

#### 2.2.3.i Challenges associated with consulting with children with ASC

Preece (2002) explored the impact of characteristics associated with ASC in research. The project sought to elicit children's views on their experience of short term residential care using a case study design. Preece (2002) found that children were dependent on prompts to elicit further information and responses often consisted of single words or short sentences. Children's responses also demonstrated both acquiescence and recency effects, thereby challenging the validity of responses given. Open questions were more difficult to answer than closed questions and children showed poor memory for personal events. A further difficulty was noted in the children's ability to recognise emotions in themselves. This resulted in difficulties eliciting preferences and children struggled to express their opinions, particularly in relation to more abstract topics. Preece (2002) concluded that the validity and the accuracy of findings were limited by characteristics associated with ASC. However, it should be noted that only three children featured in the study and the children had low levels of communication. Findings should be interpreted with caution, especially considering the heterogeneous nature of children with ASC.

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Preece and Jordan (2010) interviewed 14 children with ASC about their experiences of living at home and short term care. They argued that they obtained valuable data relating to the perspectives of children with ASC, although also noted difficulties in eliciting information about children's personal wishes. It has been suggested that questions about wishes may have been meaningless for children with ASC because of a concrete thinking style and difficulties imaging future events (Beresford et al., 2004).

#### 2.2.3.ii Overcoming barriers to effective consultation with children with ASC

Preece (2002) suggested that the validity and accuracy of children's responses may be limited by the challenges associated with consulting with children with ASC. Beresford (2004) suggested data are triangulated to ensure responses reported are accurate. Triangulation of data revealed inaccuracies in the children's responses, suggesting that the child's perspective differed from the perspective of others (Preece & Jordan, 2010). Punch (2002) suggested that it is often assumed that children's accounts lack validity because children might give untruthful or fantastical responses. Whilst triangulation would serve the purpose of confirming the children's perspectives, this study did not seek the perspective of adults. Punch (2002) described how children's responses hold a certain validity because they represent the child's perspective and their view of the world. It was also stressed that inaccuracies in facts reported could be seen in adults as well as children (Punch, 2002). Therefore, this study sought to explore the perspectives of children but not adults. The perspective of adults would have either confirmed or invalidated the views expressed by children, but would not have necessarily

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provided a more valid representation of truth. The adult's interpretations of observed behaviours, and thus their perspectives on the children's experiences, may have been biased, subjective, or inaccurate. Instead, methods were taken to increase the reliability and validity of children's responses in accordance with strategies outlined in related research studies.

Preece (2002) recommended limiting the period of time between the event being researched and the subsequent interview to improve memory for the event. Preece (2002) found that visual aids such as photographs and images helped to increase understanding, made abstract concepts more concrete, and improved memory for personal events. Preece and Jordan (2010) also found that photographs were a useful method for obtaining more detailed responses and children enjoyed looking at and discussing the photos. It was important to follow recommendations made by Preece (2002) and Preece and Jordan (2010) in this study, in order to increase the validity of children's responses. Visual aids to increase understanding, and limiting the period of time between the final Lego therapy session and the interview were of relevance to this study. However, Preece and Jordan (2010) acknowledged that the photographs used in their study may have restricted the discussion to the images presented. Punch (2002) suggested that a critical approach is taken when using task based methods to engage children in research. This is because the disadvantages of such methods are often not considered when selecting research methods. There was a possibility that using visual aids may have restricted the focus of the interviews in

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this study, and it was therefore important to ensure that children were given the opportunity to express their opinions before visual aids were introduced.

Beresford et al. (2004) sought the views of children with ASC on abstract concepts such as their personal perspectives on their lives and their aspirations.

Beresford et al. (2004) found social stories, use of photographs taken by the child, completing a practical activity, and limiting conversation to concrete experiences were useful methods for engaging children with ASC in interviews.

Minimising face to face interaction through engagement in a task, and consulting with children in a familiar school environment were techniques recommended to reduce social anxiety. Providing a task focus alongside visual aids was therefore considered to be a suitable way to promote engagement in interviews with children with ASC in this study. This study aimed to explore the children's opinions on their personal experiences, and thus involved some discussion about abstract concepts such as emotion. Visual aids were used to provide a task focus, to help improve children's memory for personal events, and to make abstract concepts more concrete. However, children were also given the opportunity to express their opinions before visual aids were introduced, to ensure that the pictures did not limit the focus of the discussions.

Preece (2002) gave children the option of having a familiar adult present during the interview to alleviate social anxiety experienced. Involving others who were familiar to the child was also used by Brewster and Coleyshaw (2011) as a way of maximising the contribution of children in the research. As the researcher was

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not familiar to the children in this study, children were given the option of having a familiar adult to accompany them.

Punch (2002) suggested that there is a fundamental difference between adults and children in research due to a power imbalance between children and the researcher. Children had a tendency to wish to please the adult, and thus may have answered questions with responses that they considered to be correct (Punch, 2002). This is of particular significance to research conducted in schools. Children may have perceived the researcher to be in a similar role to the teacher, and thus children may have felt a pressure to give correct answers to questions (Fargas-Malet, McSherry, Larkin, & Robinson, 2010). Punch (2002) stressed the importance of building relationships with children in research and emphasising that there are no right or wrong answers.

#### **2.2.4 Research Aims**

Previous studies are based upon the assumption that children are motivated to participate in Lego therapy because they are inherently interested in Lego, and thus the activity is intrinsically motivating (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). It was assumed that children with ASC were more able to participate in collaborative social play in Lego therapy because they were inherently drawn to Lego as a medium. However, the child's perspective was not investigated, challenging whether the assumptions made about the theoretical basis were valid. Owens et al. (2008) sought the child's perspective through a rating system, however, perspectives of children were not explored in detail sufficient to suggest adaptations to the programme. LeGoff (2004) suggested



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that such areas would be appropriate avenues for future research. Furthermore, Ryan and Deci (2000) highlighted the importance of focusing on the properties of activities so that they can be adapted to promote intrinsic interest and thus enhance motivation. Considering the success of Lego therapy has been explained by a child's interest and motivation to engage in the activity, it was important to explore aspects of the intervention that promote or challenge interest and enjoyment. Consideration was also paid to the role of extrinsic rewards. Current research in Lego therapy has not explored the impact of rewards on interest and enjoyment. It was therefore important to consider the child's perspective on the role of rewards in Lego therapy.

The proposed study aimed to explore the perspectives of a group of children participating in Lego therapy. The research aimed to explore factors that were perceived positively by children, and those that were a barrier to enjoyment. The role of extrinsic rewards was considered, to enable suggestions for improvements to be made on the basis of the children's perspectives. The study considered the methodological difficulties associated with researching the perspective of children with ASC, and consideration was paid to adaptations suggested by previous studies. Children were offered the opportunity to be accompanied by a familiar adult in order to reduce social anxiety. The interviews were conducted immediately after the final session when possible, in order to increase memory for the intervention. Visual aids were used to promote memory for personal events and to make abstract concepts more concrete. Children were asked to sort the visual aids in order to promote engagement through a task

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focus. However, the interview began with open ended questions to ensure that answers were not limited by the visual aids provided. Visual aids were only introduced when it was apparent that children were in need of prompts. Finally, children were assured that there are no right or wrong answers.

### **2.2.5 Research Questions**

1. i. Which aspects of Lego therapy did children perceive to be interesting and enjoyable?  
  
ii. Which aspects of the intervention did children perceive to be a barrier to enjoyment and participation?
2. What role did extrinsic rewards play in promoting motivation to engage in social interaction within sessions?
3. How can Lego therapy be further developed to promote interest and motivation to participate in the group intervention?

## **2.3 Method**

### **2.3.1 Research Design**

This study was informed by a post-positivist paradigm and employed qualitative methods to gain a detailed exploration of children's perspectives. A post-positivist paradigm seeks to discover an objective reality, but recognises that data are subject to bias and reality can only ever be known imperfectly. A post-positivist paradigm is of relevance to the research questions posited in this study because post-positivist research aims to discover theories through which the social world can be understood (Robson, 2011).

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It is recognised within this paradigm that the background knowledge, theories, hypotheses and values held by the researcher can influence and bias their interpretation of the data gathered (Reichardt & Rallis, 1994). A post-positivist paradigm recognises that research evidence is fallible, and therefore seeks to address potential sources of bias to ensure that methods hold reliability and validity (Robson, 2011). Establishing measures to control for the impact of the researcher are important to reduce bias and increase objectivity. This study sought to ensure that measures to reduce the impact of researcher bias were employed. Methods to increase reliability and validity in interviews were established through a consideration of methodological difficulties associated with conducting research with children. Sources of bias within the researcher were minimised through the use of a second rater for the thematic analysis. The researchers background, interests and context were declared, and measures were taken to ensure reflexivity throughout the research process. Sampling bias was minimised by inviting all children that participated in study one to take part in in study two.

### **2.3.2 Sampling and Participants**

This research took place in 9 schools within a local authority in the East of England. The children selected for inclusion in this study were the same children who participated in the first study (see Appendix 4 for participant characteristics). All children that participated in the first study were invited to participate in the second study. This was to ensure that there was no bias in the selection of participants. One child was not able to participate in study 2 due to a

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period of absence from school, so a total of 13 children were included in this study.

Participants were aged between 6 and 11 years, with a mean age of 9 years 8 months. The sample consisted of twelve boys and one girl. All participants had a diagnosis of Asperger syndrome. The children's parents provided consent via the initial consent form (see Appendix 8). Parents were also contacted by letter to provide further details about the interviews and to provide them with the opportunity to withdraw their child from the second study (See Appendix 29). No children were withdrawn from the study at this stage.

### **2.3.3 Procedure**

Methods to increase the reliability and validity of children's responses were established following a comprehensive review of the relevant literature. Previous research highlighted potential threats to the validity of children's responses, and suggestions were made about ways in which reliability of responses could be increased. The interviews were conducted following the final Lego therapy session to increase children's memory for events (Preece, 2002). The interviews were conducted in the children's schools, in quiet spaces where distractions were minimised. Participants were asked if they would like a familiar adult to accompany them in the interview, as suggested by Brewster and Coleyshaw (2011) as a method to reduce anxiety. Two children opted to bring an adult along with them. Participants were asked if the interview could be recorded using a Dictaphone; however, no children objected to the use of a Dictaphone.

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The interview began with an introduction and structured questions about factual events, for example, “who were you in a group with?” Initial questions were designed to be easy to answer to reduce social anxiety and build engagement in the interview process. Language used in interviews was adapted to meet the needs of individual children to promote understanding and reduce anxiety. The researcher was familiar with each of the participants so was able to adapt language accordingly.

The hierarchical focussing method recommends that interviewees are given the chance to respond as freely as possible before prompts are given (Tomlinson, 1989). After the introduction, the main body of the interview began with an open question about how the children found Lego Club. Picture cards were introduced only when it became apparent that children required non-verbal prompts to elicit further information. Three visual cards were laid out to represent emotions relating to enjoyment, to help make an abstract concept more concrete (see Appendix 30). Picture cards were designed to represent different aspects of Lego Therapy, and the children were asked to order the cards from the things they enjoyed the most through to the things that they enjoyed the least. This provided children with the opportunity to focus on a task, which was a method recommended by Beresford (2004) to reduce social anxiety. The concept of ‘enjoyment’ was chosen as the term to prompt conversations relating to interest, preference and motivation. The term enjoyment is familiar and accessible to the age of the participants involved. The positions that the children placed the cards in were used to prompt further questions about

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aspects of Lego therapy. Consequently, the order of the interview was determined by the order of the cards rather than by the interview schedule. The interview ended with an open question to enable participants to discuss anything else that had not been covered. Participants were debriefed verbally following the interview and were provided with the opportunity to ask any questions (see Appendix 31 for debrief information).

While previous research suggested that data are triangulated to ensure reliability of children's responses (Preece & Jordan, 2010), the decision was made to focus solely on children's perceptions in this study. A disparity in responses between the adult and child would reflect a difference in perceptions but would not necessarily provide a greater insight into the true perceptions held by the child. Instead, methods were taken to increase the reliability and validity of children's responses in the interviews.

#### **2.3.4 Data Collection**

Semi-structured interviews were chosen as the method of data collection (see Appendix 32 for the interview schedule). A semi-structured interview method was chosen to enable an in-depth exploration of participants' experiences. The interview schedule was devised utilising the principles of hierarchical focussing (Tomlinson, 1989). The hierarchical focussing method provided a framework for structuring initial open questions and prompts. The semi-structured interview schedule was intended to guide but not determine responses given, so care was taken to ensure that prompt questions were not leading. Leading questions were avoided to minimise bias; leading questions may have caused the children's

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responses to be influenced by the researcher, and thus responses would lack validity.

Individual interviews were favoured over focus groups in this particular study because there was often conflict in relationships within Lego therapy groups. Individual interviews were chosen to provide children with the opportunity to openly discuss their perceptions on relationships with others in the group.

Preece (2002) recommended providing visual aids to help elicit the perspectives of children with ASC. Visual support cards were developed for use in this study. Visual support cards were used to aid memory of events and to help make abstract concepts more concrete (see Appendix 30).

Interviews were designed to last approximately 20 minutes. This was to ensure that children's responses were not affected by boredom or fatigue.

### **2.3.5 Data Analysis**

Data were digitally recorded on a dictaphone, then transcribed into Microsoft Word by the researcher (see Appendix 33 for an example of a transcription). The software package NVIVO 10 was used to assist with data analysis.

The qualitative data were analysed for patterns and themes using a thematic analysis approach (Braun & Clarke, 2006). Thematic analysis was first compared to alternative methods of analysis to ensure that it was the most appropriate technique (see Appendix 34). Thematic analysis was considered to be the most appropriate method of analysis because it can be used within a range of theoretical approaches (Braun & Clarke, 2006) and was therefore suitable for the

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post-positivist paradigm adopted in this study. Thematic analysis, within a realist ontology, enables the exploration of participants' experiences, motivation, meaning and reality (Braun & Clarke, 2006).

It is possible to use either an inductive or deductive method of analysis within thematic analysis (Braun & Clarke, 2006). Qualitative research within a post-positivist paradigm typically employs deductive methods of analysis to test a theory or hypothesis (Hesse-Biber & Leavy, 2010). A deductive method of analysis utilises existing theory to generate codes and themes (Braun & Clarke, 2006). Conversely, in an inductive method of analysis codes and themes emerge from the data. Emerging codes and themes are then used to generate theories.

Thematic analysis was conducted following a hybrid approach to thematic analysis (Fereday & Muir-Cochrane, 2008). The hybrid approach used by Fereday and Muir-Cochrane (2008) was chosen because it allows both inductive and deductive methods of analysis to be employed. Whilst previous research has made suggestions about the theoretical assumptions that underpin motivation to engage in Lego Therapy, previous research has not explored or tested such assumptions. A deductive approach was of relevance to this study because the research questions were developed following a review of the literature, and based upon theoretical assumptions. However, a deductive approach may limit the breadth of exploration to existing theories, and prevents the generation of additional theories. An inductive approach was also of relevance to this study because theoretical assumptions have not been explored, and thus enabling themes to emerge from the data rather than theory would be beneficial.



Similar to methods used by Fereday and Muir-Cochrane (2008), a deductive template approach was first applied to enable data to be coded according to the research questions. The research questions aimed to explore interest and motivation, and perception on the role of rewards. The research questions were underpinned by psychological theory; namely systemising and intrinsic motivation. Data were then coded inductively within each research question, to enable themes to emerge from the data. Inductive coding of the data enabled themes to emerge freely without being limited to existing theories.

Guidance from Braun and Clarke (2006) was used to inform data coding and the generation of themes. Braun and Clarke (2006) suggest that thematic analysis consists of six stages. The processes followed in this study are outlined in Table 9.

Table 9: Stages followed in thematic analysis

Stage (from Braun and Clarke, 2006)	Details of process
1. Familiarising yourself with the data	Transcription of verbal data, repeated re-reading of transcribed data, and noting initial ideas about codes
2. Generating initial codes	Initial codes were identified within data set. Equal attention was paid to the entire data set, and data were coded for multiple themes where appropriate.
3. Searching for themes	Initial codes were arranged into potential themes, and data were collated under identified themes. Key themes, and where appropriate, sub themes, were generated for each research question.
4. Reviewing themes	Themes were refined. This involved merging themes together and deleting or merging themes with insufficient data to support theme. The entire data set was read again to code any additional data and to check that themes accurately represented data. An

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	initial thematic map was generated (see appendix 35)
<b>5. Defining and naming themes</b>	Definitions for each theme were generated and names of themes were altered to reflect what each theme represented
<b>6. Writing the report</b>	Data extracts to represent themes were selected (See 2.4 for themes and illustrative data)

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Stages 4 and 5 were repeated to further refine the analysis and generation of themes. Further analysis enabled an interpretation of the children’s perspectives to be considered. The data were revisited following interpretation to ensure that data corresponded to the interpretation of themes, and to review themes to ensure that they represented the data accurately. It was important to look at the data as a whole at this stage, to ensure that there was no additional data that would confirm or disconfirm interpretations. Further amalgamation of themes occurred at this stage, and names and definitions were amended to reflect the changes to themes. A refined thematic map can be found in Appendix 36.

Following this analysis, one transcription was shared with a colleague of the researcher to ensure that the initial codes were valid. The researcher discussed the disparity between codes with a colleague. Disparity existed only at a semantic level, namely in the labels given to codes (see Appendix 37). The meaning attached to the codes was comparable so the decision was made to proceed with the analysis.

### **2.3.6 Ethical Considerations**

Ethical approval was sought from the University of Exeter board of ethics (see Appendix 46).

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Informed consent was sought from the child's school (Appendix 9), a parent or guardian (Appendix 8), and the child (Appendix 39). Children were informed of the aims of the research and interview, the time that the interview would take, who the interview would be shared with, limits of confidentiality, and how results will be shared with them. These recommendations were suggested by Hill (2005). All data were anonymised to protect the identity of the children, and both the Local Authority and participating schools were also anonymised.

Electronic data were anonymised when inputted, and all data were stored on a password protected laptop. Participants and their parents were informed that all data would be kept confidentially and children would not be identifiable in the final report. Pseudonyms were adopted in the final report. Participants were informed that they could leave at any time throughout the interview, and parents were informed that they could withdraw their child's data from the study if they wished. The research took place in the school environment, which is an environment in which children are ordinarily expected to comply with adult requests. The researcher emphasised that participation was optional to ensure that participants did not feel that they were expected to take part. The children were also told that there were no right or wrong answers to reduce anxiety and acquiescence in responses. The children's well-being was considered throughout the process of designing the experiment and conducting the interviews, and measures were taken to reduce anxiety and distress experienced by participants.

All participants were given the opportunity to ask questions at the end of the interview and were verbally debriefed. Contact details of the researcher were given to both parents and school staff in case any follow up questions emerged.

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## **2.4 Findings**

A diagram to illustrate the structure of the themes generated can be found in Appendix 36. The themes will be presented according to the research questions for this study, and additional illustrative data for each theme can be found in Appendices 40-43.

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### 2.4.1 RQ 1i.

Which aspects of Lego therapy did children perceive to be interesting and enjoyable?

Table 10: Key themes, definitions and illustrative data: factors associated with enjoyment in Lego therapy

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Key Theme	Definition	Illustrative data
<b>Positive social opportunities</b>	Children described working with others positively. Children enjoyed the company of others, belonging to a team and forming new friendships.	<i>"It's not just about me building, it's about everyone building. I like being in a team."</i>
<b>'Freestyle' building</b>	Children enjoyed the freedom to build models of their choice in 'Freestyle' building. Children preferred building by themselves in 'Freestyle' building. Building alone was easier because they did not have to conform to rules or social norms, and they were able to build better models by themselves.	<i>"Well, I quite liked being able to choose what to build and that. It's what we do at home." "Because we got to build our own things, Um.. Oh. All by myself and it just took a short time."</i>

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**Interest and ability in Lego**

Children were inherently drawn to Lego as a medium. Children spoke positively and enthusiastically about Lego. Many referred to how much they had at home, or how long they spent playing with it.

Children perceived themselves to be good at building Lego, and better at Lego than other children. Children held their skills in building in high regard.

*“Because it is so fun and I can play with it all day. My dad bought like millions of Lego at Christmas. There is more than 1 million pieces of Lego that I've got.”*

*“Well, I find it quite easy to build very hard stuff. Like I could probably build a chair. Not a full size chair but a mini chair. I could build a candy machine that works, like you put candy in the top and then you put money in”*

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### Inherent interest and ability in Lego

There was a sense of passion and enthusiasm conveyed when children spoke about Lego. Comments made suggested that children were inherently interested in Lego as a medium and it was an activity that they felt they were successful in. Many children spoke about spending time building Lego at home, suggesting that it is an activity that they engage in out of choice in their free time.

*“I like Lego, I think when I get home I’m going to try and build a replica of my 3DS. And I’m going to need a lot of the red”*

Children enjoyed the flexibility of Lego as a medium and there was the sense that Lego was perceived to be enjoyable because of the infinite building opportunities it affords. Many children spoke about enjoying being able to build lots of different things with Lego and enjoyed the creative aspect of Lego building.

*“My favourite thing about Lego is that there’s about a jillion pieces of Lego in the world. It’s like you can build anything you want with it because there’s just so much pieces”*

Children also described themselves as being good at building Lego, and they alluded to the fact that they perceived themselves to be better at building Lego than other children.

*“They were building some mad skyscrapers which could fall over at a touch, whereas I was building some huts with actually proper sort of walls that go round and door and a roof and all that. So they were very stable, but I think the skyscrapers could fall over just by being touched.”*

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*“Well, I find it quite easy to build very hard stuff. Like I could probably build a chair.”*

The children appeared to have a positive view of themselves when talking about building. No children spoke negatively about Lego as either a medium or in relation to their abilities. Comments from this theme suggest that Lego is an area of perceived strength and interest, and thus is an appropriate medium through which to facilitate social interaction.

#### Positive social opportunities

Comments made by the children suggest that they experienced positive social interactions when working together in Lego therapy, and they enjoyed belonging to a team.

Many children related their experiences in Lego therapy sessions to team membership. Children felt like they were part of a team, suggesting that they understood and accepted that Lego therapy session required group work and a division of labour. There was a sense that children enjoyed the feeling of belonging to a team

*“Building together is fun because you’re not alone.”*

*“It’s not just about me building, it’s about everyone building. I like being in a team.”*

Children also spoke about having fun with others, suggesting that they held a positive perception of the social opportunities provided by collaborative play.



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*“It’s because I think I’m actually, cos when you’re doing it by your own you’re quite bored aren’t you but when you’re together it’s quite fun because when you’re building you can do funny things like Jamie did- really fun things.”*

One child talked about getting to know the others in the group, perhaps suggesting that a friendship was developing.

*“Well, we got to know more about each other and we got to do stuff together”*

Whilst it could be considered to be positive that children enjoyed the opportunities for social interaction in the group, there is also a difficulty associated with friendships forming with children with similar needs. It is possible that children enjoyed the social aspects of Lego therapy because interactions were centred on a shared task focus and children had similar interests. However, it is also possible that children enjoyed interactions because others in the group placed lower social demands on the children than interactions with typically developing peers. It is positive that children enjoyed interactions through the medium of Lego, but interactions with typically developing peers may provide greater opportunities for modelling positive social behaviour.

### Freestyle building

All of the children interviewed spoke positively about freestyle building, and the majority of the children rated freestyle building as their favourite aspect of Lego Therapy. Children enjoyed both the opportunity for solitary play and the creative freedom that freestyle building provided.

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There was a sense that children preferred building in freestyle building because they had the freedom to build whatever they wanted, without being constrained by sets with specific instructions.

*“We get to build anything that we want”*

Children related freestyle building to the sort of building that they do at home, perhaps indicating that they prefer building creatively and without instructions.

*“Well, I quite liked being able to choose what to build and that. It's what we do at home.”*

The children alluded to the fact that they enjoyed the more solitary aspect of free style building.

*“Because I like building and stuff. On my own.”*

Although children were still building collaboratively in free style building, the social demands placed on them were perhaps lower. Children were expected to devise a joint project to work on together in free style building. This required children to incorporate each other's views and come to a compromise, so provided the opportunity to practice some important social skills. However, children often built individual models once the group had made a decision about what to build. Lego as a medium does not lend itself to joint building of the same model, unless a very large model was built. When the children were asked about reasons for liking free style building many referred to the opportunity to build by themselves.

*“We were still building together but we were building separate models.”*

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*“Yeah by ourselves, we tried to connect it up but mine couldn’t really connect up. Mine had bits that wouldn’t connect on. We did try with Richard’s and Callum’s but they all smashed up at the end.”*

It is possible that free style building placed lower social and cognitive demands on the children, and thus they perceived it to be more enjoyable.

*“Easy because I could just leave most of it to the other two, and I could just build a fish or something.”*

One child spoke about enjoying free style building because he was able to stay away from the children that he experienced difficulties with.

*“Because they’re not mean to me. Because I get, because then I get to not make things that they make, because then I get to stay out their way”.*

A difficulty associated with changing the structure of the programme to focus more on ‘freestyle’ building is that reduced levels of conflict provide fewer opportunities for developing the children’s skills in resolving conflict. However, it is possible that levels of interest and motivation would have been higher if building with free style bricks rather than sets with instructions. This is further emphasised in the emergence of the theme ‘sets’ within barriers to engagement. This theme will be considered within the next research question.

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### 2.4.2 RQ 1.ii.

Which aspects of the intervention did children perceive to be a barrier to enjoyment and participation?

Table 11: Key themes, definitions and illustrative data: factors associated with difficulties in Lego therapy

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Key Theme	Definition	Illustrative data
<b>Social difficulties</b>	Children spoke negatively about other children, and relationships with others hindered enjoyment of Lego therapy. Children found relationships challenging and struggled to resolve conflicts. Children spoke about how they preferred to play in their own company. Other children made building more difficult and less enjoyable	<i>"Because Tom* keeps annoying me, he keeps saying, before we did Lego club, like, one week ago he said 'I can't wait til Lego club, I get to annoy you'"</i>
<b>Roles</b>	Children thought enjoyment was affected by the role that they were playing. Being the builder was the preferred role. Children did not enjoy waiting for their turn, they wanted to spend all of their time in their preferred role and did not like to compromise. Children found the role of the engineer to be the most difficult role and they felt they were not good at being the engineer.	<i>"Yep. Me, I liked to build the Lego. I think everyone liked building the Lego." "I don't really like describing because then it takes a bit of time for people to understand because I'm not very good at it."</i>

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Key Theme	Definition	Illustrative data
<b>Sets</b>	<p>Children described how sets were too simple and there was not enough choice. Children wanted more challenging sets. Children felt that they would be able to build much bigger sets than they had access to. However, instructions were difficult to follow, which became a barrier to enjoyment because conflicts and frustrations occurred when the team made mistakes building.</p>	<p><i>“I would like to build.. well, we built like vehicles every day so I would like to build something else.”</i></p> <p><i>“Because they’re not very well laid out. Because the colours sometimes get mixed up like grey and black. And sometimes when Jack* says to get a piece you always pick up a piece that has two like that, two bits like that and it’s actually a bit like that, but then Simon* picks up something else.”</i></p>

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### Social difficulties

Whilst social factors emerged as an aspect of the intervention that children enjoyed, it was also apparent that they experienced conflicts and difficulties with group members. The majority of children spoke about social difficulties with group members, and there was the sense that difficulties were a barrier to engagement and enjoyment in group sessions.

*“Kind of with Jimmy but Tom’s getting really annoying now that’s the thing. That’s why I don’t like Lego club because it’s so annoying, Tom’s always winding me up”*

Comments made by children suggest that collaborative play generated conflict, disagreement and feelings of frustration in group members.

*“Yeah because when Will is the supplier or the engineer or the builder he was an idiot. He’s literally like ‘I don’t know what this piece is’”*

However, some children commented on the benefits of collaborative play and felt that it made the task easier.

*“Really its cos if you were like playing a game on your own you probably would lose, but if you were with someone else it make you a little bit more happy, because you can win the game that you are playing. Because you’ve got someone else in your team.”*

Many expressed the view that they preferred building by themselves. It seems that children often became frustrated by the building abilities of other group

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members, and felt that building collaboratively made the building process slower.

*“Or maybe because it takes about an hour or so to do, to do one because they're messing around all the time”*

This relates to the earlier theme ‘interest and ability in Lego’; children perceived themselves to be better at building Lego than other children, and thus expressed frustrations when building with others.

*“Yes well usually when I'm building at home, it takes me about five minutes”*

*“Yes because that boat is huge, it probably took me about an hour to complete it. I was reading the instructions, putting it together and, well getting the bricks at the same time. Yes, that's sort of the way that we always do it. We never tend to work together, I think that's only at Lego club that I have to do that”*

There was a sense that collaborative play was more of a hindrance than a help, and children found building easier and more enjoyable when they were not required to build with the others. The extent to which conflict affected children’s motivation to participate in the groups varied. One child commented:

*“I'll probably do a few more weeks and then I'd give up because Tom would start annoying me”*

Other children spoke positively about their experiences, despite having experienced some difficulties within the groups.

*“It just really starts my week off well and makes me really really happy”*

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It is possible that the conflicts were managed and facilitated in some groups better than others. Experiencing conflicts could be perceived to be a positive opportunity if facilitated appropriately, because children would have the chance to learn and practice skills for managing conflicts. Themes suggest that children experienced feelings of frustration with others in the group, and if this was not managed appropriately the conflicts would be likely to become a barrier to enjoyment and thus engagement. It is also possible that some groups of children were more fractious than others, and thus the group dynamic should be monitored to ensure that resolution to conflicts can be achieved.

The experience of conflicts within collaborative play may suggest why children were more motivated by freestyle building than building with instructions. As discussed previously, children preferred free style building because they enjoyed the opportunity to build by themselves. When talking about difficulties with group members, many children alluded to the fact that they preferred to play in their own company.

*“I don't like building together because, well I just naturally tend to prefer to do things on my own.”*

Children appeared to be aware of the difficulties that they experienced with social interactions and many seemed to accept the difficulties that they experienced.

*“Asperger's just means that I have to be taught the social rules. I don't learn them just by watching adults like other children do”*



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*“Also I find it, well I do like Lego but I find it hard to work as a team”*

Comments made suggest a degree of awareness of difficulties experienced, and an awareness that Lego therapy required the children to engage in something that they found challenging.

### Roles

There was congruence in children’s perceptions about roles as a barrier to engagement. The vast majority of children suggested that they enjoyed being the builder and disliked being the engineer. Consequently, the requirement to take turns was a barrier to enjoyment.

Many children commented that the builder was their favourite role and the role of the engineer was challenging

*“Yeah building together, but I really really really just want to be the builder all the time, because it’s really really fun”*

*“I didn’t really like doing the describing because it took a long time because I’m not really that good at describing”*

This perception perhaps relates to the earlier theme of ‘Inherent interest and ability in Lego’. The role of the builder was the only role that enabled children to build, and thus was the role that they perhaps felt most successful in.

Frustrations were experienced when playing the role of the engineer because the role was perceived to be difficult. This perhaps suggests that children’s inherent interest in Lego relates only to building. Related roles and tasks are perceived to

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be challenging rather than engaging. Children did not enjoy taking turns, perhaps because of perceived strengths in building and difficulties with other roles.

*"I said already, I want to be the builder all the time"*

### Lego sets

Children were required to build small Lego sets with instructions during the first part of the Lego sessions. The Lego sets emerged as a barrier to enjoyment, in terms of both the sets themselves and the instructions. Whilst children spoke about an interest and ability in Lego, this did not appear to extend to building sets with instructions collaboratively. Children found the instructions difficult to follow and they was perceived to be a source of frustration within the group.

*"Well, the background could be a little bit more funny and it could be a little bit more helpful, because it's got a picture and then a picture and you've just got to try and find it is so sometimes it goes wrong."*

*"Because they're not very well laid out. Because the colours sometimes get mixed up like grey and black. And sometimes when Josh says to get a piece you always pick up a piece that has two like that, two bits like that and it's actually a bit like that, but then Daniel picks up something else."*

Although the children found the instructions difficult to follow, they also commented that the sets were too simple and not interesting enough

*"I liked the really big ones, and ones that are like games. The little ones are too boring they're just too easy to build"*

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This perhaps relates again to children's perceptions of their strengths in Lego building. They wanted bigger, more interesting and more challenging sets, perhaps because they believed that they could build bigger sets than they were given in sessions. There is some incongruence between what children would like to build and what they were able to build collaboratively. Children may be able to build larger and more complex sets if building by themselves, however, building was more challenging when children were required to build together. The division of labour in Lego therapy required the use of complex language and collaborative play required children to utilise social skills. There was a sense that children disliked building sets collaboratively because it was challenging, and they were not able to experience the same success in building as they would experience if they were building by themselves. Children's perceived interests and abilities in Lego Therapy perhaps did not extend to collaborative Lego play, and this was therefore a barrier to interest and engagement. However, collaborative play provided the opportunity to learn and practice skills required for success in social interaction. Removing the collaborative element from the intervention would reduce the opportunity for facilitating positive skills and interaction and thus could be considered to be a necessary component. Difficulties experienced suggest the need to further increase motivation to participate, perhaps through minimising barriers to engagement where possible, and through use of extrinsic rewards to promote behaviours that were not perceived to be inherently interesting.

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### 2.4.3 RQ2

What role did extrinsic rewards play in promoting motivation to engage in social interaction within sessions?

Table 12: Key themes, definitions and illustrative data: the role of extrinsic rewards in Lego therapy

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Key Theme	Definition	Illustrative data
<b>Disparity in perception of rewards</b>	Some children spoke about feeling proud when they received rewards, and enjoyed sharing them with others. Other children were not concerned about whether or not they got rewards	<i>“Getting certificates is fun because then you can show them off.”</i> <i>“No because they’re just a bit of paper”</i>
<b>Inconsistency in rewards Uncertain of expectations</b>	Children often could not remember getting certificates, or received rewards according to alternative criteria. Children also spoke about receiving tangible rewards outside of Lego therapy. Children were either rewarded incorrectly or rewards were not significant enough for them to remember the details of. Children were uncertain of behaviour and expectations required to earn rewards.	<i>“I like getting the certificates, because then I get to go on the ps3 at home.”</i> <i>“I think it was about being very nice to each other”</i>

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## Role of rewards

### Incongruence in perception of rewards

There was a sense of division in children's perceptions of rewards. Some children spoke positively about rewards whereas others placed little value on rewards.

Those that enjoyed receiving rewards spoke about positive emotions associated with receiving the reward.

*"Well you can take them home to show your parents what you've done"*

Children spoke about showing their certificates to others and feeling proud of their accomplishments. Interestingly, positive emotions and feeling of pride were always related to individual accomplishments. Although many of the certificates were given out to the whole group following group accomplishments, no children commented on positive emotions associated with group successes. This perhaps reflects a degree of egocentricity in the children's perceptions.

The other children did not place great value on rewards and did not speak about positive emotions associated with receiving them. One child commented

*"I wasn't really interested in the certificates. You only got a certificate"*

The disparity in perceptions about the role of rewards may be linked to the emphasis placed on rewards by the activity leader. It is possible that some activity leaders were more able to help children feel that they had achieved something worthwhile, whereas others may have handed out certificates with little emphasis on their significance.

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### Inconsistency in rewards

The emergent theme of inconsistency in rewards may link to the theme 'incongruence in perception of rewards'. Children's comments suggest that the reward structure was not followed were not administered as Lego Therapy intended. There was a sense that children were unsure about behaviours that they needed to engage in to obtain rewards, with many describing incorrect behaviours for rewards

*"Yeah we got one (a certificate) for good listening"*

Some children could not remember whether they got rewards or not, suggesting that rewards were either not given or children could not remember receiving them. Findings from session checklists in study one highlighted that summary, praise and certificates were given in 72% of sessions. It is possible therefore that some children were not given rewards throughout the intervention. It is important to consider this when interpreting emergent themes relating to the value of rewards. It is possible that those children that placed little value on rewards were rewarded inconsistently or not at all.

It seems that children were also given tangible rewards for achieving Lego points or certificates. Although this was not part of the reward system, tangible rewards were received positively by children.

*"Because the more get, we've got enough for free play at break time and an ice lolly."*

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It is difficult to suggest implications relating to the role of rewards because it is apparent that they were not utilised as intended. However, emergent themes relating to the third research question suggest a way in which the reward system can be improved.

### 2.4.4 RQ3

How can Lego therapy be further developed to promote interest and motivation to participate in the group intervention?

Table 13: Key themes, definitions and illustrative data: measures to improve Lego therapy

Key theme	Definition	Illustrative data
<b>Sets</b>	Children wanted more variety, more complex sets, and sets that could be used. The sets would be motivating to children if they were more interested in them. However, instructions were too complex and confusing. Improving instructions would make building easier and more enjoyable, and more complex sets could then be attempted.	<i>"I think the engineer doesn't have so complex instructions. Make it smaller steps at a time." "Because it could actually be more interesting to look at and play with having more complex parts."</i>
<b>Tangible rewards</b>	Children suggested working towards tangible rewards as a way to make Lego therapy more enjoyable. The rewards available did not captivate their interest.	<i>"If you get a certificate you could get two models to keep."</i>
<b>Social factors</b>	Children suggested changing group members to make Lego club more enjoyable, or having the opportunity to build models by themselves. They wished to avoid relationships that they did not enjoy.	<i>"Yes, the choice of people. Because if you're told the first time who you are going with you could say 'I don't like him could we like have someone watching him.'"</i>
<b>Increase frequency</b>	Children referred to increasing time spent in Lego therapy as a way to improve sessions. Children enjoyed Lego therapy and wanted to spend more time doing it.	<i>"Do it every day, do it every Monday and Friday."</i>



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### Increasing interest, motivation and engagement

Children were able to discuss aspects of the intervention that they felt would make it more enjoyable. Discussions about improvements to Lego therapy arose following discussions about the things that they did not enjoy about Lego Therapy, and children were also asked directly how they thought that Lego Therapy could be changed to make it more enjoyable. Emergent themes included 'Lego sets', 'tangible rewards', 'frequency' and social factors.

#### Lego sets

There was a general consensus that children wanted to build more complex sets but with instructions that were easier to follow.

*"Probably, um ... put different parts...Put.. quite maybe you could, because it was more steps you might be at put slightly more complex parts on the models. Because it could actually be more interesting to look at and play with having more complex parts."*

*"I think the engineer doesn't have so complex instructions. Make it smaller steps at a time"*

The emergence of this theme perhaps reflects the children's perceptions of their building abilities. The children believed they were good at building, so wanted to be able to build large complex models. Experiencing difficulties with the instructions perhaps challenged the view that they held about their abilities, and thus reduced enjoyment. The aim of Lego therapy is to promote the

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development of social skills, an area they find difficult, through an area that they perceive to be a strength. It is therefore important to ensure that aspects of the intervention relating to Lego are motivating. Some children also suggested that it would be more enjoyable if the sets could be played with, or if they were usable in some way.

*“This time can we have ones with motors and stuff”*

Incorporating sets which could be played with as a group would provide further opportunity for collaborative play and facilitating social skills. If children had built the sets together they may be more motivated to play together with them, thus providing further opportunity for encouraging positive social interaction.

Interestingly, despite comments made about preferring free play and preferring to play alone, no children said that the intervention would be improved by not needing to build sets with instructions. However, one child did comment that it would be better if they could just build a model each

*“I think that we could make a little model each.”*

The emergence of Lego sets as a theme suggests that children placed importance on the sets that they built, and the type of sets appeared to have an impact upon their level of interest and motivation. It is therefore important to consider the types of sets offered to children in the intervention.

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## Tangible rewards

Children suggested that they should be able to work towards tangible rewards. This perhaps suggests that they did enjoy receiving rewards, but the rewards were not interesting enough.

*"Maybe a few minutes of free play then go on the computer. I love going on the computer Do you? How would that have made it better? In a way it would have because I wouldn't really mind what job I did"*

The emergence of this theme suggests that although some children appreciated receiving rewards, many would be more interested in rewards if they were associated with tangible rewards. This may be particularly true for those children that did not associate extrinsic rewards with feelings of positive emotion and personal accomplishment. The rewards offered by the intervention were not motivating enough for some children, and thus behaviour could not be expected to be changed in order to achieve rewards. One child commented

*"It's better to work by yourself. Playing by yourself is funner than getting Lego points"*

Comments from children also suggested that they were each motivated to work towards different things. Many of the things suggested did not have financial implications for schools and would be feasible to implement alongside Lego therapy. It may therefore be important for children to choose the tangible rewards that they work towards, to ensure that they are motivating to individuals.

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### Social factors

Children suggested making changes to the groups to increase enjoyment, which perhaps reflects the degree to which group difficulties impacted upon their perceived enjoyment.

*“Yes, the choice of people. Because if you're told the first time who you are going with you could say ‘I don't like him could we like have someone watching him’ because then they don't get that annoying.”*

Conflicts within the group are likely to occur regardless of the group composition, and conflicts are an important aspect of the group intervention because they enable children to practice skills to minimise and resolve social difficulties. However, there is perhaps a need to monitor group composition if conflicts arise to the extent where they begin to affect the children's motivation to participate in the intervention.

### Increase frequency or duration of Lego Therapy

Despite difficulties with group members, increasing the frequency emerged as a way to improve Lego therapy.

*“Maybe if we could have more sessions, twice per week. So you'd want them more often? Yeah, because there was a 5 day wait. 7 day wait actually. Like a Monday and Friday and then you'd only have to wait 4 days til the next one”*

Children wanted to do it more often, suggesting that they wanted to take part in the group sessions despite the difficulties that encountered. Only one child

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commented that they would not like to continue with the intervention for much longer.

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## 2.5 Discussion

### 2.5.1 Discussion of Key Findings

This study sought to gain the views of children with Asperger syndrome after participation in Lego therapy in school. The aim of the study was to explore the children's perspectives, specifically in relation to interest and enjoyment. The purpose was to discover ways in which the intervention could foster children's interest in Lego therapy, in order to increase the chance of successful engagement in the intervention. The key findings will be discussed according to the research questions and in relation to existing theory and literature. Research questions 1.ii and 3 will be discussed concurrently because themes relating to barriers to enjoyment are associated with ways in which Lego therapy can be improved.

Due to the extent of the data collected and the number of themes that emerged, only the themes that are of relevance to implications and future directions will be discussed in detail.

RQ1. i. Which aspects of Lego therapy did children perceive to be interesting and enjoyable?

Previous studies suggested that children with ASC are motivated to participate in Lego therapy because they are inherently interested in Lego (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). Owens et al. (2008) suggested that children were inherently interested in Lego because Lego is predictable and systematic and thus appeals to a drive to systemize (Baron-Cohen, 2006).

Existing research has not explored the perspective of the child so this study

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sought to identify factors within Lego therapy that interested children and thus increased motivation to participate. The key theme ‘interest and ability in Lego’ suggests that children were inherently interested in Lego; children spoke enthusiastically about Lego and saw it as a personal strength. Children spoke positively about Lego as a medium and it was something they perceived themselves to be both interested in and good at.

*“When I’m older I want to be a Lego builder.”*

‘Positive social opportunities’ emerged as a key theme, suggesting children were able to enjoy working together when engaged in collaborative play with Lego. Children spoke positively about building together as a team, and team work was seen as beneficial to the building process.

*“Really its cos if you were like playing a game on your own you probably would lose, but if you were with someone else it make you a little bit more happy, because you can win the game that you are playing. Because you’ve got someone else in your team.”*

Children enjoyed working together to build models and spoke positively about the interactions that they engaged in. Findings from these two key themes are consistent with ideas suggested in strength-based research. Winter-Messiers (2007) developed a strength-based model for children with Asperger syndrome, which suggested that deficits typically associated with an Autism Spectrum Condition diminished when children engaged in their special interest area (SIA). The strength based model proposes that children will be more willing to interact,

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and more able to detect social cues, and more able to use appropriate social skills when engaged in their SIA. LeGoff (2004) developed Lego therapy after observing that children with ASC were more able to interact and communicate when Lego was available as a focus of conversation. Children spoke positively about social factors following Lego therapy in this study, suggesting that children enjoyed interacting with others through the medium of Lego.

While the key themes outlined above suggest that children enjoyed working collaboratively with Lego, and Lego was inherently interesting, a further theme related to enjoying the opportunity to build alone in 'freestyle' building. This suggests a degree of disparity in perceptions. Children spoke of the benefits of working together when building sets with instructions, yet many spoke about enjoying building without others in 'freestyle' building.

*"Because I like building and stuff. On my own."*

The Lego therapy programme intends for children to work together on models in 'freestyle' building, however, children spoke about enjoying the opportunity to work on models alone. 'Freestyle' building was often described as the children's favourite aspect of the intervention because they were able to build by themselves. While this poses challenges to the fidelity of the intervention, it is apparent that children were highly motivated by 'freestyle' building. There was a sense that children were willing to engage in collaborative play when building sets with instructions but enjoyed the opportunity to build alone in 'freestyle' building.



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Lego play is typically experienced as a solitary activity, Boucher (1999), when referring to activities such as Lego, argued that children with ASC do not typically develop their play to a level where they attempt to engage others in play.

Boucher (1999) described how children with ASC often develop the ability to play, however, play typically becomes repetitive and solitary. Comments from children within emergent theme 'interest and ability in Lego' suggest that children spend a considerable period of time playing with Lego outside of sessions, and they feel that they are successful in building. It is likely that their prior experience of Lego play has been an experience of Lego as a solitary activity.

*"Yes, that's sort of the way that we always do it. We never tend to work together, I think that's only at Lego club that I have to do that."*

This perhaps explains the frustrations that children experienced when required to build collaboratively in Lego therapy sessions; Lego building was more challenging when building with others and thus may have been less rewarding than building alone.

Piggot-Irvine (2012) described how collaboration is based upon the principles of shared goals, trust, democracy and openness. The term relates to the process of working together to accomplish shared goals. Authentic collaboration is considered to be a deeper level of collaboration (Piggot-Irvine, 2012). Adelman and Taylor (2003) described an important aspect of authentic collaboration to be a *"formal agreement among participants to establish mechanisms and processes to accomplish mutually desired result (usually outcomes that would be difficult to*

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*achieve by any of the participants alone)*" (Adelman and Taylor, p 55). The Lego building task, and aspects of the reward structure, could be considered to be shared goals. Lego Therapy is dependent upon the successful collaboration of the group to accomplish these shared goals. However, the requirement for collaboration was one that was enforced by the intervention and not the children. Emergent themes suggest that the children would prefer to build by themselves, and they perceive collaboration to hinder the achievement of goals. Piggot-Irvine (2012) argued that collaboration has advantages in group work, including higher levels of motivation, satisfaction and commitment to achieving the collective goals. It is possible that children were able to build models more effectively if they were to build alone, perhaps accounting for the frustrations that they experienced when building collaboratively. It could also be argued that the level of collaboration in this study could not be considered to be authentic collaboration. The children had not openly agreed shared goals and they were not motivated and committed to working collaboratively.

Many of the reasons for enjoying aspects of Lego therapy were very specific, and individual to children, for example, one boy enjoyed how the bricks at school were different to the ones at home *"I just like building it, I mean first chance I get I'll probably be grabbing some rare pieces as we call them. They're things like purple, brown, light green, see-throughs, sort of.. is it?"*. Whilst this does not necessarily help to develop implications for the future of Lego therapy, it does highlight the importance of seeking individual children's perspectives when engaging them in interventions. This reflects the heterogeneous nature of

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children with Asperger syndrome as suggested in existing research (Church, Alisanski, & Amanullah, 2000). It also highlights the importance of asking children about their views to ensure the intervention is enjoyable and interesting, and not assuming that all children with ASC will be inherently interested in the same things. Previous research suggests that children with ASC may have difficulty expressing a personal preference or viewpoint (Preece & Jordan, 2010), however, children have a right to be consulted on matters that affect them (UN, 1989). The views of children are often not sought in research, and previous research has not explored the perspectives of children that participated in Lego therapy. Children in this study were able to say why they did or did not enjoy aspects of the intervention, and the children's perspectives were valuable in determining ways in which the intervention could be developed. The children in this study had higher levels of verbal communication than the children in Preece and Jordan's (2010) study, and thus language was less of a barrier to engagement in research.

#### Barriers to enjoyment and participation, and ways in which to overcome barriers to participation

- RQ 1.ii. Which aspects of the intervention did children perceive to be a barrier to enjoyment and participation
- RQ3: How can Lego therapy be further developed to promote interest and motivation to participate in the group intervention?

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Whilst social factors emerged as a key theme relating to interest and enjoyment, difficulties with social relationships emerged as a barrier to enjoyment and children often spoke about how they would have preferred to play alone.

Children held negative perceptions about group members and experienced social difficulties with others. Negative perceptions stemmed from arguments they had with other children in sessions, or frustrations about the other children's building abilities or behaviour, for example *"Tom's getting really annoying now that's the thing. That's why I don't like Lego club because it's so annoying, Tom's always winding me up"*. There is a wealth of research to suggest that children with ASC experience difficulties with social relationships and difficulties with social interaction are a key feature of diagnostic criteria (APA, 2000; WHO, 1993). One of the key themes that emerged in relation to improvements that could be made was *'Social factors'*, with children suggesting changing members of the group or enabling children to build alone rather than collaboratively. Collaborative play is fundamental to Lego therapy as it is the avenue within which appropriate social interaction is taught, facilitated and practiced. Working through disagreements within sessions enables appropriate social skills can be learnt through modelling and facilitation. However, the emergence of this theme suggests that difficulties in relationships was a primary concern to the children, and it is important that relationships with others do not ultimately affect interest and enjoyment in sessions. One child was aggravated by another to the extent where he was unsure about whether he would want to continue or not. When asked if he would like to continue going to Lego sessions he responded *"Probably not. I'll probably do a few more weeks and then I'd give up because Tom would start*

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*annoying me*". While it is not feasible to reduce the requirement for social interaction, it would be prudent to consider and closely monitor group dynamics when establishing groups. A degree of disagreement with group members enables a child to practice resolving conflict in a safe environment, although it is important that children also experience successful and rewarding interactions with peers to promote social cohesion. Themes suggest low levels of social cohesion within groups, and thus extrinsic rewards to promote positive social interaction may be of greater importance. Lou et al. (1996) suggested that homogenous groupings promote group cohesion, however, high levels of cohesion were not evident in emergent themes.

The group composition may also have had an impact upon the level of disagreement between group members. Groups consisted of children with social communication difficulties and thus group members are likely to have experienced difficulties with managing conflicts. Fewer conflicts may have been found if groups were composed of a child with AS and two children with more developed social skills. Utilising appropriate peers may have increased opportunities for modelling appropriate interaction and conflict resolution skills, and promoted social inclusion. It may also be possible that TAs felt less confident in managing conflicts within the group. Further research should seek to gain the perspective of the school staff, and further training should place more emphasis on managing conflicts.

A key theme relating to barriers to enjoyment was 'Lego Sets'. Themes emerged relating to the instructions and the complexity of sets. Both factors also emerged

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as themes in RQ3. Children wanted more choice over sets and the opportunity to build larger, complex sets. They also wanted sets that had complex, moveable parts and that were usable in play once built, for example one child said *“Because it could actually be more interesting to look at and play with having more complex parts”*. This relates to the theme ‘interest and ability in Lego’ from RQ1. Children perceived themselves to be good at building Lego, and thus spoke of wanting more interesting and complex sets that challenged their skills in building. Despite wanting more complex sets, frustrations over the Lego instructions emerged as a barrier to enjoyment.

*“Because they’re not very well laid out. Because the colours sometimes get mixed up like grey and black. And sometimes when Josh says to get a piece you always pick up a piece that has two like that, two bits like that and it’s actually a bit like that, but then Daniel picks up something else.”*

The pictures on the instructions often depicted a number of stages within one image, which lead to mistakes in building and consequent difficulties within the group. Specific sets for Lego therapy would be beneficial to ensure that instructions are clear and comprehensible. Furthermore, providing the group with choice over sets would ensure that the sets were ones that they were interested and motivated by.

Findings from the first research question suggest that Lego was perceived to be a strength and interest, but building sets with instructions was a barrier to enjoyment. Children’s frustrations with building sets, but inherent motivation for freestyle building may be explained by the fact that because ‘freestyle’ building is

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more closely related to their usual experiences of Lego play. It is thought that children are more able to engage in interactions when the activity is related to their strengths and interests (Winter-Messiers et al., 2007). It would therefore be prudent to ensure that the Lego activities appeal to the children's strengths and interests before expecting children to willingly engage in interactions with others. Focusing the intervention on 'freestyle' or naturalistic play may be more motivating to children, and thus they may be more motivated to engage with others. Smith and Gilles (2003) also advised that social skills are taught and practiced in the environment in which they are ordinarily used, and across a variety of naturalistic situations. Naturalistic play may therefore be beneficial for promoting maintenance and generalisation of skills, as well as being more motivating for children.

The constraint imposed by Lego sets on creative play was a barrier to enjoyment, and also reduces opportunities to develop skills in play. Children spoke about enjoying the creative aspect of 'freestyle' building. Children said that they liked being able to choose what to build in 'freestyle' building, and when talking about liking Lego, many referred to the infinite possibilities for building. Building sets with instructions does not enable creative play, perhaps explaining why children preferred 'freestyle' building. Russ (2004) argued that pretend play is an important aspect of creative play and pretend play enables the development of cognitive and affective processes. Naturalistic play enables children to create models that can be played with symbolically, and may foster collaborative pretend play with the models built. Wolfberg and Schuler (1993) argue that

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interventions for children with ASC typically do not enhance spontaneous play skills. Whilst Lego therapy uses models that are suitable for play, playing with the models is not an aspect of the intervention. There is scope for Lego materials to be used in manner that would facilitate spontaneous, naturalistic and creative play. Furthermore, emergent themes suggest that children would be more motivated to engage with materials when they are enabled greater creative freedom. Collaborative Lego play may provide more opportunities for naturalistic play and would also be more motivating to children if the creative element of the medium was emphasised.

A further barrier was the emergent theme of 'roles'. Children's perceived strengths appeared to lie in building, and the role of the engineer was perceived to be difficult and thus less enjoyable. The role of the engineer required use of fairly complex language, including prepositional language and Lego specific vocabulary. These themes suggest the importance of encouraging children to swap roles frequently within sessions. This would provide children with the opportunity to practice skills of turn taking but also to ensure that motivation is not adversely affected by remaining in difficult roles for prolonged periods of time.

Despite difficulties experienced, children remained interested in Lego therapy and wanted to continue participation in the intervention. This is reflected in the theme 'Increase frequency or duration' in RQ3. Children spoke positively about the intervention and wanted it to occur more frequently



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*“It just really starts my week off well and makes me really really happy. Yeah, I just wake up and know it’s a really nice day and I get to school and Lego club just makes my day really good.”*

### RQ 3: The importance of rewards

Children experienced positive emotions after receiving extrinsic rewards.

Children enjoyed showing others the rewards they have achieved and spoke about feeling proud when they received rewards, for example *“I quite like them because I feel proud when I get a Lego point.”* However, there was some incongruence in emergent themes relating to rewards, with some themes reflecting positive attitudes and others reflecting confusion or indifference.

Comments such as *“you only got a certificate”* were made by children, suggesting that they were not motivated by the rewards offered.

Research relating to the importance of extrinsic rewards is contradictory. Deci et al. (1999) suggest that tangible rewards undermine and reduce intrinsic motivation, however, Cameron and Pierce (2002) suggest that extrinsic rewards play an important role in developing motivation for tasks that are not inherently interesting. In this study Lego points and certificates were given to reward social behaviour and building (see Appendix 10 for details of the reward system).

Children enjoyed the opportunity to build alone in ‘freestyle’ building, and children preferred not to work with others during this part of the session. The drive to build alone is perhaps stronger than the drive to work towards a Lego point, and thus children chose not to engage in social behaviour in ‘freestyle’ building. However, children described feeling proud when receiving rewards,

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suggesting that extrinsic rewards may play an important role in developing engagement in activities that are not intrinsically motivating. When suggesting ways to improve Lego therapy, children spoke about receiving tangible rewards; one child suggested “Once you’ve built a model you can keep it.” The emergent theme of ‘tangible rewards’ suggest that the reward structure should be adapted to make rewards more motivating. Children expressed the desire to work towards tangible rewards. LeGoff (2004) allowed children to exchange Lego points for rewards such as Lego models. This may have increased the motivation to work towards rewards in his sessions, and consequently children may have been more motivated to engage in social behaviour. LeGoff (2004) found that behaviours eventually occurred even when rewards were not offered, and children began to be motivated by social approval. Children did not comment on social approval in this study and related achievements only to individual accomplishments. It is apparent that some children enjoyed being rewarded for things that they found difficult in this study. However, the rewards offered by the intervention were not sufficient to encourage the children to interact with others when they did not want to. The decision was made not to offer tangible rewards in this study because of monetary implications for schools. However, points could be exchanged for time doing something the children enjoy outside of the session, such as going on the computer or building Lego alone.

Although some of the rewards offered in Lego therapy in this study were dependent on collective group attainment, no children related successes or rewards to group factors. Slavin et al. (2003), when discussing success in

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collaborative learning groups, suggested that rewards are most effective when used to recognise success on both individual and whole group goals. Children did not allude to the fact that they were motivated to attain collective group goals, and they did not appear to be motivated by social approval within the group.

A further theme emerged around uncertainty relating to rewards. There was a sense that children were not certain about behaviour required to achieve certificates and Lego points, or could not remember why they had been given rewards. An implication for this is that rewards are unlikely to have the desired influence on behaviour. Lego points were intended to be awarded only when children built collaboratively in 'freestyle' building, however, children spoke about receiving Lego points regardless of whether they worked together or not. It is important that children are clear about expectations and the behaviour required to achieve rewards. Future Lego therapy groups should ensure that this is made clearer to children, and school staff should be encouraged to adhere to the reward structure.

## **2.5.2 Limitations and Reflexivity**

### **2.5.2.i Methodological limitations**

The literature review highlighted a number of methodological considerations specifically related to gaining the perspective of children with ASC. These included a lack of engagement with the research process, acquiescence and recency effects, poor memory for personal events and a difficulty in answering open questions and expressing personal preferences (Preece, 2002). Research suggests that the validity of responses given is therefore challenged and

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children's responses may not be representative of their true beliefs. Measures were taken to ensure that such effects were minimised, including using visual aids and a task focus, starting with open questions and narrowing down to more closed questions if required, and reassuring children that there were no right or wrong answers. Furthermore, children were given the option to be accompanied by a familiar adult. This study highlighted the need for prompts to elicit information, however, responses were sufficiently detailed to generate themes and conclusions. Data collected from interviews suggest that children were able to express their views and opinions and children made a worthwhile contribution to the research process.

Children's responses may also be affected by a pressure to give 'correct answers' (Fargas-Malet et al., 2010). This point is of particular relevance to this study as the interviewer was present in Lego therapy sessions, and thus familiar to the children. The children may have felt a pressure to give favourable responses in the interview and may not have felt comfortable giving negative responses to the researcher. Researchers have recommended that responses are triangulated with perspectives from others close to the child (Preece & Jordan, 2010), however, the decision was taken not to obtain the perspectives of others in this study. Within a post-positivist paradigm it is recognised that an objective reality can only be known imperfectly (Robson, 2011). Methods were carefully considered to increase the reliability and validity of children's responses, however, the decision was made not to triangulate responses with views of adults. The reason for this was that seeking the perspectives of others would

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merely indicate a difference in perspective rather than an objective truth. Punch (2002) argued that inaccuracies can be seen in adults as well as children and children's responses should be considered to reflect their reality. A method to further increase the validity of responses is respondent validation, in which participants are asked to give their perspective on themes generated. However, it was not feasible to do this in this study because interviews were conducted in the last week of the summer term. Seeking respondent validation after the summer holiday would have reduced the validity of findings, because research suggests that children have poor memory for personal events (Preece, 2002). It is important to recognise that responses given in this study may lack validity, and therefore should not be reported as an objective measure of truth or reality. This study sought to explore factors relating to interest and motivation, and findings should be considered to be illuminative rather than confirmatory.

It is also possible that the visual support cards used in the interviews limited the topics of discussion to the aspects of the intervention that featured in the cards, and therefore limited the emergent themes. However, children were given the opportunity to first answer open-ended questions and picture cards were only introduced when the children required prompts.

A further limitation relates to the composition of the groups in this study. The children were in groups with other children with social communication difficulties, thereby limiting their opportunity for interactions with socially competent peers. This challenges the social inclusion of children participating in the intervention because children were required to spend time away from peers.

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Children spent time outside of the classroom and thus opportunities to engage with other children in the classroom were reduced. Wolfberg and Schuler (1999) argued that collaborative play with more competent peers provides opportunity for practicing more complex forms of play and to further develop skills in imitation. Strain et al. (2011) also suggested that the opportunity to regularly interact with typically developing peers is an important component of intervention programmes. This study did not provide children with the chance to interact with typically developing peers within the intervention, and thus reduced opportunities to utilise peers as agents for change. Preissler (2006) recommended that interventions for children with ASC should utilise typically developing peers to enable modelling of appropriate social behaviour and to enable children to practice skills. Furthermore, Smith and Gilles (2003) suggest that it is important to teach social skills in the environment in which skills are ordinarily required, particularly for children with social difficulties. It was suggested that acquisition, maintenance and generalisation is further promoted when skills are taught in naturalistic environments (Smith & Gilles, 2003). Collaborative play should thus occur in the environment in which skills would be required, and with socially competent peers. Use of peers without AS would provide greater opportunities for learning and practicing more complex social skills. It would also promote social inclusion within the school environment, and provide opportunities for authentic collaboration.

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### 2.5.2.ii Reflexivity and bias in qualitative analysis

This study was conducted within a post-positivist paradigm, and thus recognised that the background knowledge, theories, hypotheses and values held by the researcher can influence and bias their interpretation of the data gathered (Reichardt & Rallis, 1994).

It is possible that the interpretation of the findings has been inadvertently biased by the researcher's personal investment in the intervention. Possible sources of bias and subjectivity in qualitative analysis include ignoring information that conflicts with hypotheses, over or under-reacting to information, and inconsistency in analysis (Robson, 2011). Measures were taken to overcome the possibility of bias; the philosophical assumptions upon which the analysis was based were clearly stated, the researcher acknowledged their role in the study, and a colleague of the researcher analysed one interview transcription for initial codes.

Measures were also taken to ensure that the data were analysed objectively and without bias. One transcription was shared with a colleague of the researcher to ensure that the initial codes were valid. The transcription was analysed by both raters independently, then compared and discussed. A comparison of coded extracts from both raters can be found in Appendix 37. It is possible that coding could have been affected by researcher bias as the analysis progressed; however, unfortunately it was not feasible for all data to be coded by an additional rater.

Braun and Clarke (2006) discussed the need for researchers to remain reflexive throughout the process of thematic analysis. It is also important to outline

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potential sources of bias to ensure transparency. It was therefore important to consider potential sources of bias within myself, through being reflexive about my role in the research. I ensured that I remained consciously aware and reflexive throughout the entire research process. Lego therapy was chosen as the topic for my doctoral research due to a professional interest in ASC. My interest has stemmed from a previous role working as an Applied Behaviour Analysis (ABA) tutor, and my current role as a trainee EP supporting a large number of children with ASC in mainstream schools. Working with children in schools in the local authority highlighted a need for a greater range of quality, evidence-based interventions that can be delivered within the school environment.

Aside from the time invested in delivering the programme, I have no investment in the intervention. However, the intervention was already established in 11 schools in the local authority. Lego therapy is currently delivered to schools in the Local Authority, despite there being no research evidence to evaluate its effectiveness when delivered outside of the clinic. Consequently there may be an implicit pressure to demonstrate effectiveness of the intervention. I ensured that I remained consciously aware of this pressure throughout the research process, in order to minimise the chances of it inadvertently biasing my interpretation of the findings.

### **2.5.3 Future Considerations and the Role of the Educational Psychologist**

Educational Psychologists are ideally placed to support schools to meet the needs of pupils with Asperger syndrome. Educational Psychologists commonly recommend interventions to support children, and provide training to staff so



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that staff can deliver interventions in school. A number of implications have arisen from the emergent themes, and these should be considered when implementing the intervention in the future. Implications relate to both the structure and delivery of the intervention, and are presented in Table 17.

This study highlighted ways in which the intervention could be developed in order to promote motivation to engage in collaborative Lego play. Emergent themes suggest that children had an interest and ability in Lego, but were more motivated by 'freestyle building'. 'Building sets with instructions' was a barrier to engagement, and children preferred the creative aspect of freestyle building. Freestyle play enables more creative and naturalistic play, whilst providing opportunities to facilitate social interaction. The emergent theme of Lego as a strength and interest suggests that Lego is an appropriate medium through which to promote engagement in interaction. However, motivation to participate in collaborative play may be further promoted through the use of Lego in naturalistic play. The guidance provided to activity leaders could be applied to naturalistic play, in order to facilitate appropriate and positive social interactions. Further emphasis should be placed on supporting TAs to facilitate conflict resolution within the groups, to maximise the opportunity that conflicts provide for such learning, and to promote social cohesion within the group. Group composition should also be carefully considered in order to include socially competent peers. This would promote social inclusion and enable more complex social skills to be practiced and modelled.

Future research should further address the importance of rewards in promoting interest and engagement in interventions. This study has indicated that some children enjoyed receiving rewards but some showed little interest. Emergent themes suggested that rewards were administered inconsistently and children lacked an understanding of behaviours which would result in rewards. It is important to consider the impact of rewards on motivation. This study suggests that whilst children spoke positively about interactions with others, children were inherently interested in building alone when they had the opportunity to do so. Further research could explore the impact of rewards on motivation to engage in social behaviours, when rewards are of greater interest to children.

Table 14: Future considerations

<b>Future considerations</b>	
<b>Structure and design of the intervention</b>	<b>Delivery of the intervention</b>
<b>Clearly defined rewards, with expectations of behaviour expected for rewards detailed in the training manual</b>	<p>Expectations of behaviour required to achieve rewards are clearly communicated to group members</p> <p>Rewards are given consistently and in line with expectations of behaviour for rewards</p>
<b>Building alone in ‘freestyle’ building is inherently rewarding, and extrinsic rewards offered do not compensate for difficulties experienced building together. Tangible rewards for Lego points could be incorporated into the reward structure</b>	<p>There is a need to ask children what they find rewarding to ensure they are motivated by rewards. Children should be encouraged to work towards tangible rewards.</p>
<b>The intervention is based upon strengths and inherent interests of children, and children are willing to overcome challenges associated in engaging with others when it is through the medium of Lego, However, Use of Lego sets for collaborative building tasks reduced</b>	<p>It is important to ensure that children are inherently interested in Lego initially. The child’s perspective should be sought before the intervention commences</p> <p>Emphasis should be placed on facilitation of interaction within naturalistic Lego play</p>

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**interest and engagement in Lego, and increased frustrations and conflict.**

rather than through a structured intervention with Lego sets. Naturalistic Lego play should occur in the environment in which social skills would ordinarily be required, in order to promote generalisation.

**Swapping roles regularly should be built into the programme. Children had the option to decide how often to take turns and this resulted in children staying in one role for too long**

The facilitator should prompt children to swap roles regularly

**Group dynamics can be detrimental to both intrinsic motivation to participate in the programme and willingness to engage in interactions with others**

Group dynamics should be considered when setting up the group. Dynamics should be monitored as the intervention progresses to ensure that children have the opportunity to experience successful and rewarding interactions with others

Training in facilitation should place more emphasis on conflict resolution

Group composition should include typically developing peers to increase inclusion, to promote modelling of appropriate behaviour, and to reduce conflicts in groups

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## Conclusions

This research study explored Lego therapy as an intervention to promote social competence in children with Asperger syndrome. The first study explored outcomes in social competence following participation in Lego therapy and programme fidelity when the intervention was delivered by school staff. The second study focused on the perspective of the child, and aimed to explore how aspects of the intervention affected the children's interest and engagement.

The first study explored the feasibility of Lego Therapy as a school based intervention, using programme fidelity measures. Programme fidelity data suggest that most aspects of the programme were adhered to in the majority of sessions. However, there were some aspects that were adhered to less frequently, and these tended to relate to a shortage of time in sessions. The items '*giving summary, praise and certificates*' and '*a minimum of 15 minutes 'freestyle' building*' from the session checklists were adhered to 72% and 75% respectively. Emergent themes from the second study suggest the importance of adhering to these particular aspects of the intervention. 'Freestyle' building emerged as one of the aspects that children were most motivated by, and themes from RQ2 suggest that rewards were given inconsistently or incorrectly. Emergent themes highlight the importance of incorporating both of these items into sessions. These aspects occur towards the end of each session, suggesting that these aspects may not have occurred in sessions when there was insufficient time. The duration of the intervention was reduced from 60 minutes to 45 minutes in this study to reduce disruption to learning within the school day.

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Themes from the second study suggest that sessions should last a minimum of 60 minutes, in order to maintain fidelity to the programme and ensure motivating aspects of the programme occur.

Changes in social competence were explored in study one. This study demonstrated significant increases in adaptive socialisation after participation in Lego therapy. Increases in adaptive socialisation confirm similar findings seen in previous research (LeGoff, 2004; Owens et al., 2008), despite the intervention only occurring for 8 weeks rather than 18 weeks (Owens et al., 2008), 24 weeks (LeGoff, 2004) or 36 weeks (LeGoff, 2006). However, conclusions cannot be drawn with regards to whether such changes would have occurred without intervention due to a lack of comparison group. No effects on adaptive communication or frequency or duration of social interaction were found. It can be concluded that Lego therapy did not have an impact on the playground behaviour of children in this study, and therefore the intervention did not successfully promote the generalisation of skills into other settings. Findings from this study highlighted a need for the intervention to be modified to promote maintenance and generalisation. Ways in which social competence could be promoted in the school environment were discussed.

Findings from the second study informed suggestions about ways to develop the intervention, in order to promote interest and engagement. This study utilised the voice of the child in order to inform explore theoretical concepts and identify ways in which the intervention could be adapted. Children with AS are underrepresented in research, despite the United Nations Convention on the

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Rights of the Child (United Nations, 1989) recommendations. The United Nations Convention on the Rights of the Child recommended that children have the right to be consulted on matters that directly affect them. This study sought to ensure that methods enabled children to communicate their perspective, and their perspectives were incorporated into recommendations for the future of Lego therapy. The perspective of the child provided valuable insights into the children's interest, engagement and motivation. Emergent themes suggested that children were found to be inherently interested in Lego and experienced positive social interactions with sessions. Children were highly motivated by 'freestyle' building, and despite enjoying aspects of collaborative building, children enjoyed the opportunity to build alone. Children also experienced social difficulties within the group, sometimes to the extent where it negatively affected their perception of the programme. It is apparent that children held a positive perception of being rewarded, although were not always motivated by the rewards offered and did not fully understand what they needed to do to obtain rewards. This study highlighted the importance of seeking the perspective of the child when engaging them in research. While previous studies have highlighted methodological difficulties when eliciting the views of children with ASC, this study has demonstrated that children were able to express their opinions and suggest feasible ways to make the intervention more interesting and enjoyable. Consulting with children is fundamental to promoting individual engagement, and the process should be embedded within programmes designed to promote social competence in children.

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Emergent themes from the second study suggest that children perceive Lego to be inherently interesting, and thus has the potential to engage children with AS in interactions that they may not find interesting otherwise. However, there is a need to further develop the use of Lego to increase motivation to participate and maintenance and generalisation of skills. Children were more motivated to engage in more naturalistic free style Lego play, and use of Lego sets restricted creative play and was a barrier to interest and engagement. This study discussed ways in which social skills may be developed in more naturalistic settings.

Research suggests that social skills should be taught, facilitated and reinforced in naturalistic environments with appropriate peers. This study suggested a way to incorporate Lego into such an approach, enabling the development of social skills within naturalistic settings whilst promoting engagement through use of Lego as a medium. Literature suggests that use of typically developing peers would promote social inclusion and provide opportunities for practicing and modelling social skills. Further research should therefore focus on redefining the intervention, to focus on developing methods of promoting social skills and competence in naturalistic environments such as the classroom, with typically developing peers. Single case study designs would be an appropriate way to develop and define methods and further large scale experimental research is not warranted on the basis of this study.

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## Appendices

### Appendix 1 Initial contact to schools

Dear (insert name)

I am a Doctoral Trainee Educational Psychologist working for (Local Authority) Community Educational Psychology Service. I am conducting a research project exploring Lego therapy as a social skills intervention for children with an Autism Spectrum Condition, and would like to invite your school to be part of this exciting research.

Lego therapy teaches social skills to children through collaborative, facilitated Lego play. The intervention has been adapted to be run by Teaching Assistants within the school environment. This research aims to measure the effectiveness of Lego therapy on developing social competence in children with autism, when the intervention is delivered within the school setting. Previous research has found increases in social communication, turn-taking, and frequency and duration of social interactions after participation in Lego therapy. I have attached some additional information about Lego therapy for your information.

I am looking for a sample of approximately 8-10 primary schools in (Local Authority) to participate. As part of the sample group you will receive:

- Full training in how to deliver Lego therapy. This is free of charge and can be delivered in school to a number of support staff. Lego therapy can then be utilised as a social skills intervention across the school, even after the research has finished. The training will last approximately 2 hours
- Support in implementing and delivering the sessions throughout the research period. This support aims to build confidence in the staff who are delivering the project, to enable them to feel comfortable delivering the intervention independently.
- Resources to enable you to deliver Lego therapy to the group identified for the research
- Feedback about the results of the research

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Participation in the project would require:

Identification of 2 or 3 children in KS2 with Asperger syndrome/high functioning autism (Although you may select up to 6 children to participate)

Allocating 1 TA to run the Lego club. The intervention will run for 8 weeks from May-July. Lego club can occur at any point throughout the day, including lunchtime, and should last for 45 minutes.

The class teacher of the identified children to complete a questionnaire at 4 time points between February and September. The Questionnaire takes approximately 10 minutes to complete.

I will also need to complete four observations of the identified children on the playground. Schools will not be required to do anything in preparation for these observations. You will receive plenty of notice of when these observations will occur, and permission will be sought from the parents of the children by the researcher.

If you would like to register your interest for this opportunity, or have any questions, please contact me by email or telephone by 24<sup>th</sup> February. Places are limited so will be considered on a first come, first served basis.

I look forward to hearing from you,



Ellie Brett

Doctoral Trainee Educational, Child and Community Psychologist

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## Appendix 2 Participant inclusion criteria

The selection criteria for inclusion were as follows:

- Age 6-11, in accordance with participant age range in Owens study (2008)
- Ability to speak in phrases, as a degree of language is required for successful participation in Lego therapy (Owens, Granader, Humphrey, & Baron-Cohen, 2008)
- Not currently receiving support for social skills
- A diagnosis of Asperger syndrome or high functioning autism, in accordance with participant characteristics selected in previous research (Owens et al., 2008)
- No previous SALT involvement, to ensure HFS/AS not autism
- A score of 15 or above on the Social Communication Questionnaire, to verify the medical diagnosis of autism (Rutter, Bailey, & Lord, 2003)
- Fine motor skills sufficient to manipulate small Lego pieces



### Appendix 3 Background questionnaire

<b>Background Information:</b> To be completed by parent/carer	
Child's name:	
Date of Birth:	
Year group at school (please circle)	2 3 4 5 6
Does your child have a medical diagnosis of Asperger syndrome or high functioning autism	YES/NO
If you answered yes, please provide details of when the diagnosis was made (approximately, eg. month and year) and by who (eg. Paediatrician at ....). If you are unsure please leave blank	
Does your child have any medical/educational diagnoses in addition to the above?	YES/NO Please detail:
Can your child speak in phrases?	YES/NO
Is your child currently receiving speech and language therapy support? If you are unsure please leave blank Name of speech and language therapist:	YES/NO
If your child has received speech and language therapy support in the past please provide an estimate of when they were discharged from the service	YES/NO Discharged:
Is your child taking any medication? Please provide details if you are happy to.	YES/NO Details:
Is your child currently receiving support or intervention for social skills? (If you are unsure please leave blank)	YES/NO Please detail:
Has your child received support or intervention for social skills in the past?	YES/NO Please detail:
Has your child received any other medical or educational interventions or programmes (related specifically to a diagnosis of autism/Asperger syndrome)?	YES/NO Please detail:
<p>Thank you for your time. Please return in the enclosed S.A.E.          If you have any questions please contact Ellie Brett          Ellie.brett@(localauthority).gov.uk</p>	

#### Appendix 4 Participant characteristics

Child ID	School	Age at Phase 1 (months)	Age at Phase 2 (months)	Age at Phase 3 (months)	Age at Phase 4 (months)	Diagnosis	NC Year	Other diagnoses	SALT involvement	Speaks in phrases	Social skills intervention at present	Social Communication Questionnaire Score
1	1	99	101	103	No follow up	AS	3	NO	NO	YES	NO	30
2	1	91	93	95	No follow up	AS	3	NO	NO	YES	NO	17
3	2	131	133	135	137	AS	6	ADHD	NO	YES	NO	16
4	2	113	115	117	119	AS	4	ADHD	NO	YES	NO	27
5	3	120	122	124	126	AS	5	NO	NO	YES	NO	24
6	4	90	92	94	96	AS	3	Dyspraxia	NO	YES	NO	25
7	5	98	100	102	104	AS	3	NO	NO	YES	NO	33
8	6	96	98	100	102	AS	3	NO	NO	YES	NO	19
9	6	120	122	125	127	AS	5	NO	NO	YES	NO	26
10	7	120	122	124	No follow up	AS	5	NO	NO	YES	NO	15
11	7	82	84	86	No follow up	AS	2	NO	NO	YES	NO	22
12	8	114	116	118	No	AS	5	NO	NO	YES	NO	15

Child ID	School	Age at Phase 1 (months)	Age at Phase 2 (months)	Age at Phase 3 (months)	Age at Phase 4 (months)	Diagnosis	NC Year	Other diagnoses	SALT involvement	Speaks in phrases	Social skills intervention at present	Social Communication Questionnaire Score
					follow up							
13	9	133	135	137	No follow up	AS	6	Dyspraxia	NO	YES	NO	24
14	2	117	119	121	123	AS	5	NO	NO	YES	NO	27

**Statistics**

	Age in months	SCQ score
N	Valid	14
	Missing	0
Mean	108.86	22.86
Median	113.50	24.00
Std. Deviation	16.009	5.723
Range	51	18

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## Appendix 5 Initial contact with confirmed schools

Date: 21<sup>st</sup> February 2012  
Contact: Ellie Brett  
Phone:  
Email: Ellie.brett@(localauthority).gov.uk

Dear (insert name),

Thank you for volunteering to take part in the Lego therapy research project. As discussed on the phone, parental consent is required in order for the children to participate in the research. For each of the children I have enclosed:

- Lego therapy information for parent/carer (s)
- Parental consent form (signature required)
- Background questionnaire for parent/carer (s)
- School consent form
- Social Communication Questionnaire for parents to complete

The research has ethical approval from the Graduate School of Education Ethics Committee at the University of Exeter. Unfortunately the project cannot commence until consent forms have been signed by both the parent of the child and the school.

The time-scales for the data collection and the data sets that will be collected at each time are as follows:

<b>Data type</b>	<b>Data collection (week commencing)</b>
Baseline data- Playground observation and completion of teacher scales	5 <sup>th</sup> March
TAs/School staff to receive training between 19 <sup>th</sup> March-27 <sup>th</sup> April	
Pre-intervention data-Playground observation and completion of teacher scales	30 <sup>th</sup> April
Lego therapy intervention runs for 8 school weeks, 30 <sup>th</sup> April-6 <sup>th</sup> July	
End of Intervention data- Playground observation and completion of teacher scales	9 <sup>th</sup> July
Child's perspective gathered (if child willing)	9-16 <sup>th</sup> July
Follow up data gathered to see if gains maintained- Playground observation and completion of teacher scales	10 <sup>th</sup> September

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The purpose of the Social Communication Questionnaire is to verify the clinical diagnosis. It should be completed by parents and returned to school with the signed consent form.

Unfortunately, if a child is not thought to meet the research criteria they will not be able to participate in the research. If this occurs, the child will be able to take part in Lego therapy still but no data will be collected for research. Once the child's eligibility is confirmed the observation data and teacher rating form data will be collected.

The initial playground observations will be conducted between 5<sup>th</sup> and 9<sup>th</sup> March ideally, and during lunchtime or break time. Schools are not expected to do anything in preparation of these observations; the observation is of the child in their school environment and should be as natural as possible.

Please could the consent forms be signed and ready for me to collect when I come into school week commencing 5<sup>th</sup> March. Please accept my apologies for the tight time scale in obtaining consent from parents; if it is not going to be possible in this time scale please get in touch with me to discuss further.

Please get in touch if you have any questions at any point throughout the research.

Yours Sincerely,



Ellie Brett  
Doctoral Trainee Educational Psychologist

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## Appendix 6 Initial letter to parents

Date: 23rd February 2012  
Contact: Ellie Brett  
Phone:  
Email: [Ellie.brett@\(localauthority\).gov.uk](mailto:Ellie.brett@(localauthority).gov.uk)

Dear Parent

I am a Doctoral Trainee Educational Psychologist working for (local authority) Community Educational Psychology Service. I am conducting a research project exploring Lego therapy as a social skills intervention for children with Autism Spectrum Conditions, and would like to invite your child to be part of this exciting research.

Lego therapy teaches social skills to children through collaborative, facilitated Lego play. The intervention has been adapted to be run by Teaching Assistants within the school environment. This research aims to measure the effectiveness of Lego therapy on developing social competence in children with autism, when the intervention is delivered within the school setting. Previous research found increases in social communication, turn-taking, and frequency and duration of social interactions after participation in Lego therapy. I have attached some additional information about Lego therapy for your information.

Your child's school is participating in the research, and would like your permission to select your child as a potential participant for the research. I have attached a parental consent form for you to complete should you wish your child to take part.

I would also be grateful if you could fill in the enclosed background questionnaires. Data from these questionnaires will remain confidential, and will be analysed only for the purposes of research. Please return the attached forms to school by March 5th.

Please do not hesitate to contact me if you have any questions or if you require any further information.



Ellie Brett  
Doctoral Trainee Educational, Child and Community Psychologist

## What is Lego Therapy?

Lego therapy is a social skills intervention designed for use for children with Autism Spectrum Conditions (ASC, also commonly referred to as ASD). Lego therapy aims to develop social skills in children through facilitated, collaborative Lego play.

### Key Principles

- Collaborative Lego play between 3 children
- Group Lego play provides opportunities for social interaction, turn taking, joint attention, social communication and problem solving. A trained adult facilitates the development of such skills
- A session lasts 45 minutes, and consists of 30 minutes structured Lego play (building a Lego set with instructions) and 15 minutes 'freestyle building'. In freestyle building the children design and build an object together. This encourages communication of ideas, perspective taking and compromise.
- Group rules are developed and followed by group members
- Each child is assigned to the role of an 'engineer', a 'supplier' or a 'builder'.
  - The engineer is given a set of directions, and is required to instruct the builder.
  - The builder constructs the Lego set
  - The supplier provides the builder with the required pieces.
  - The children change roles throughout the sessions. The assignment of roles allows the children to practice social interactions in a safe environment, and encourages the development of skills essential for social interaction.

And most importantly, the children enjoy themselves. Lego therapy is thought to be so successful because the children are motivated to take part, and enjoy being part of the Lego group. This enables social skills to be taught indirectly through collaborative Lego play.

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## Who is Lego Therapy suitable for?

Previous research has demonstrated the effectiveness of Lego therapy for children with autism, who are able to communicate verbally and do not show impairments in cognitive functioning. Such children are often diagnosed as having Asperger's syndrome or high functioning autism. As Lego therapy is a relatively new intervention, there is yet to be research conducted which measures the effectiveness of Lego therapy on children with a greater degree of autism severity. Therefore the intervention is currently recommended for children with higher functioning autism, although it may be beneficial for children across the autism spectrum.

### Previous research

Lego therapy was first devised by Psychologist Dan LeGoff in 2004. It has since been researched by the autism research centre in Cambridge (Owens, Granader, Humphrey, and Baron-Cohen, 2008).

Previous research has shown increases in social skills and communication in children after participation in Lego therapy. However, in previous research Lego therapy was delivered in a clinical setting.

Lego therapy is designed to be suitable for delivery in a school setting. It is a low cost intervention and is easy to implement. The proposed research aims to investigate if social skills and communication increase in children after participating in Lego therapy in school.

### References:

LeGoff, D. B. (2004). Use of LEGO® as a therapeutic medium for improving social competence. *Journal of Autism and Developmental Disorders, 34*(5), 557-571.

LeGoff, D. B., & Sherman, M. (2006). Long-term outcome of social skills intervention based on interactive LEGO® play. *Autism, 10*(4), 317-329

Owens, G., Granader, Y., Humphrey, A., & 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 and developmental disorders, 38*(10), 1944-1957.



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**Appendix 8 Parental consent form (study one and two)**

**PARENTAL CONSENT FORM**

Information Brief: Lego Therapy

Researcher: Ellie Brett

Role: Trainee Educational Psychologist and Doctoral student in Educational, Child and Community Psychology (The University of Exeter)

Contact: [ellie.brett@\(localauthority\).gov.uk](mailto:ellie.brett@(localauthority).gov.uk) Tel:

Please consider the following information carefully, and sign the paper overleaf if you consent to your child participating in the proposed research.

The research project aims to evaluate the effectiveness of Lego therapy as a social skills intervention for children with Autism Spectrum Conditions (ASC).

Data will be collected in a number of ways:

- Background information completed by yourself in the attached questionnaire
- Playground observations, occurring on four occasions throughout the research project and lasting 20 minutes each. You will be informed of the dates of these observations. Please note, 10% of all observations will be conducted by an additional researcher alongside the researcher named above. This is to ensure that the observations are consistent and reliable. The additional researcher will also be an employee of Cambridgeshire Community Educational Psychology Service.
- Standardised questionnaire data, completed by yourself at the start of the research project and by the child's class teacher on four occasions throughout the research period.
- Questionnaire data collected from the TA that will be delivering the Lego therapy

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The research also aims to gain an understanding of the child's perspective through a brief interview if the child is willing. Interviews will be recorded and the copies of the recordings and any transcriptions will be securely stored by the researchers

All data collected will be securely held only by the researchers and personal details will be securely destroyed once the data has been analysed. No individual children will be identifiable except to the researchers. Participation is entirely voluntary and the child and/or their data can be withdrawn from the research at any time. Data collected will be analysed to allow the researcher to determine the effectiveness of Lego therapy as a school based social skills intervention for children with ASC. All participants and their parents/carers will receive a letter at the end of the project explaining the overall findings.

The researcher's contact details can be found at the top of this letter. If have any questions or concerns throughout the research process please do not hesitate to contact the researcher directly.

Please note the University guidelines on data protection:

*"The information you provide will be used for research purposes and your personal data will be processed in accordance with current data protection legislation and the University's notification lodged at the Information Commissioner's Office. Your personal data will be treated in the strictest confidence and will not be disclosed to any unauthorised third parties. The results of the research will be published in anonymised form."*

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**Parental Consent form: Lego Therapy**

I have been fully informed about the aims and purposes of the project.

I understand that:

- My child’s participation in this research project is entirely voluntary, and, if I do choose to consent to their participation, I may withdraw their participation at any stage in the research
- Any information which is gathered by the researcher(s) will be used solely for the purposes of this research project, which may include academic publications
- Any information gathered by the researcher(s) may be shared between any of the other researcher(s) participating in this project in an anonymised form
- All information gathered will be treated as strictly confidential, and will be stored securely throughout the research process
- At the end of the research process all data gathered will be destroyed securely
- The researcher(s) will make every effort to preserve the anonymity of participants
- If I have any concerns about my child’s well-being which relate to their participation in the research I will share them with the researcher and the school

.....  
(Signature of parent/carer) (Date)

If you have any concerns about the project that you would like to discuss,  
please contact: Ellie Brett (ellie.brett@(localauthority).gov.uk)

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## Appendix 9 School consent form (study one and two)

### CONSENT FORM

#### Information Brief: Lego Therapy

Researcher: Ellie Brett

Role: Trainee Educational Psychologist and Doctoral student in Educational, Child and Community Psychology (The University of Exeter)

Contact: [ellie.brett@\(localauthority\).gov.uk](mailto:ellie.brett@(localauthority).gov.uk) Tel:

Please consider the following information carefully, and sign the paper overleaf if consent to (child name) participating in the proposed research.

The research project aims to evaluate the effectiveness of Lego therapy as a social skills intervention for children with Autism Spectrum Conditions (ASC).

Data will be collected in a number of ways:

- Background information completed by parent/guardian
- Playground observations, occurring on four occasions throughout the research project and lasting 20 minutes each. You will be informed of the dates of these observations. Please note, 10% of all observations will be conducted by an additional researcher alongside the researcher named above. This is to ensure that the observations are consistent and reliable. The additional researcher will also be an employee of (local authority) Community Educational Psychology Service, and will hold an enhanced CRB certificate.
- Standardised questionnaire data, completed by parents at the start of the research project and by the child's class teacher on four occasions throughout the research period.
- Questionnaire data collected from the TA that will be delivering the Lego therapy

---

The research also aims to gain an understanding of the child's perspective through a brief interview if the child is willing. Interviews will be recorded and the copies of the recordings and any transcriptions will be securely stored by the researchers.

All data collected will be securely held only by the researchers and personal details will be securely destroyed once the data has been analysed. No individual children will be identifiable except to the researchers. Participation is entirely voluntary and the child and/or their data can be withdrawn from the research at any time. Data collected will be analysed to allow the researcher to determine the effectiveness of Lego therapy as a school based social skills intervention for children with ASC. All participants, their parents/carers and schools will receive a letter at the end of the project explaining the overall findings.

The researcher's contact details can be found at the top of this letter. If have any questions or concerns throughout the research process please do not hesitate to contact the researcher directly.

Please note the University guidelines on data protection:

*"The information you provide will be used for research purposes and your personal data will be processed in accordance with current data protection legislation and the University's notification lodged at the Information Commissioner's Office. Your personal data will be treated in the strictest confidence and will not be disclosed to any unauthorised third parties. The results of the research will be published in anonymised form."*

---

### School Consent form: Lego therapy

I have been fully informed about the aims and purposes of the project.

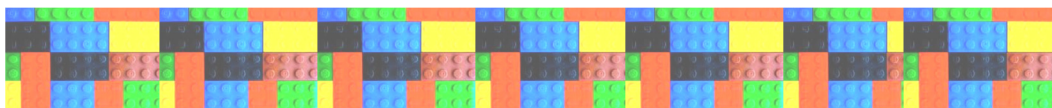
I understand that:

- The child's participation in this research project is entirely voluntary, and, if I do choose to consent to their participation, I may withdraw their participation at any stage in the research
- Any information which is gathered by the researcher(s) will be used solely for the purposes of this research project, which may include academic publications
- Any information gathered by the researcher(s) may be shared between any of the other researcher(s) participating in this project in an anonymised form
- All information gathered will be treated as strictly confidential, and will be stored securely throughout the research process
- At the end of the research process all data gathered will be destroyed securely
- The researcher(s) will make every effort to preserve the anonymity of participants
- I will share any concerns about a child's well-being which relates to their participation in the research with the researcher

Child's name:	
School:	
Signed:  (Head teacher of school)	Print name:  (Head teacher of school)
Signed: (Class teacher of above named child)	Print name:(Class teacher of above named child)

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## Appendix 10 Lego Therapy training booklet



# Lego Therapy training

## Outline of training

- Introduction to Lego therapy
- Theory and previous research
- Session structure and implementation
- Building with instructions
- Freestyle building
- The role of the activity leader
- Lego club rewards
- Monitoring and behaviour

## 1. What is Lego Therapy?

Lego therapy is a play based social skills intervention, for children with ASC. Social skills are taught and modelled through collaborative, small group Lego play.

Children are given roles to play in the group, and social skills and social problem solving are facilitated by an adult. Group members are expected to follow group rules, and can collectively work towards certificates.

## Aims of Lego Therapy

- To promote the development of social, communication & play skills
- Uses children's strengths to develop these areas of weakness
- To improve social competence enabling children to sustain lasting friendships and reach their potential

## Background Theory and Research

Lego is based on the theory of Systemizing (Baron-Cohen). Baron-Cohen suggested that children with ASC are attracted to activities that are predictable and controllable (e.g. Machines, mathematics, computers- 'systems'). Lego is predictable, so appeals to the strengths and interests of children with ASC.

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LeGoff (2004,2006), Owens et al (2008)

Clinic based research demonstrating the effectiveness of Lego in developing social skills in children with Asperger syndrome (AS)/high functioning autism (HFA)

- LeGoff (2004): 6-16 year olds, 12-24 weeks with control group. Improvements were seen in measures of social ability
- LeGoff (2006): Measured long term outcomes. After three years those receiving Lego showed significantly greater improvements in social skills
- Owens, Granader, Humphrey, & Baron-Cohen (2008) ARC in Cambridge. Compared Lego to Sulp, 18 weeks 6-11 years with AS/HFA. Found improvements in socialisation after Lego therapy intervention.
- Proposed research: Exploring use of Lego therapy in schools and measuring changes to social competence in children with AS/HFA

## **2. Implementing Lego Therapy**

Overview:

- 1 TA: 3 children with ASC
- Same children each week
- Identify time slot. Lego therapy is a weekly intervention, min 45 mins per session
  - 30 mins building a Lego set. Children play roles of builder, engineer and supplier, and are required to follow instructions for set
  - 15 minutes collaborative 'freestyle' building in group
- 8 weeks of intervention
- Same room each week

### **Rules**

It is important that children are aware of the rules of Lego Club so that the session can be beneficial for all group members. Rules should be on display each session so they can be referred to if rules are broken.

1. Build things together.
2. If it gets broken, fix it or ask for help.
3. If someone else is using a piece, ask first (don't take it).
4. Use indoor voices.
5. Use polite words.
6. Sit nicely (keep your hands and feet to yourself)
7. Tidy up and put things back where they came from.
8. Do not put LEGO® in your mouth.

The children can also add their own rules if there are extra things they consider to be important.



---

Rules can be reinforced using a Social Story™ or Comic strip Conversations about LEGO® (See handout)

### **The introductory session**

1. Welcome to LEGO Club. Discuss what Lego group is about.
2. Introductions; take a digital photo of each individual & whole group and adult. Display on notice board, in an individual scrapbook or a group scrapbook.
3. Discuss rules together; group can have individual copies
4. Discuss what you will be doing in the group – 2 parts to a session
  - a. Focus activity (model building)
  - b. Freestyle building/free play
5. Discuss when the group will happen, time and place
6. Naming the bricks activity to develop the language of Lego

### **Running the group: structure of sessions**

1. Initial greeting (with names)
2. Discussion of activities for session
3. Overview of rules
4. Role assignment and task assignment
5. Building with instructions
6. Freestyle building
7. Children tidy up
8. Summary/certificates/goodbye

### How to decide allocation of roles:

- Allocation of roles provides opportunity for social problem solving and turn-taking
- Roles can be swapped between or within sessions
- TA to prompt children to make a decision appropriately, e.g. ‘everyone wants to be the builder today, how can we make sure it is fair?’  
e.g.
  - Draw from hat
  - Paper scissors stone
  - Rota system

Role cards should be placed in front of the child so they know who is who.

Roles:

- Engineer - reads instructions
- Supplier- sorts and finds bricks (possibly take photographs through session)
- Builder - builds the model

---

## Building with Instructions

Once roles have been allocated the building can begin.

Building with instructions aims to develop:

- Joint attention
- Collaboration
- Communicating ideas
- Compromise
- Joint problem solving
- Turn taking
- Sharing
- Enjoyment
- Good listening

### Tips:

1. Encourage members to stick to their own roles
2. All members of the group should be encouraged to jointly problem solve (e.g. if pieces have been placed incorrectly, if rules have been broken, or if social difficulties have arisen)
3. The supplier has the least active role in the group. The supplier may also like to take photographs of the building (up to 4 photos per session)
4. Remind children that they will all get a chance to play each role
5. Build small sets in the first few sessions so that children can see the completed model and experience success
6. Allow the sessions to be as child-led as possible
7. Monitor group dynamics and highlight problems early on in the programme

*Group activity: In groups of three, allocate roles within the group and begin to build a Lego model. Don't forget to follow the instructions and work according to your role.*

### The role of the Activity Leader

**Facilitate rather than direct:** prompt children to come up with their own ideas and solutions as a group

**Reinforcing rules** "I think a rule has just been broken, what rule do you think has been broken?"

---

**Facilitating appropriate social interaction** “When someone helps you what would be a nice thing to say to them?” “What would be a nicer way of asking?”

**Praise** for appropriate social behaviour

**Modelling appropriate behaviour:** Using appropriate language, saying positive things to group, showing them how to ask nicely

**Facilitating social problem solving** “John is upset because Lucy snatched the brick from him. What could we do to make this better? What would be a better way for Lucy to get the brick she needs next time?” Encourage the children to take responsibility to social problem solving, and encourage role play to teach appropriate behaviour.

**Rewards:** Encourage children to work towards rewards (see later section on Lego certificates)

**Noticing and commenting**

“I noticed how nicely you asked Toby for the brick then”

“You just said something really positive to Toby then, well done”

“I’ve noticed how well you’ve all got on today..You’ve spoken politely to each other and you’ve built a really lovely model”

Additionally:

-Completing the attendance register

There is a section on the attendance register that give you space to comment upon:

- Any Behaviour issues?
- Any time out given
- Positives
- Milestones/developments

-Checklist/prompt sheet (see handout). It is important that the sessions are carried out consistently across weeks, and across schools that are participating in the research. The checklist is there to help you do this. Please complete it as honestly as possible!

**Part 2: Freestyle building**

Children may need suggestions about things that they can build....houses, planes, cars, monsters, dinosaurs.... Some pictures would help to prompt ideas if children find this difficult. Freestyle building aims to develop:

- Communicating ideas
- Taking into account other’s ideas
- Compromise
- Explaining opinions/views

- 
- Dealing with competition
  - Thinking about the good points in others' designs

### **Freestyle building:**

- 15 minutes
- No instructions, no set
- Working in pairs or three
- Children may prefer to play alone initially-encourage to play together but allow individual play in first sessions
- Give reminders of time

### **Lego Club rewards**

Lego club rewards can be given to the group when the activity leader thinks is appropriate. Certificates aim to motivate children to work together, and can be given to individuals or whole group.

#### **Helper**-give after 1 or 2 sessions

- Can pre-sort pieces, helps tidy up and clean room, sorts freestyle pieces, checks set against instructions

#### **Builder**-give when they can construct moderate sets together (100+ pieces)

**Creator**-give when they can create a freestyle creation with help from other children

#### **Master**-Given when a child can lead a group project

- Child to co-ordinate construction of a freestyle project, assign roles of builder and supplier and direct project

#### **Genius**-Given rarely

- Child shows leadership skills in directing a Lego film. To achieve certificate child must write a movie script, presenting idea to group, translate script into film and direct filming.

### **Practicalities**

- Dismantling- take photographs of completed sets for the display board/scrapbook, and explain that Lego sets will be dismantled.
- Freestyle builds can run week to week
- Storage of Lego?
- If a child is off sick the session can run with two children- the adult can play the role of the supplier

- 
- If possible, arrange for someone else who has had training to cover a session if activity leader is absent

### **Behaviour**

First and foremost, follow behaviour policy in school to ensure consistency.

If behaviour is problematic to the group, and Lego rules are consistently broken:

- Children could be given a short period of time out, preferably taken within the Lego room.
- Children should be given warning before time out, and provided with choices over behaviour
- Any serious behaviour should be recorded

### **Support throughout the programme**

I will be supporting you throughout the programme but won't be in every session. I will be there to help 2-3 times throughout the 8 week period, and am contactable by phone or email if you ever have any questions.

[Ellie.brett@\(localauthority\).gov.uk](mailto:Ellie.brett@(localauthority).gov.uk)

Appendix 11 Session Checklist

**Session Checklist: Lego Therapy**

Activity	Present	Comments
<b>Session structure</b>		
Initial check in/introductions		
Names recorded		
Rules displayed and mentioned		
Roles assigned and role cards on display		
30 mins of instruction building		
Minimum of 15 minutes freestyle building		
Children tidy up		
Summary/praise/certificates		
<b>Group activities</b>		
Children working in group of three		
1 adult per 3 children		
Children sitting around table		
Adult facilitating		
Children play according to role		
Children interact with each other		
<b>Activity leader</b>		
Gives praise for good building		
Gives praise for good social skills		
Gets the children to help each other		
Facilitates rather than directs		
Helps children with difficulties		
Highlights presence of social problem		
Prompts children to come up with solutions		
Gives children opportunity to problem solve		
Asks children to role play positive behaviour		
Reminds children of strategies previously worked on		
Highlights presence of a rule break		
Prompts other children to remind group if a rule has been broken		
Gives praise		
Highlights successes to group		

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## Appendix 12 Consideration of available measures

Item	Purpose	Age range	Administration time	Method of administration	Other considerations
<b>Social Communication Scale (SCQ) Current (Rutter, Bailey, Berument, Lord, &amp; Pickles, 2003)</b>	Autism screening tool	4 years +	Under 10 minutes	Rating form, completed by parents	Focuses on past 3 months, doesn't produce cut off points
<b>Social Communication Scale (SCQ) Lifetime form (Rutter, Bailey, Berument, et al., 2003)</b>	Autism screening tool	4 years +	Under 10 minutes	Rating form, completed by parents	Content parallels ADI-R, , with high agreement between ADI-R  Lifetime focuses on developmental history  Enables comparison of symptom levels across groups

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<b>Item</b>	<b>Purpose</b>	<b>Age range</b>	<b>Administration time</b>	<b>Method of administration</b>	<b>Other considerations</b>
<b>Gilliam Autism Rating Scale- second edition (GARS)</b> <b>(Gilliam, 2006)</b>	Autism screening tool, helps identify severity	2.5 years+	5-10 minutes	Rating scale, completed by parents, teachers or clinicians	Concerns over psychometric properties
<b>Gilliam Asperger Disorder Scale</b> <b>(Gilliam, 2001)</b>	Screening tool for Asperger Disorder, distinguishing between autism and Asperger Disorder	3-22 years	5-10 minutes	Completed by parent or professional	



<b>Item</b>	<b>Purpose</b>	<b>Age range</b>	<b>Administration time</b>	<b>Method of administration</b>	<b>Other considerations</b>
<b>Childhood Autism Rating Scale-second edition (Schopler, Van Bourgondien, Wellman, &amp; Love, 2010)</b>	Autism screening tool, helps identify severity	2 years +	5-10 minutes	Rating scale, informed by parent and teacher interview and direct observation, completed by clinician	CARS-2 has a separate scale for HFA/AS
<b>Autism Diagnostic Interview Revised (Lord, Rutter, &amp; Couteur, 1994)</b>	Autism diagnosis	2 years +	1.5-2.5 hours	Parent interview with clinician	
<b>Social Responsiveness Scale (Constantino &amp; Gruber, 2005)</b>	Identifies presence and severity of social impairment	2.5 years-18 years	15-20 minutes	Parent and teacher rating form	

<b>Item</b>	<b>Purpose</b>	<b>Age range</b>	<b>Administration time</b>	<b>Method of administration</b>	<b>Other considerations</b>
<b>Vineland Adaptive Behaviour Scales, second edition Teacher Rating Scale (Sparrow, Balla, &amp; Cicchetti, 2005)</b>	A measure of adaptive behaviour in four domains: socialisation, communication, daily living skills and Motor Skills	0-90	20 minutes	Teacher completes rating form	
<b>Vineland Adaptive Behaviour Scales, second edition Survey Interview</b>	As above	0-90	20-60 minutes	Semi-structured interview with parents	
<b>Vineland Adaptive Behaviour Scales, second edition Parent/caregiver form</b>	As above	0-90	20-60 minutes	Parent/caregiver rating form	

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## **Appendix 13 Justification of standardised measures**

### Justification for the SCQ as a measure to verify a clinical diagnosis of autism

The Social Communication Questionnaire (Rutter, Bailey, Berument, et al., 2003) was used to verify clinical diagnoses of autism. A score of 15 or above was required to verify the clinical diagnosis (Rutter, Bailey, & Lord, 2003). The SCQ was chosen because it can be completed quickly and easily by parents, it is psychometrically associated with the ADI-R (Lord et al., 1994) and has high sensitivity (0.86) and specificity (0.78) (Charman et al., 2007).

### Justification of the VABS as a measure of adaptive behaviour (socialisation and communication)

The Vineland Adaptive Behaviour Scales (VABS), Second Edition II (Sparrow et al., 2005) were chosen to obtain a measure of adaptive social functioning (Socialisation Domain, VABS-SD) and communication (Communication Domain, VABS-CD). The VABS II was chosen as a measure of socialisation and communication to allow for comparison of methods and findings with the most recent clinic based research investigating Lego therapy (Owens et al., 2008). As there is not currently any other research investigating Lego therapy as school based intervention, it is important that the findings from this study are comparable to clinic based research. Owens et al. (2008) used the original VABS (Sparrow, Balla, & Cicchetti, 1984), and used the semi-structured interview forms to collect data. This study used the teacher rating scales instead. This is because the research was based within schools so it is more appropriate for teachers than parents to comment on socialisation and communication. A measure of maladaptive behaviour was obtained in previous studies, however, this would require teachers' to complete the full VABS teacher rating form. As Lego therapy is not thought to target skills featuring in the VABS domains of daily living skills and motor skills, it was not appropriate to ask teachers to complete the full teacher rating form at each time point. A disadvantage of this is that a maladaptive behaviour score cannot be generated. The GARS II (Gilliam, 2006) was considered as an

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alternative measure for socialisation. This was because previous studies investigating outcomes of Lego therapy have utilised this scale as a measure of autism specific social skills (LeGoff, 2004; Legoff & Sherman, 2006; Owens et al., 2008). However, it has been suggested that the GARS has questionable psychometric properties, including a high false negative rate (Mazefsky & Oswald, 2006; South et al., 2002). South et al. (2002) recommended that the GARS should be used with caution in clinical settings and research, and LeGoff (2004) suggested the VABS is a more detailed measure of social adaptation, and the VABS was used alongside the GARS in subsequent studies (LeGoff, 2004; Legoff & Sherman, 2006).

The VABS demonstrates good psychometric properties. The mean Coefficient Alpha for the age range used in this study ranged from 0.83-0.97 (Sparrow, Cicchetti, & Balla, 2006), and test-retest reliability yielded a mean correlation of 0.82. However, interrater reliability was lower, at 0.60. (Sparrow et al., 2006) suggested that scores reflect disparity in teacher's perceptions and interpretations of behaviours. Care will be taken to ensure the VABS is completed by the same teacher at each time point wherever possible.

#### Justification of structured observation as a method

Both Owens et al. (2008) and LeGoff (2004) conducted structured observations as a measure of social competence in the school environment. Frequency of self-initiated interactions, and duration of all social interactions were recorded during unstructured periods in the school environment. The same measures will be taken in this study to operationalize a measure of social competence. Furthermore, Merrell (2001) suggested that naturalistic observations and behaviour rating scales should be used as the two primary measures for assessing social skills in children. The school setting was described as a relevant location for a behaviour observation due to the opportunity for peer interaction in unstructured settings.

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A disadvantage of observation measures is that they are open to observer bias (Robson, 2011). As it will not be possible to utilise a blind observer in this study, a measure of inter-observer agreement will be taken. This will require an observer to be trained in the use of the observation schedule (see Appendix 11), and conduct a proportion of observations concurrently with the researcher.

#### **Appendix 14 Letter to teachers to accompany VABS**

Date: 2<sup>nd</sup> March 2012  
Contact: Ellie Brett  
Direct Dial:  
E-Mail: [Ellie.brett@localauthority.gov.uk](mailto:Ellie.brett@localauthority.gov.uk)

Dear (Class Teacher),

As you are aware, (child name) has been participating in a research project investigating the effectiveness of Lego therapy as an intervention to support social skills development in children with Autism Spectrum Condition (ASC).

As the class teacher sees the child in their classroom environment on a daily basis, it is important to gain the class teacher's perspective. I would appreciate it if you could complete the attached questionnaire between (...) and (...). The same questionnaire will be sent at four time points throughout the research process. Please answer the questions as honestly as possible, and in relation to the child's current behaviour and functioning. All information will remain confidential and will be fully anonymised. I will be in school to collect the completed forms on (...); please could you pass the form to the school office for collection.

Thank you in advance for your help.



Ellie Brett

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## Appendix 15 Additional VABS instructions

### Vineland Adaptive Behaviour Scales: current class teacher

- Please read the instructions at the front of the booklet before completing
- Please ONLY complete the Communication and Socialisation scales
- There is no need to complete the comments sections
- There is no need to complete the tables at the end of the booklet
- There is no need to complete additional information on the front cover (I have this from last time)
- Please complete as honestly as possible, and relation to the child's current level of functioning (i.e during the week that you complete the form)

NB: On the communication written domain you may need the following US-UK conversion. 2<sup>nd</sup> Grade=age 7-8, 4<sup>th</sup> grade= age 9-10, 6<sup>th</sup> grade= age 11-12

Many Thanks for your time. The overall results from the research project will be shared with you after the data has been analysed.

Please contact me on [ellie.brett@localauthority.gov.uk](mailto:ellie.brett@localauthority.gov.uk) if you have any questions.

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## Appendix 16 Playground Observation Schedule

From Owens et al. (2008)

**\*Record frequency and duration of self-initiated interactions\***

**\*Record duration of other initiated interactions\***

### **Self-Initiated Interactions:**

These include the target child carrying out one of the following behaviours that lead to some form of social exchange. Do not count adult interactions or interactions prompted by an adult. Count frequency and duration of the following:

#### Verbal Recruitment

- Child appropriately performs an action and names it to another (e.g. 'Look at my sand castle').
- Child invites another to join a game, with the view of doing something together (e.g. 'Do you want to play "dinosaur chase"')
- Child initiates a conversation with a peer by asking a question, making a statement or indicating an interest in what the peer is doing/playing. For example, 'what are you doing?'; 'what football team do you support'?

#### Non-verbal Recruitment

An attempt to engage another using a non-verbal gesture, such as beckoning, waving, pointing at a toy.

#### Joins in

Child approaches a peer who is playing a game/ doing an activity and actively joins them in a collaborative fashion. This does not include a child going up and playing in parallel with a peer using the same apparatus (e.g. the swings), and it must be more than simply going to watch another peer. There must be some collaborative action or participation in conversation.

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## Other Initiated Social Interactions

Same events as described in self-initiated interactions but the initiation of the conversation/ game/ activity comes from the peer not the target child.

Duration of **all interactions** with peers is measured if they were clearly social or play interactions, there was no adult supervision, and the play was clearly interactive and not parallel. To be counted as an interaction, the target child must respond in an appropriate way, either by giving a verbal response, a non-verbal response, or joining in collaboratively. Do not count adult interactions.

## Recording

### Duration (of self and other initiated)

SI time= Press to start recording duration of self-initiated interactions

OI time= Press to start recording duration of interactions initiated by another  
child

Press button to start recording, and press again to end recording.

At the start of a new interaction start recording duration before recording  
frequency count

Press play to start, - to delete last event if pressed by mistake, and II to pause

### Frequency (of self-initiated interaction)

**Buttons for:** Verbal, non-verbal, joins in, and misc (miscellaneous)

Buttons can be pressed to count frequencies whilst time is being recorded.



## Appendix 17 Intra-Class Correlation data

### Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded <sup>a</sup>	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.990	2

### Intraclass Correlation Coefficient

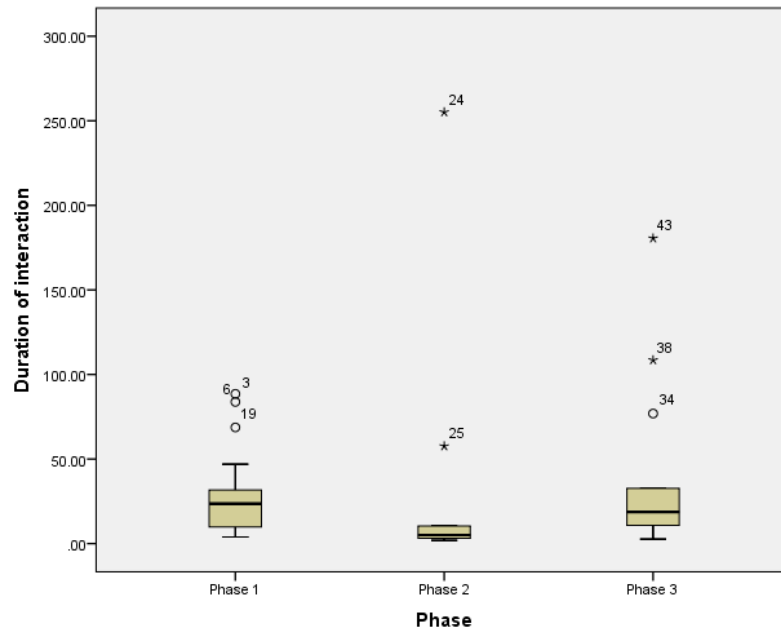
	Intraclass Correlation <sup>b</sup>	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.981 <sup>a</sup>	.952	.992	99.787	19	19	.000
Average Measures	.990 <sup>c</sup>	.976	.996	99.787	19	19	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

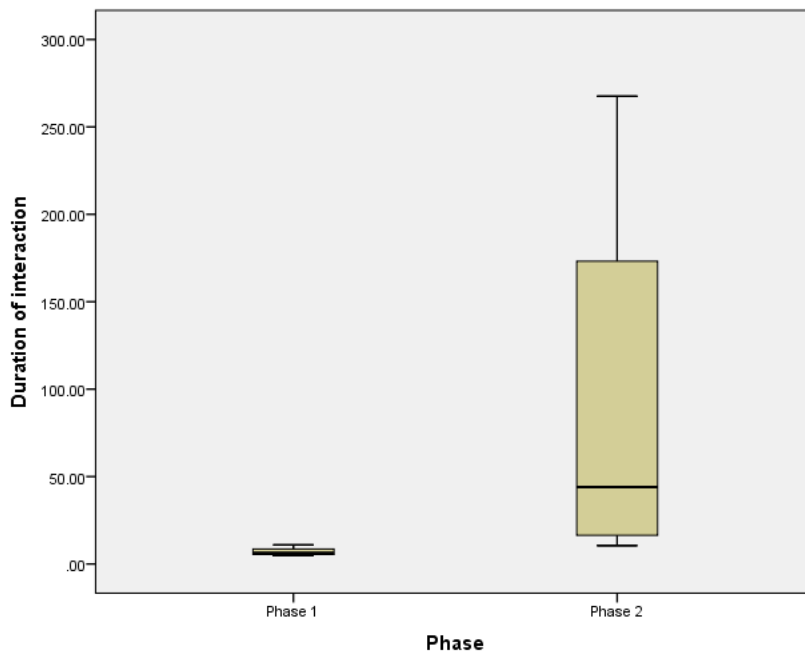
- The estimator is the same, whether the interaction effect is present or not.
- Type A intraclass correlation coefficients using an absolute agreement definition.
- This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

## Appendix 18: Boxplots for duration of interactions for individual children

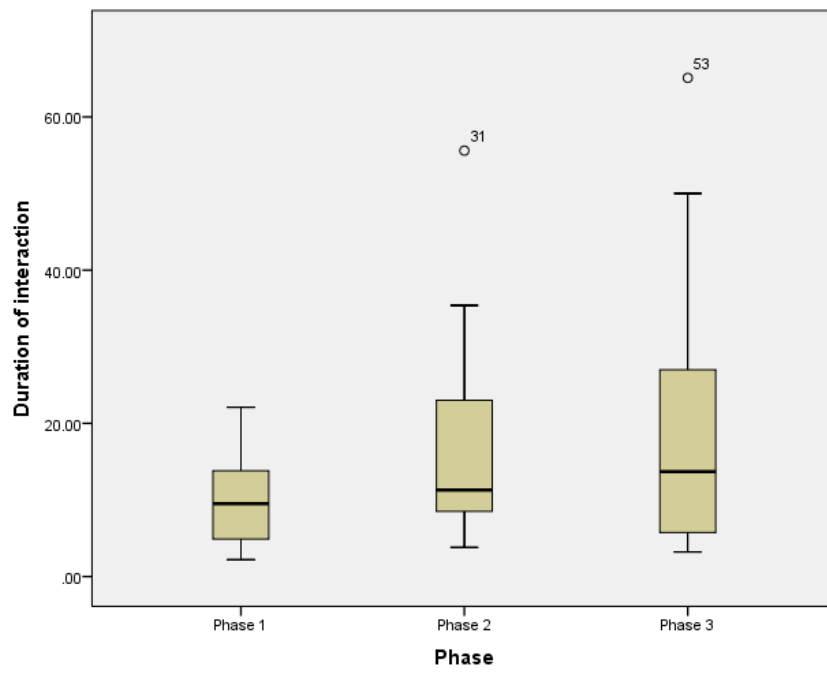
### Child one



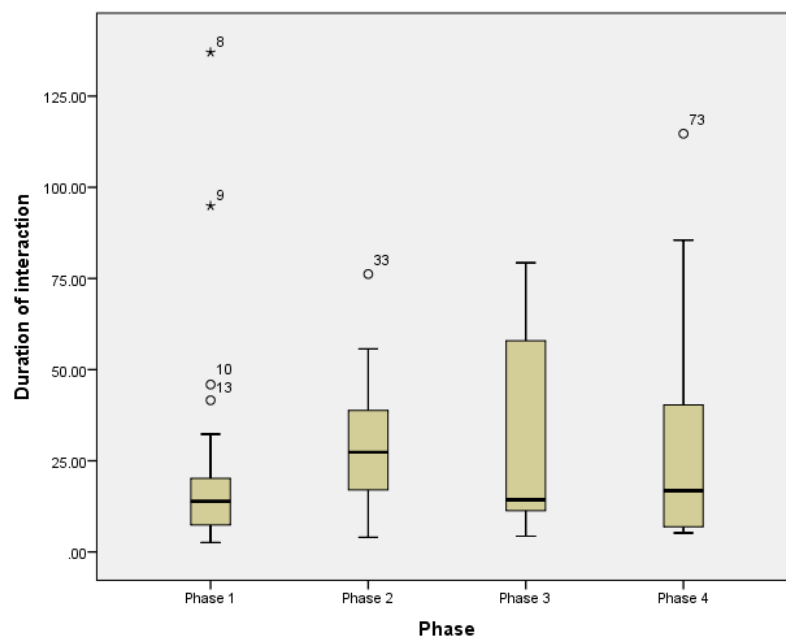
### Child two



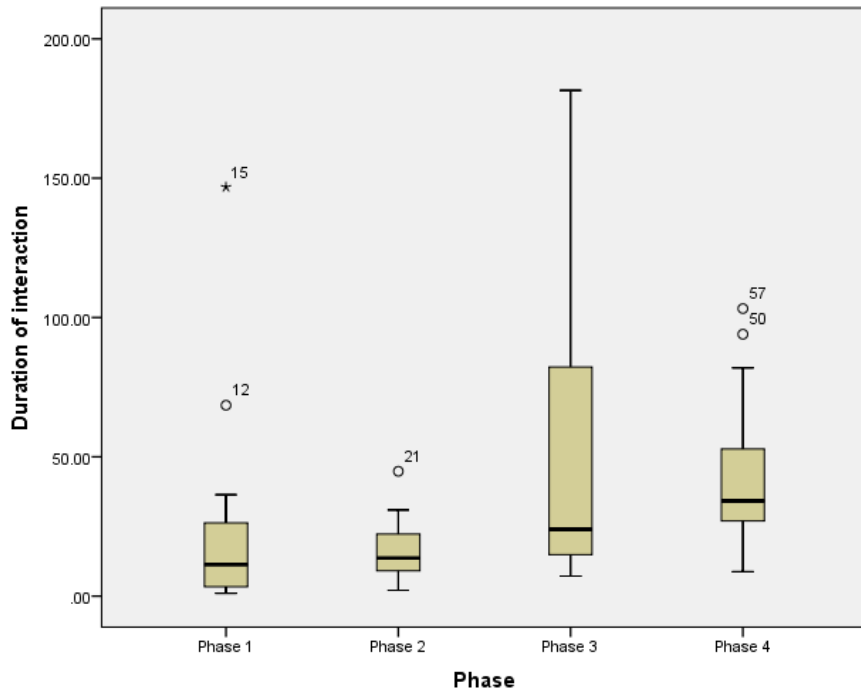
### Child three



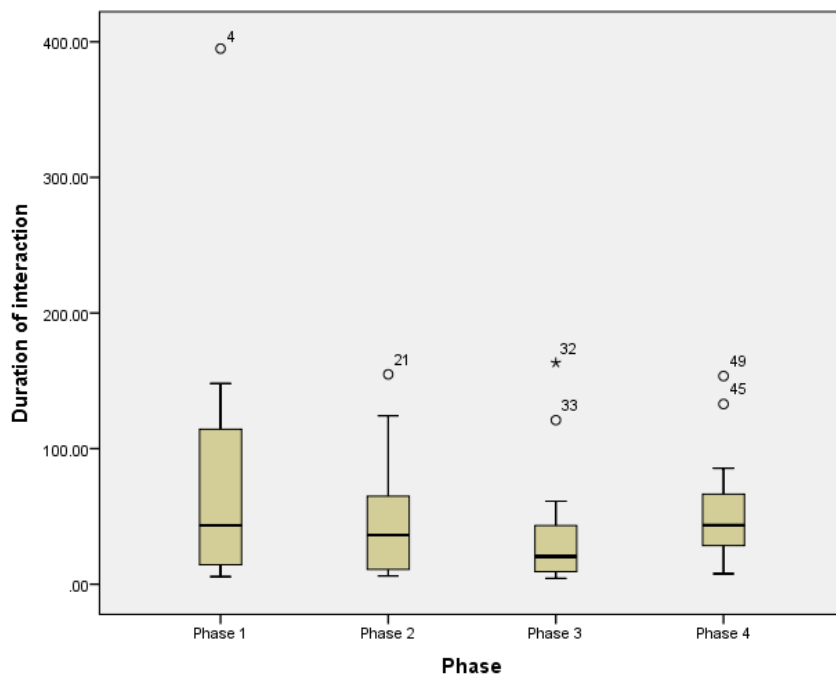
### Child four

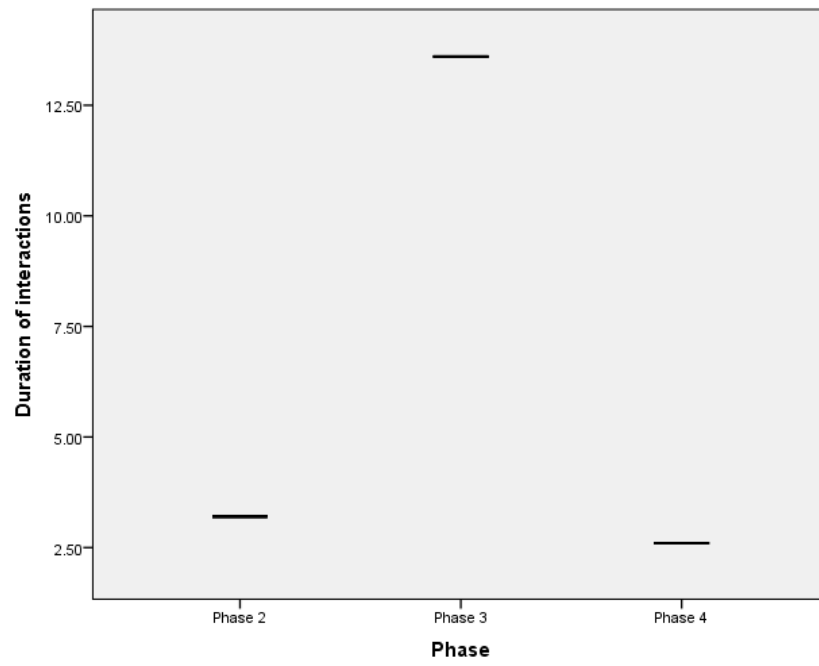


## Child five

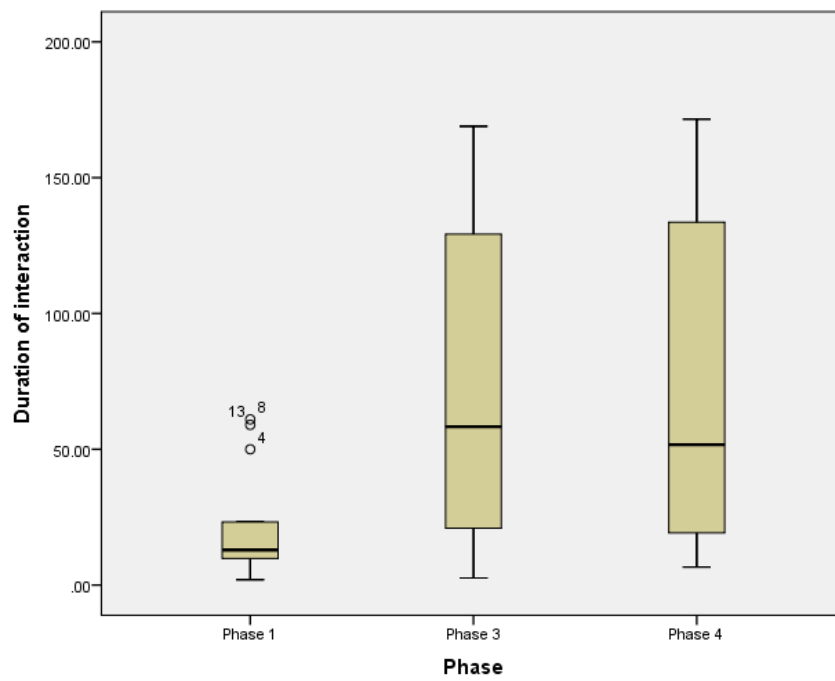


## Child six

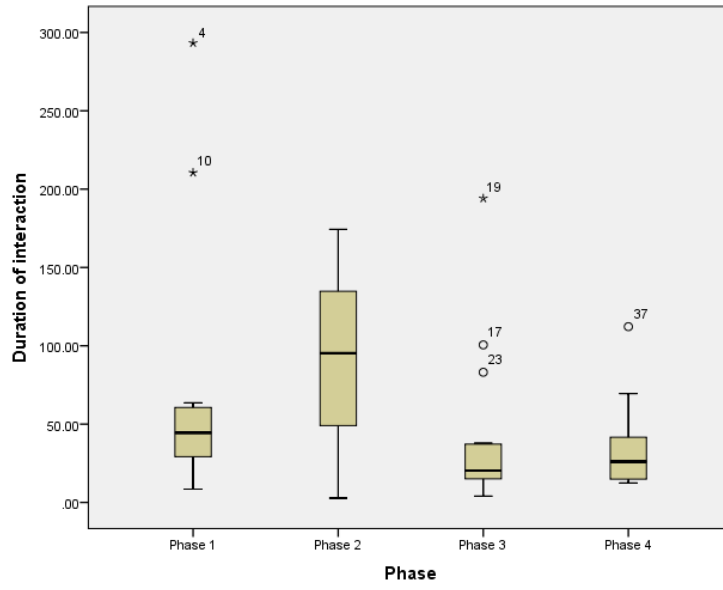




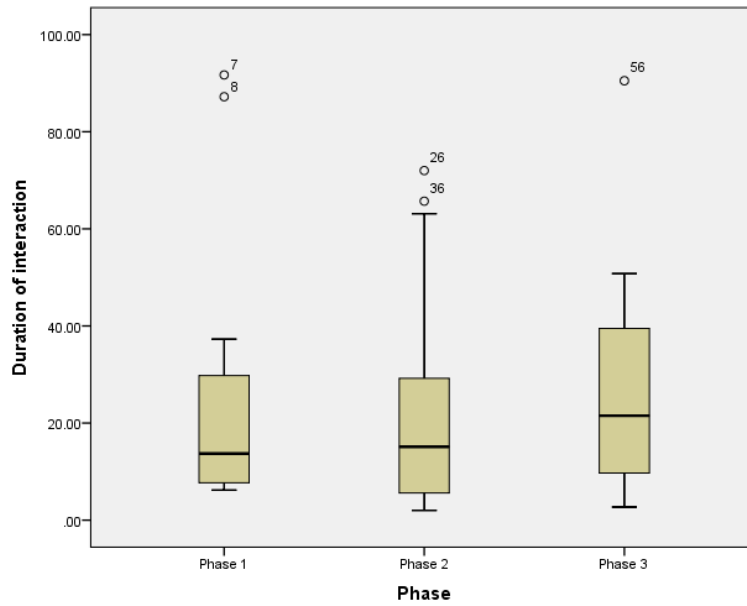
Child eight



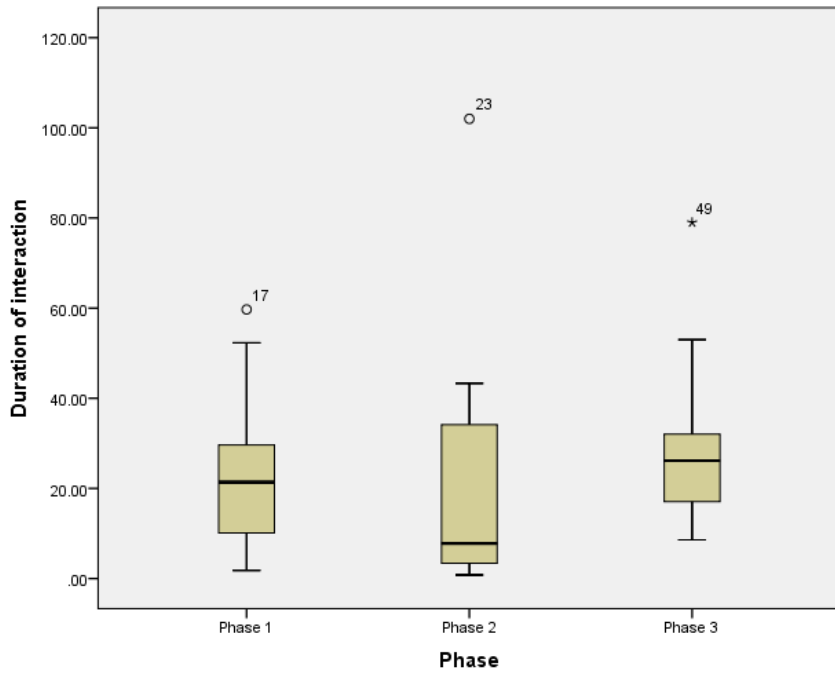
### Child nine



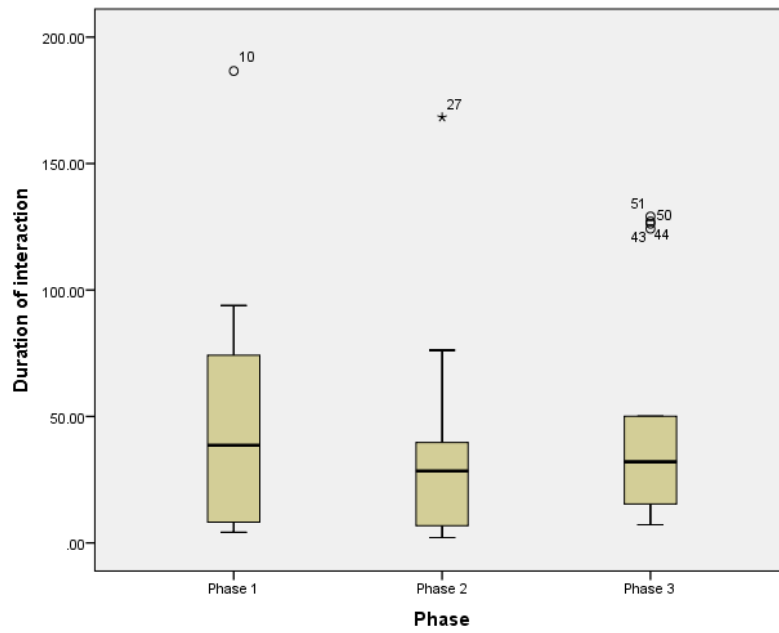
### Child ten



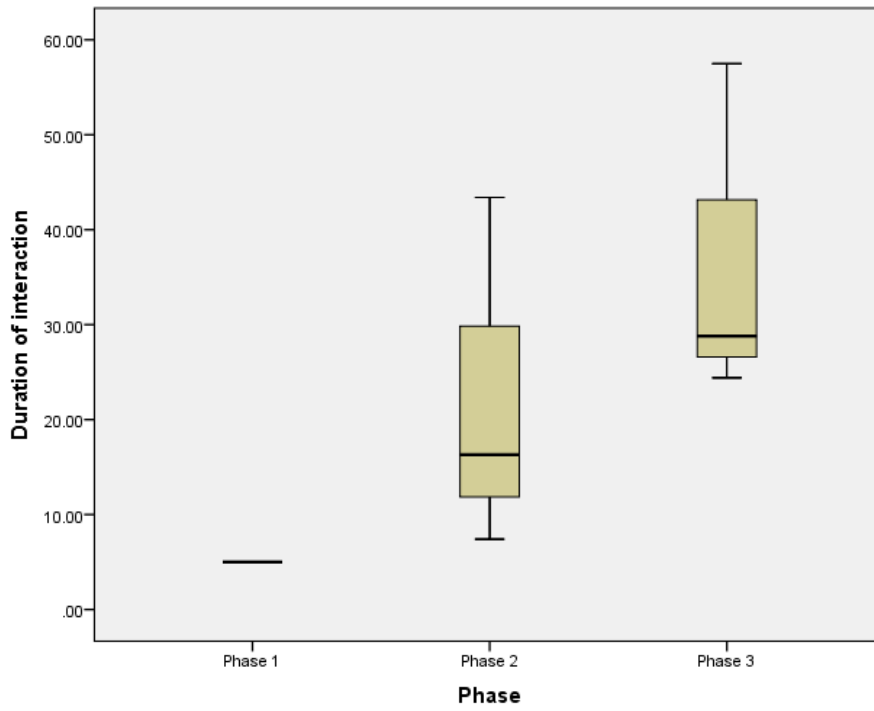
### Child eleven



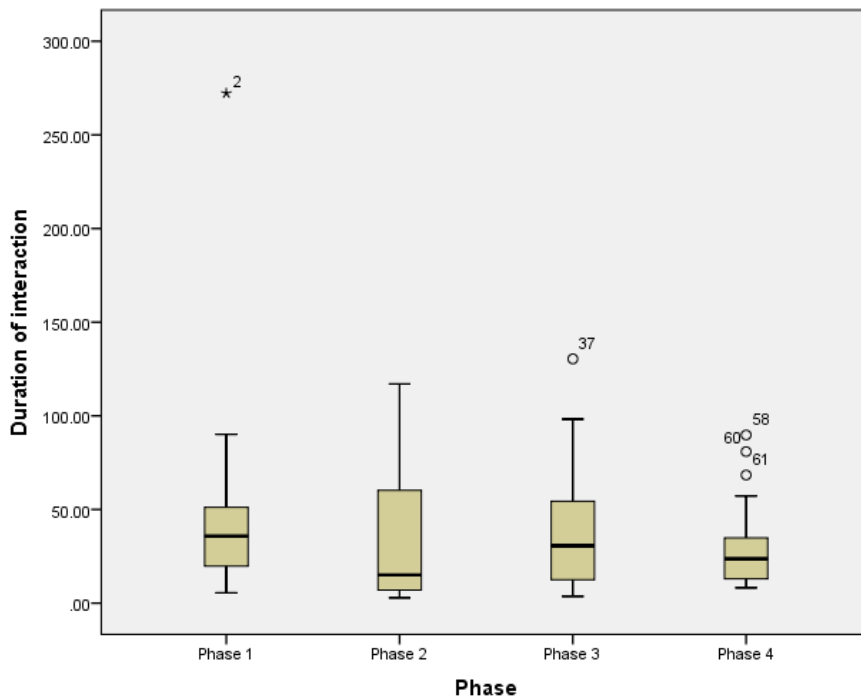
### Child twelve



### Child thirteen



### Child fourteen





**Appendix 19 Frequency and duration of interactions. Descriptive statistics, tests of normality and statistical analyses**

**Appendix 19.i Descriptive statistics for individual children**

Child ID		Duration of interactions (seconds)			
		Phase 1	Phase 2	Phase 3	Phase 4
1	Total number of interactions	23	10	14	
	Total number of self-initiated interactions	10	0	4	
	Median duration in seconds (IQR)	23.60 (22.9)	5.10 (19.18)	18.75 (34.08)	
2	Total number of interactions	3	6	0	
	Total number of self-initiated interactions	3	4	0	
	Median duration in seconds (IQR)	6.10 (NA)	44.00 (181.88)	0 (NA)	
3	Total number of interactions	29	13	20	
	Total number of self-initiated interactions	29	7	14	
	Median duration in seconds (IQR)	9.50 (8.90)	11.30 (17.15)	13.70 (23.08)	
4	Total number of interactions	22	26	17	13
	Total number of self-initiated interactions	19	26	14	11
	Median duration in seconds (IQR)	13.90 (15.82)	27.35 (23.93)	14.30 (53.05)	16.80 (39.10)
5	Total number of interactions	16	18	15	13
	Total number of self-initiated interactions	13	14	11	12
	Median duration in seconds (IQR)	11.35 (23.30)	13.70 (15.68)	24.00 (80.40)	34.20 (45.95)
6	Total number of interactions	11	15	15	16
	Total number of self-initiated interactions	9	7	7	9
	Median duration in seconds (IQR)	43.40 (110.60)	36.30 (54.70)	20.50 (46.30)	43.55 (41.70)
7	Total number of interactions	0	1	1	1
	Total number of self-initiated interactions	0	0	1	0

	Median duration in seconds (IQR)	0 (NA)	3.20 (NA)	13.60 (NA)	2.60 (NA)
8	Total number of interactions	14	0	11	10
	Total number of self-initiated interactions	5	0	6	8
	Median duration in seconds (IQR)	12.90 (20.53)	-	58.30 (120.50)	29.90 (117.98)
9	Total number of interactions	11	3	16	13
	Total number of self-initiated interactions	11	2	15	12
	Median duration in seconds (IQR)	44.50 (40.70)	95.30 (NA)	20.35 (22.48)	26.10 (32.40)
10	Total number of interactions	21	21	22	
	Total number of self-initiated interactions	19	16	13	
	Median duration in seconds (IQR)	13.70 (22.60)	15.10 (28.60)	21.50 (31.03)	
11	Total number of interactions	19	16	16	
	Total number of self-initiated interactions	9	12	12	
	Median duration in seconds (IQR)	21.40 (24.00)	7.80 (33.08)	26.15 (16.05)	
12	Total number of interactions	14	26	18	
	Total number of self-initiated interactions	10	18	14	
	Median duration in seconds (IQR)	38.60 (70.25)	28.45 (33.55)	32.05 (53.23)	
13	Total number of interactions	1	3	3	
	Total number of self-initiated interactions	0	3	2	
	Median duration in seconds (IQR)	5.00 (NA)	16.30 (NA)	28.80 (NA)	
14	Total number of interactions	18	14	16	17
	Total number of self-initiated interactions	13	11	14	13
	Median duration in seconds (IQR)	35.75 (35.60)	15.05 (61.23)	30.60 (44.28)	23.70 (33.75)

Appendix 19.ii Descriptive statistics: Observation data

**Descriptives**

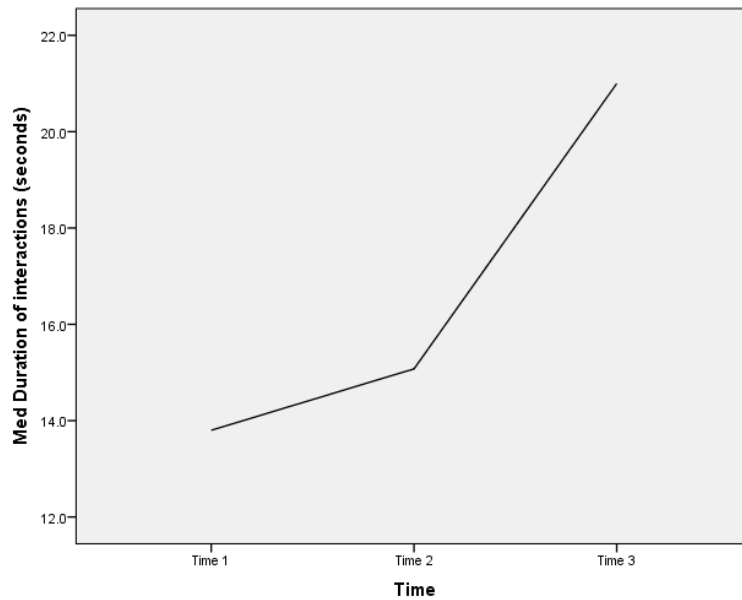
			Statistic	Std. Error
Median Duration of Interactions 1	Mean		19.9786	3.98303
	95% Confidence Interval for Mean	Lower Bound	11.3738	
		Upper Bound	28.5834	
	5% Trimmed Mean		19.7262	
	Median		13.8000	
	Variance		222.103	
	Std. Deviation		14.90312	
	Minimum		.00	
	Maximum		44.50	
	Range		44.50	
	Interquartile Range		27.81	
	Skewness		.580	.597
	Kurtosis		-1.076	1.154
Median Duration of Interactions 2	Mean		22.7821	6.52952
	95% Confidence Interval for Mean	Lower Bound	8.6760	
		Upper Bound	36.8883	
	5% Trimmed Mean		20.0190	
	Median		15.0750	
	Variance		596.886	
	Std. Deviation		24.43124	
	Minimum		.00	
	Maximum		95.30	
	Range		95.30	
	Interquartile Range		23.29	
	Skewness		2.228	.597
	Kurtosis		5.945	1.154
Median Duration of Interactions 3	Mean		23.0429	3.51090
	95% Confidence Interval for Mean	Lower Bound	15.4580	
		Upper Bound	30.6277	
	5% Trimmed Mean		22.3643	
	Median		21.0000	
	Variance		172.570	
	Std. Deviation		13.13660	
	Minimum		.00	
	Maximum		58.30	
	Range		58.30	
	Interquartile Range		15.10	
	Skewness		1.209	.597
	Kurtosis		3.803	1.154

**Descriptives**

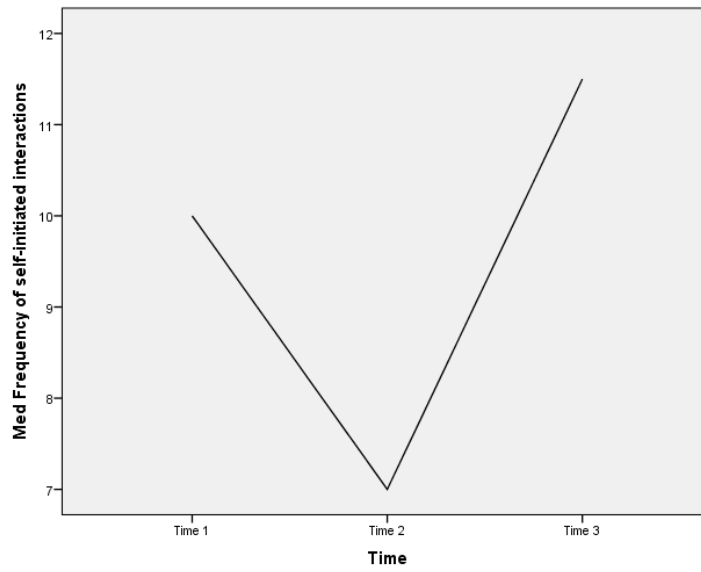
			Statistic	Std. Error
Frequency of self initiated interactions 1	Mean		10.71	2.111
	95% Confidence Interval for Mean	Lower Bound	6.15	
		Upper Bound	15.27	
	5% Trimmed Mean		10.29	
	Median		10.00	
	Variance		62.374	
	Std. Deviation		7.898	
	Minimum		0	
	Maximum		29	
	Range		29	
	Interquartile Range		10	
	Skewness		.758	.597
	Kurtosis		.949	1.154
Frequency of self initiated interactions 2	Mean		8.57	2.117
	95% Confidence Interval for Mean	Lower Bound	4.00	
		Upper Bound	13.14	
	5% Trimmed Mean		8.08	
	Median		7.00	
	Variance		62.725	
	Std. Deviation		7.920	
	Minimum		0	
	Maximum		26	
	Range		26	
	Interquartile Range		13	
	Skewness		.778	.597
	Kurtosis		.008	1.154
Frequency of self initiated interactions 3	Mean		9.07	1.477
	95% Confidence Interval for Mean	Lower Bound	5.88	
		Upper Bound	12.26	
	5% Trimmed Mean		9.25	
	Median		11.50	
	Variance		30.533	
	Std. Deviation		5.526	
	Minimum		0	
	Maximum		15	
	Range		15	
	Interquartile Range		11	
	Skewness		-.539	.597
	Kurtosis		-1.451	1.154

		<b>Time 1 (N=14)</b>	<b>Time 2 (N=14)</b>	<b>Time 3 (N=14)</b>
<b>Frequency of self-initiated interactions</b>	Median (IQR)	10 (10)	7 (13)	11.5 (11)
	Mean (SD)	10.71 (7.90)	8.57 (7.92)	9.07 (5.53)
<b>Duration of interactions in (seconds)</b>	Median (IQR)	13.80 (27.81)	15.07 (23.29)	21.00 (15.10)
	Mean (SD)	19.98 (14.90)	22.78 (24.43)	23.04 (13.14)

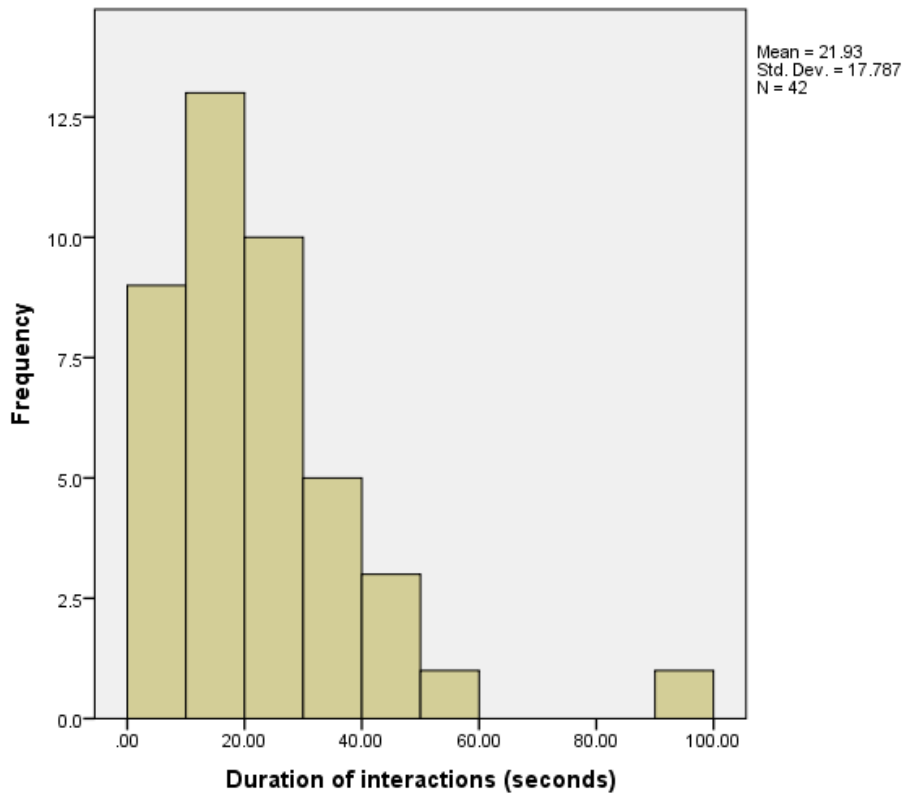
### Median duration of interactions

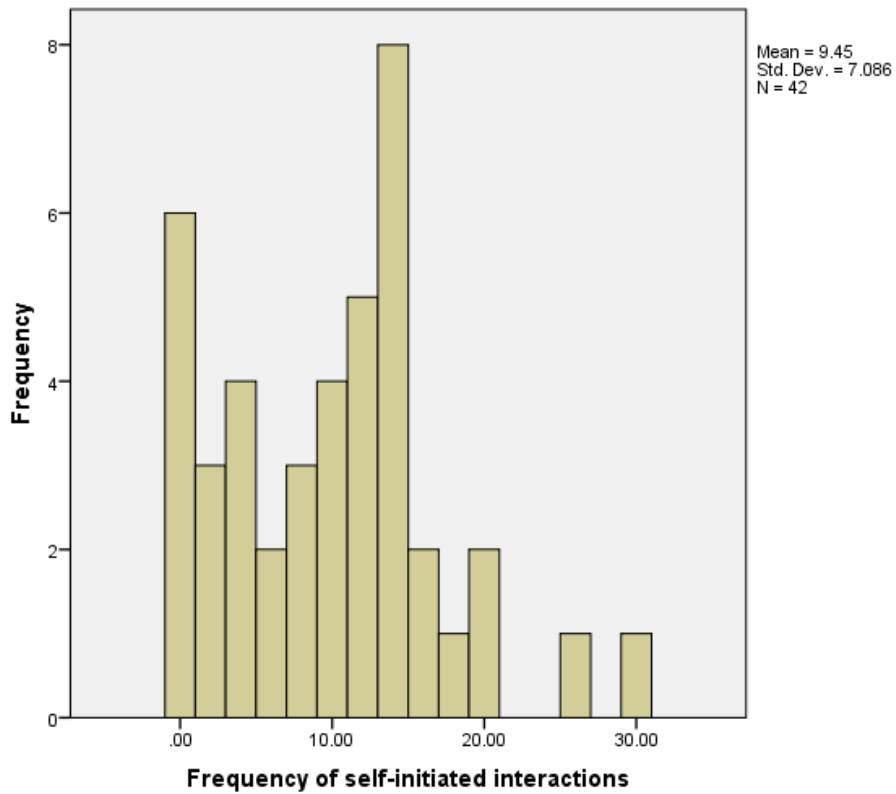


## Median frequency of self-initiated interactions



## Appendix 19.iv: Normality assumptions for observation data





**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Median Duration of Interactions 1	.230	14	.044	.900	14	.112
Median Duration of Interactions 2	.247	14	.020	.767	14	.002
Median Duration of Interactions 3	.175	14	.200 <sup>*</sup>	.891	14	.083
Total time interacting 1	.140	14	.200 <sup>*</sup>	.928	14	.290
Total time interacting 2	.113	14	.200 <sup>*</sup>	.956	14	.665
Total time interacting 3	.170	14	.200 <sup>*</sup>	.934	14	.348
Frequency of self initiated interactions 1	.172	14	.200 <sup>*</sup>	.936	14	.368
Frequency of self initiated interactions 2	.150	14	.200 <sup>*</sup>	.917	14	.200
Frequency of self initiated interactions 3	.208	14	.103	.853	14	.024

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Appendix 19.v: Frequency of self-initiated interactions: Friedman analysis

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
Frequency of self initiated interactions 1	14	10.71	7.898	0	29	4.50	10.00	14.50
Frequency of self initiated interactions 2	14	8.57	7.920	0	26	1.50	7.00	14.50
Frequency of self initiated interactions 3	14	9.07	5.526	0	15	3.50	11.50	14.00

**Ranks**

	Mean Rank
Frequency of self initiated interactions 1	2.04
Frequency of self initiated interactions 2	1.96
Frequency of self initiated interactions 3	2.00

**Test Statistics<sup>a</sup>**

N	14
Chi-Square	.038
df	2
Asymp. Sig.	.981
Exact Sig.	.996
Point Probability	.031

a. Friedman Test



**Ranks**

		N	Mean Rank	Sum of Ranks
Frequency of self initiated interactions 2 - Frequency of self initiated interactions 1	Negative Ranks	7 <sup>a</sup>	8.14	57.00
	Positive Ranks	6 <sup>b</sup>	5.67	34.00
	Ties	1 <sup>c</sup>		
	Total	14		
Frequency of self initiated interactions 3 - Frequency of self initiated interactions 2	Negative Ranks	6 <sup>d</sup>	5.75	34.50
	Positive Ranks	6 <sup>e</sup>	7.25	43.50
	Ties	2 <sup>f</sup>		
	Total	14		

- a. Frequency of self initiated interactions 2 < Frequency of self initiated interactions 1
- b. Frequency of self initiated interactions 2 > Frequency of self initiated interactions 1
- c. Frequency of self initiated interactions 2 = Frequency of self initiated interactions 1
- d. Frequency of self initiated interactions 3 < Frequency of self initiated interactions 2
- e. Frequency of self initiated interactions 3 > Frequency of self initiated interactions 2
- f. Frequency of self initiated interactions 3 = Frequency of self initiated interactions 2

**Test Statistics<sup>a</sup>**

	Frequency of self initiated interactions 2 - Frequency of self initiated interactions 1	Frequency of self initiated interactions 3 - Frequency of self initiated interactions 2
Z	-.805 <sup>b</sup>	-.354 <sup>c</sup>
Asymp. Sig. (2-tailed)	.421	.723
Exact Sig. (2-tailed)	.445	.747
Exact Sig. (1-tailed)	.222	.373
Point Probability	.011	.013

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.
- c. Based on negative ranks.

Appendix 19.vi Duration of interactions: Friedman analysis

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
Median Duration of Interactions 1	14	19.9786	14.90312	.00	44.50	8.6500	13.8000	36.4625
Median Duration of Interactions 2	14	22.7821	24.43124	.00	95.30	7.1250	15.0750	30.4125
Median Duration of Interactions 3	14	23.0429	13.13660	.00	58.30	14.1500	21.0000	29.2500

**Ranks**

	Mean Rank
Median Duration of Interactions 1	1.86
Median Duration of Interactions 2	1.86
Median Duration of Interactions 3	2.29

**Test Statistics<sup>a</sup>**

N	14
Chi-Square	1.714
df	2
Asymp. Sig.	.424
Exact Sig.	.489
Point Probability	.051

a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Median Duration of Interactions 2 - Median Duration of Interactions 1	Negative Ranks	6 <sup>a</sup>	8.67	52.00
	Positive Ranks	8 <sup>b</sup>	6.63	53.00
	Ties	0 <sup>c</sup>		
	Total	14		
Median Duration of Interactions 3 - Median Duration of Interactions 2	Negative Ranks	4 <sup>d</sup>	10.75	43.00
	Positive Ranks	10 <sup>e</sup>	6.20	62.00
	Ties	0 <sup>f</sup>		
	Total	14		

- a. Median Duration of Interactions 2 < Median Duration of Interactions 1
- b. Median Duration of Interactions 2 > Median Duration of Interactions 1
- c. Median Duration of Interactions 2 = Median Duration of Interactions 1
- d. Median Duration of Interactions 3 < Median Duration of Interactions 2
- e. Median Duration of Interactions 3 > Median Duration of Interactions 2
- f. Median Duration of Interactions 3 = Median Duration of Interactions 2

**Test Statistics<sup>a</sup>**

	Median Duration of Interactions 2 - Median Duration of Interactions 1	Median Duration of Interactions 3 - Median Duration of Interactions 2
Z	-.031 <sup>b</sup>	-.596 <sup>b</sup>
Asymp. Sig. (2-tailed)	.975	.551
Exact Sig. (2-tailed)	1.000	.583
Exact Sig. (1-tailed)	.500	.292
Point Probability	.024	.021

- a. Wilcoxon Signed Ranks Test
- b. Based on negative ranks.

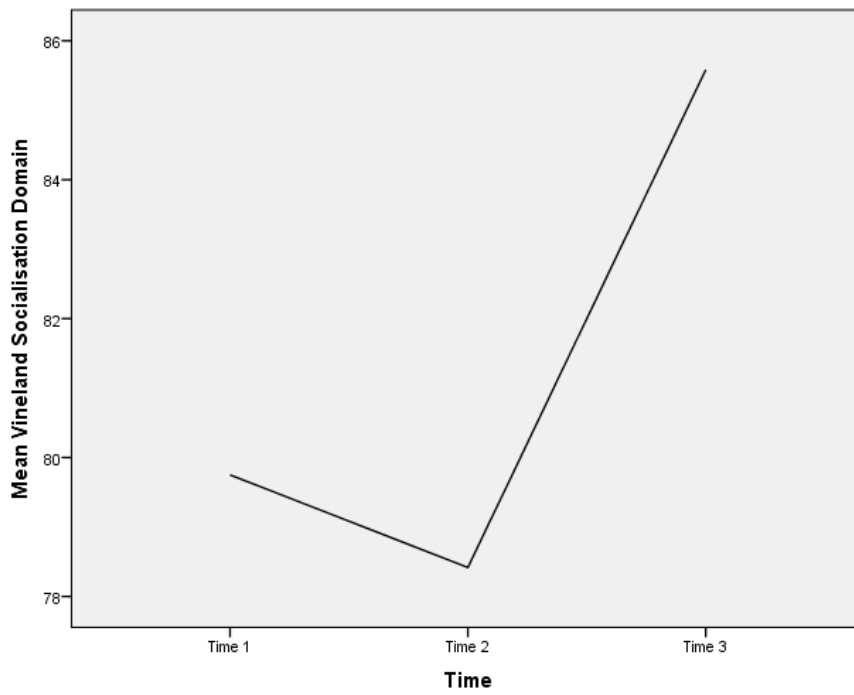
**Appendix 20 Adaptive Social and Communication. Descriptive statistics, tests of normality and statistical analyses**

Appendix 20.i VABS data: descriptive statistics and graphs

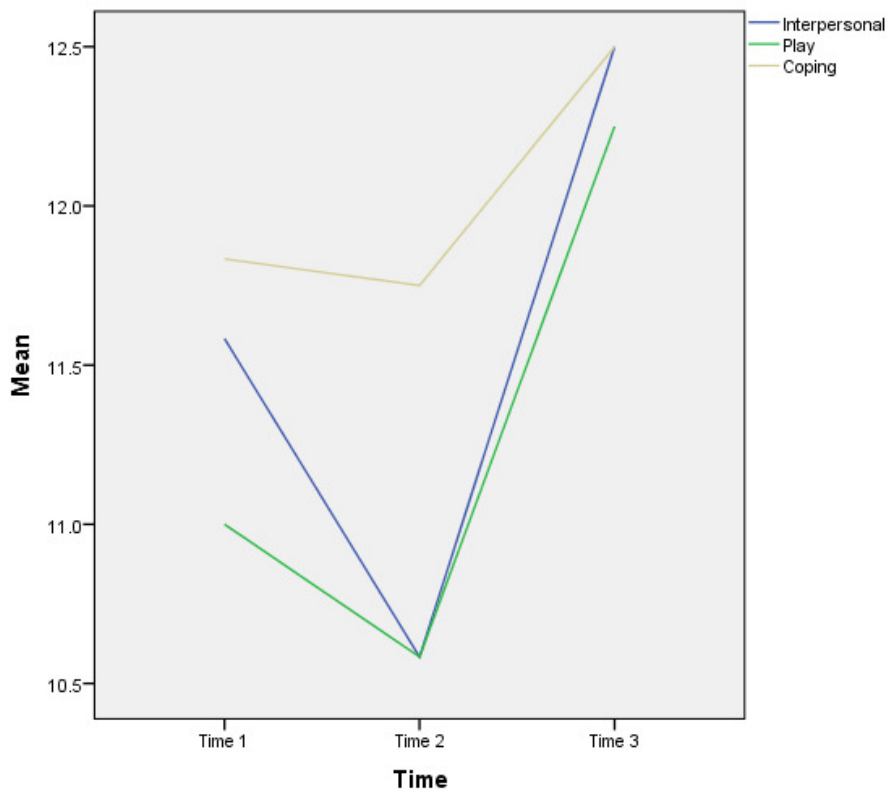
	<b>Time 1</b> <i>(Start of Baseline period)</i>	<b>Time 2</b> <i>(End of baseline/start of intervention)</i>	<b>Time 3</b> <i>(End of intervention)</i>
	Mean standard score (SD)	Mean standard score (SD)	Mean standard score (SD)
	N=12	N=12	N=12
<b>VABS Socialisation Domain (SD)</b>	79.75 (10.41)	78.42 (10.56)	85.58 (13.52)
<b>VABS-SD: Play</b>	11.00 (2.17)	10.58 (2.19)	12.25 (3.04)
<b>VABS-SD: Coping</b>	11.83 (2.36)	11.75 (2.00)	12.50 (2.15)
<b>VABS-SD: Interpersonal skills</b>	11.58 (2.27)	10.58 (2.19)	12.50 (2.84)
<b>VABS Communication Domain (CD)</b>	93.08 (12.24)	94.08 (15.79)	93.83 (10.71)
<b>VABS-CD: Expressive communication</b>	12.75 (2.09)	13.25 (2.66)	12.17 (1.99)
<b>VABS-CD Receptive communication</b>	13.00 (3.10)	12.50 (3.00)	13.33 (3.08)
<b>VABS-CD Written communication</b>	16.17 (2.37)	16.42 (3.63)	16.92 (3.02)

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Mean VABS standard scores: Socialisation



Mean VABS Socialisation subdomain standard scores



Mean VABS standard scores: Communication

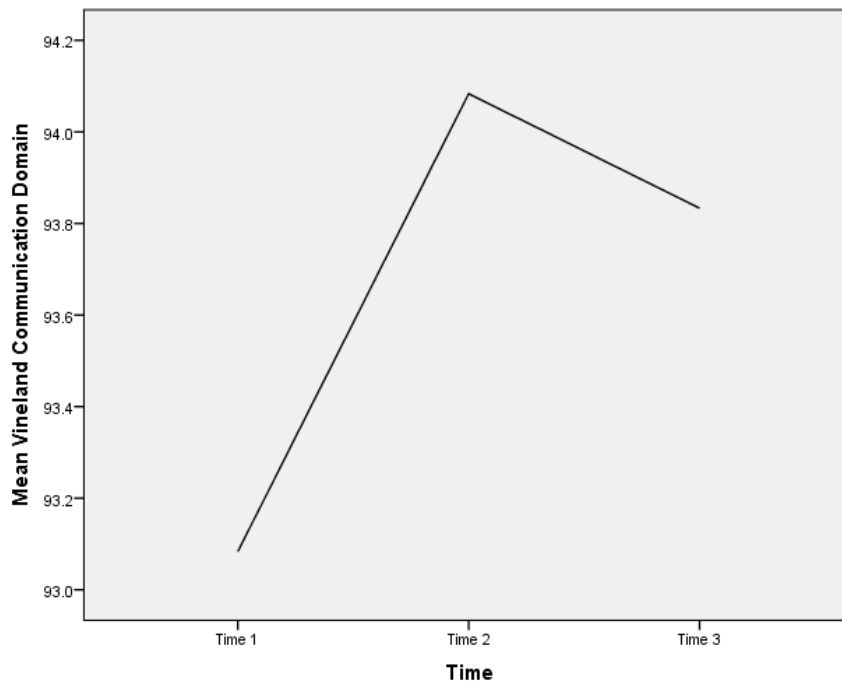
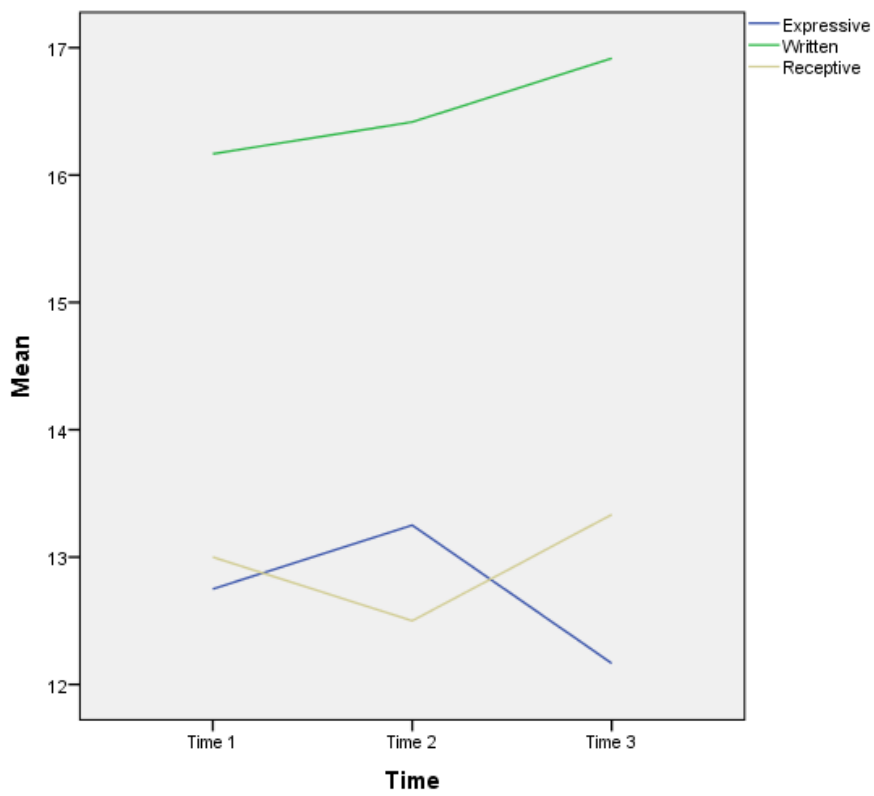
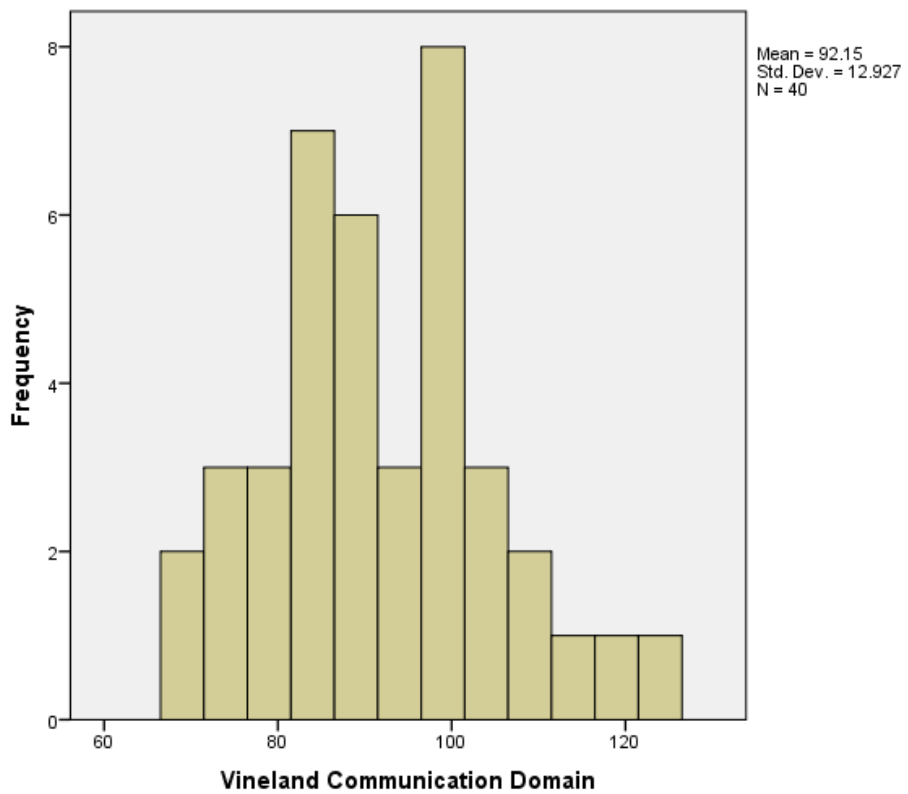
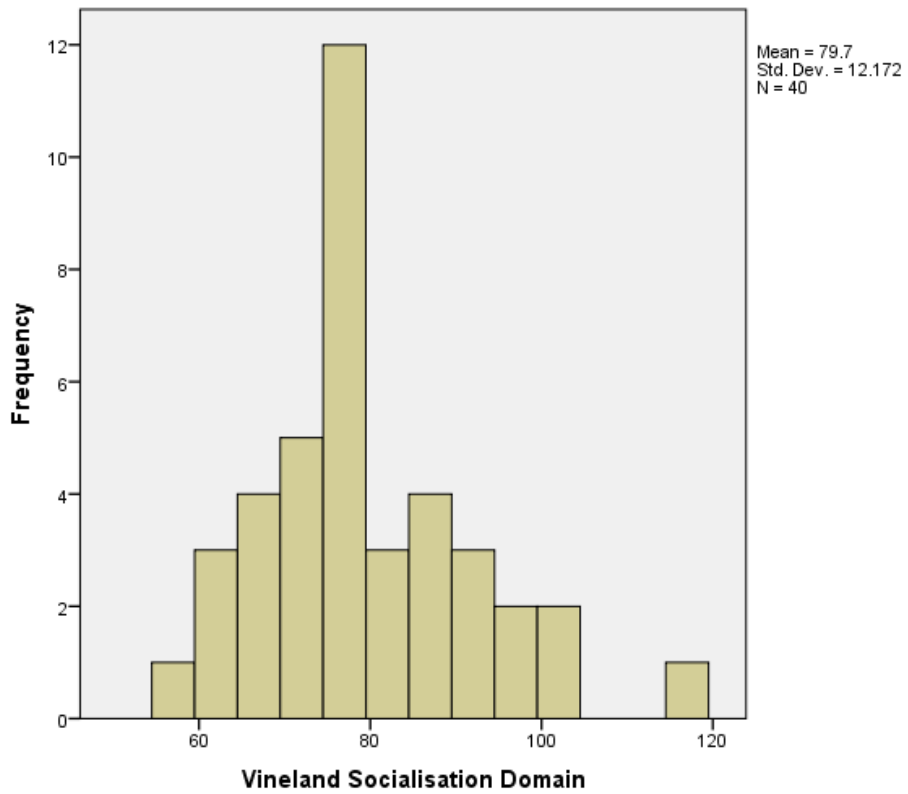


Figure 6: Mean VABS Communication subdomains standard scores



Appendix 20.ii Normality assumptions for VABS data



**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Vineland Socialisation 1	.150	12	.200 <sup>*</sup>	.957	12	.737
Vineland Socialisation 2	.266	12	.019	.902	12	.170
Vineland Socialisation 3	.178	12	.200 <sup>*</sup>	.923	12	.314
Vineland Communication Domain 1	.146	12	.200 <sup>*</sup>	.961	12	.804
Vineland Communication Domain 2	.177	12	.200 <sup>*</sup>	.935	12	.439
Vineland Communication Domain 3	.185	12	.200 <sup>*</sup>	.922	12	.302
Interpersonal 1	.239	12	.056	.901	12	.163
Interpersonal 2	.188	12	.200 <sup>*</sup>	.894	12	.134
Interpersonal 3	.153	12	.200 <sup>*</sup>	.949	12	.627
Play 1	.261	12	.024	.925	12	.331
Play 2	.188	12	.200 <sup>*</sup>	.894	12	.134
Play 3	.186	12	.200 <sup>*</sup>	.927	12	.345
Coping 1	.222	12	.106	.909	12	.210
Coping 2	.200	12	.198	.940	12	.500
Coping 3	.242	12	.052	.882	12	.093
Written 1	.195	12	.200 <sup>*</sup>	.962	12	.817
Written 2	.235	12	.066	.903	12	.174
Written 3	.156	12	.200 <sup>*</sup>	.943	12	.532
Expressive 1	.223	12	.101	.922	12	.302
Expressive 2	.180	12	.200 <sup>*</sup>	.956	12	.730
Expressive 3	.133	12	.200 <sup>*</sup>	.936	12	.451
Receptive 1	.166	12	.200 <sup>*</sup>	.938	12	.479
Receptive 2	.131	12	.200 <sup>*</sup>	.959	12	.771
Receptive 3	.169	12	.200 <sup>*</sup>	.945	12	.569

\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

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Appendix 20.iii Socialisation and Communication Domain: statistical analyses

**Socialisation Domain**

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Vineland Socialisation 1	12	79.75	10.411	64	97
Vineland Socialisation 2	12	78.42	10.561	64	102
Vineland Socialisation 3	12	85.58	13.521	66	118

**Ranks**

	Mean Rank
Vineland Socialisation 1	1.67
Vineland Socialisation 2	1.67
Vineland Socialisation 3	2.67

**Test Statistics<sup>a</sup>**

N	12
Chi-Square	8.348
df	2
Asymp. Sig.	.015
Exact Sig.	.013
Point Probability	.000

a. Friedman Test



**Ranks**

		N	Mean Rank	Sum of Ranks
Vineland Socialisation 3 - Vineland Socialisation 1	Negative Ranks	2 <sup>a</sup>	4.50	9.00
	Positive Ranks	11 <sup>b</sup>	7.45	82.00
	Ties	1 <sup>c</sup>		
	Total	14		
Vineland Socialisation 2 - Vineland Socialisation 1	Negative Ranks	5 <sup>d</sup>	7.10	35.50
	Positive Ranks	5 <sup>e</sup>	3.90	19.50
	Ties	2 <sup>f</sup>		
	Total	12		
Vineland Socialisation 3 - Vineland Socialisation 2	Negative Ranks	2 <sup>g</sup>	5.75	11.50
	Positive Ranks	10 <sup>h</sup>	6.65	66.50
	Ties	0 <sup>i</sup>		
	Total	12		

- a. Vineland Socialisation 3 < Vineland Socialisation 1
- b. Vineland Socialisation 3 > Vineland Socialisation 1
- c. Vineland Socialisation 3 = Vineland Socialisation 1
- d. Vineland Socialisation 2 < Vineland Socialisation 1
- e. Vineland Socialisation 2 > Vineland Socialisation 1
- f. Vineland Socialisation 2 = Vineland Socialisation 1
- g. Vineland Socialisation 3 < Vineland Socialisation 2
- h. Vineland Socialisation 3 > Vineland Socialisation 2
- i. Vineland Socialisation 3 = Vineland Socialisation 2

**Test Statistics<sup>a</sup>**

	Vineland Socialisation 3 - Vineland Socialisation 1	Vineland Socialisation 2 - Vineland Socialisation 1	Vineland Socialisation 3 - Vineland Socialisation 2
Z	-2.558 <sup>b</sup>	-.819 <sup>c</sup>	-2.158 <sup>b</sup>
Asymp. Sig. (2-tailed)	.011	.413	.031
Exact Sig. (2-tailed)	.007	.453	.028
Exact Sig. (1-tailed)	.004	.227	.014
Point Probability	.001	.014	.001

- a. Wilcoxon Signed Ranks Test
- b. Based on negative ranks.
- c. Based on positive ranks.

---

## Communication Domain

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Vineland Communication Domain 1	12	93.08	12.243	74	113
Vineland Communication Domain 2	12	94.08	15.791	69	125
Vineland Communication Domain 3	12	93.83	10.718	70	108

### Ranks

	Mean Rank
Vineland Communication Domain 1	2.13
Vineland Communication Domain 2	1.67
Vineland Communication Domain 3	2.21

### Test Statistics<sup>a</sup>

N	12
Chi-Square	2.085
df	2
Asymp. Sig.	.353
Exact Sig.	.382
Point Probability	.052

a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Vineland Communication Domain 2 - Vineland Communication Domain 1	Negative Ranks	8 <sup>a</sup>	5.44	43.50
	Positive Ranks	4 <sup>b</sup>	8.63	34.50
	Ties	0 <sup>c</sup>		
	Total	12		
Vineland Communication Domain 3 - Vineland Communication Domain 2	Negative Ranks	4 <sup>d</sup>	8.13	32.50
	Positive Ranks	8 <sup>e</sup>	5.69	45.50
	Ties	0 <sup>f</sup>		
	Total	12		

- a. Vineland Communication Domain 2 < Vineland Communication Domain 1
- b. Vineland Communication Domain 2 > Vineland Communication Domain 1
- c. Vineland Communication Domain 2 = Vineland Communication Domain 1
- d. Vineland Communication Domain 3 < Vineland Communication Domain 2
- e. Vineland Communication Domain 3 > Vineland Communication Domain 2
- f. Vineland Communication Domain 3 = Vineland Communication Domain 2

**Test Statistics<sup>a</sup>**

	Vineland Communication Domain 2 - Vineland Communication Domain 1	Vineland Communication Domain 3 - Vineland Communication Domain 2
Z	-.354 <sup>b</sup>	-.510 <sup>c</sup>
Asymp. Sig. (2-tailed)	.723	.610
Exact Sig. (2-tailed)	.747	.642
Exact Sig. (1-tailed)	.373	.321
Point Probability	.015	.016

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.
- c. Based on negative ranks.

---

## VABS Socialisation subdomain: Interpersonal

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Interpersonal 1	12	11.58	2.275	8	15
Interpersonal 2	12	10.58	2.193	8	14
Interpersonal 3	12	12.50	2.844	8	19

### Ranks

	Mean Rank
Interpersonal 1	2.00
Interpersonal 2	1.46
Interpersonal 3	2.54

### Test Statistics<sup>a</sup>

N	12
Chi-Square	10.903
df	2
Asymp. Sig.	.004
Exact Sig.	.002
Point Probability	.000

a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Interpersonal 2 - Interpersonal 1	Negative Ranks	6 <sup>a</sup>	4.25	25.50
	Positive Ranks	1 <sup>b</sup>	2.50	2.50
	Ties	5 <sup>c</sup>		
	Total	12		
Interpersonal 3 - Interpersonal 2	Negative Ranks	0 <sup>d</sup>	.00	.00
	Positive Ranks	8 <sup>e</sup>	4.50	36.00
	Ties	4 <sup>f</sup>		
	Total	12		
Interpersonal 3 - Interpersonal 1	Negative Ranks	1 <sup>g</sup>	3.50	3.50
	Positive Ranks	7 <sup>h</sup>	4.64	32.50
	Ties	6 <sup>i</sup>		
	Total	14		

- a. Interpersonal 2 < Interpersonal 1
- b. Interpersonal 2 > Interpersonal 1
- c. Interpersonal 2 = Interpersonal 1
- d. Interpersonal 3 < Interpersonal 2
- e. Interpersonal 3 > Interpersonal 2
- f. Interpersonal 3 = Interpersonal 2
- g. Interpersonal 3 < Interpersonal 1
- h. Interpersonal 3 > Interpersonal 1
- i. Interpersonal 3 = Interpersonal 1

**Test Statistics<sup>a</sup>**

	Interpersonal 2 - Interpersonal 1	Interpersonal 3 - Interpersonal 2	Interpersonal 3 - Interpersonal 1
Z	-1.983 <sup>b</sup>	-2.533 <sup>c</sup>	-2.124 <sup>c</sup>
Asymp. Sig. (2-tailed)	.047	.011	.034
Exact Sig. (2-tailed)	.078	.008	.055
Exact Sig. (1-tailed)	.039	.004	.027
Point Probability	.031	.004	.023

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.
- c. Based on negative ranks.

---

## VABS Socialisation subdomain: Play

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Play 1	12	11.00	2.174	8	15
Play 2	12	10.58	2.193	8	14
Play 3	12	12.25	3.049	8	17

### Ranks

	Mean Rank
Play 1	1.88
Play 2	1.54
Play 3	2.58

### Test Statistics<sup>a</sup>

N	12
Chi-Square	9.314
df	2
Asymp. Sig.	.009
Exact Sig.	.007
Point Probability	.001

a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Play 2 - Play 1	Negative Ranks	5 <sup>a</sup>	4.10	20.50
	Positive Ranks	2 <sup>b</sup>	3.75	7.50
	Ties	5 <sup>c</sup>		
	Total	12		
Play 3 - Play 2	Negative Ranks	1 <sup>d</sup>	3.00	3.00
	Positive Ranks	9 <sup>e</sup>	5.78	52.00
	Ties	2 <sup>f</sup>		
	Total	12		
Play 3 - Play 1	Negative Ranks	1 <sup>g</sup>	3.00	3.00
	Positive Ranks	8 <sup>h</sup>	5.25	42.00
	Ties	5 <sup>i</sup>		
	Total	14		

- a. Play 2 < Play 1
- b. Play 2 > Play 1
- c. Play 2 = Play 1
- d. Play 3 < Play 2
- e. Play 3 > Play 2
- f. Play 3 = Play 2
- g. Play 3 < Play 1
- h. Play 3 > Play 1
- i. Play 3 = Play 1

**Test Statistics<sup>a</sup>**

	Play 2 - Play 1	Play 3 - Play 2	Play 3 - Play 1
Z	-1.127 <sup>b</sup>	-2.534 <sup>c</sup>	-2.360 <sup>c</sup>
Asymp. Sig. (2-tailed)	.260	.011	.018
Exact Sig. (2-tailed)	.375	.012	.023
Exact Sig. (1-tailed)	.188	.006	.012
Point Probability	.094	.005	.010

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.
- c. Based on negative ranks.

## VABS Socialisation subdomain: Coping

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Coping 1	12	11.83	2.368	9	17
Coping 2	12	11.75	2.006	9	16
Coping 3	12	12.50	2.153	10	17

### Ranks

	Mean Rank
Coping 1	1.71
Coping 2	1.83
Coping 3	2.46

### Test Statistics<sup>a</sup>

N	12
Chi-Square	4.895
df	2
Asymp. Sig.	.087
Exact Sig.	.085
Point Probability	.008

a. Friedman Test

### Ranks

	N	Mean Rank	Sum of Ranks
Coping 2 - Coping 1	Negative Ranks	2 <sup>a</sup>	5.25
	Positive Ranks	4 <sup>b</sup>	2.63
	Ties	6 <sup>c</sup>	
	Total	12	
Coping 3 - Coping 2	Negative Ranks	2 <sup>d</sup>	7.75
	Positive Ranks	8 <sup>e</sup>	4.94
	Ties	2 <sup>f</sup>	
	Total	12	

a. Coping 2 < Coping 1

b. Coping 2 > Coping 1

c. Coping 2 = Coping 1

d. Coping 3 < Coping 2

e. Coping 3 > Coping 2

f. Coping 3 = Coping 2

### Test Statistics<sup>a</sup>

	Coping 2 - Coping 1	Coping 3 - Coping 2
Z	.000 <sup>b</sup>	-1.235 <sup>c</sup>
Asymp. Sig. (2-tailed)	1.000	.217
Exact Sig. (2-tailed)	1.000	.229
Exact Sig. (1-tailed)	.531	.114
Point Probability	.063	.016

a. Wilcoxon Signed Ranks Test

b. The sum of negative ranks equals the sum of positive ranks.

c. Based on negative ranks.



## VABS Communication subdomain: Expressive

### Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum
Expressive 1	12	12.75	2.094	9	16
Expressive 2	12	13.25	2.667	9	18
Expressive 3	12	12.17	1.992	9	15

### Ranks

	Mean Rank
Expressive 1	2.13
Expressive 2	1.96
Expressive 3	1.92

### Test Statistics<sup>a</sup>

N	12
Chi-Square	.389
df	2
Asymp. Sig.	.823
Exact Sig.	.872
Point Probability	.074

a. Friedman Test

### Ranks

		N	Mean Rank	Sum of Ranks
Expressive 2 - Expressive 1	Negative Ranks	4 <sup>a</sup>	3.38	13.50
	Positive Ranks	4 <sup>b</sup>	5.63	22.50
	Ties	4 <sup>c</sup>		
	Total	12		
Expressive 3 - Expressive 2	Negative Ranks	4 <sup>d</sup>	7.25	29.00
	Positive Ranks	5 <sup>e</sup>	3.20	16.00
	Ties	3 <sup>f</sup>		
	Total	12		

a. Expressive 2 < Expressive 1

b. Expressive 2 > Expressive 1

c. Expressive 2 = Expressive 1

d. Expressive 3 < Expressive 2

e. Expressive 3 > Expressive 2

f. Expressive 3 = Expressive 2

### Test Statistics<sup>a</sup>

	Expressive 2 - Expressive 1	Expressive 3 - Expressive 2
Z	-.641 <sup>b</sup>	-.776 <sup>c</sup>
Asymp. Sig. (2-tailed)	.521	.438
Exact Sig. (2-tailed)	.586	.500
Exact Sig. (1-tailed)	.293	.250
Point Probability	.047	.043

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

---

**VABS Communication subdomain: Receptive**

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Receptive 1	12	13.00	3.104	9	18
Receptive 2	12	12.50	3.000	8	18
Receptive 3	12	13.33	3.085	8	18

**Ranks**

	Mean Rank
Receptive 1	2.13
Receptive 2	1.75
Receptive 3	2.13

**Test Statistics<sup>a</sup>**

N	12
Chi-Square	1.500
df	2
Asymp. Sig.	.472
Exact Sig.	.507
Point Probability	.020

a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Receptive 2 - Receptive 1	Negative Ranks	6 <sup>a</sup>	4.92	29.50
	Positive Ranks	3 <sup>b</sup>	5.17	15.50
	Ties	3 <sup>c</sup>		
	Total	12		
Receptive 3 - Receptive 2	Negative Ranks	3 <sup>d</sup>	4.17	12.50
	Positive Ranks	6 <sup>e</sup>	5.42	32.50
	Ties	3 <sup>f</sup>		
	Total	12		

- a. Receptive 2 < Receptive 1
- b. Receptive 2 > Receptive 1
- c. Receptive 2 = Receptive 1
- d. Receptive 3 < Receptive 2
- e. Receptive 3 > Receptive 2
- f. Receptive 3 = Receptive 2

**Test Statistics<sup>a</sup>**

	Receptive 2 - Receptive 1	Receptive 3 - Receptive 2
Z	-.840 <sup>b</sup>	-1.194 <sup>c</sup>
Asymp. Sig. (2-tailed)	.401	.232
Exact Sig. (2-tailed)	.445	.277
Exact Sig. (1-tailed)	.223	.139
Point Probability	.023	.016

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.
- c. Based on negative ranks.

**VABS Communication subdomain: Written**

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Written 1	12	16.17	2.368	12	21
Written 2	12	16.42	3.630	12	24
Written 3	12	16.92	3.029	13	22

**Ranks**

	Mean Rank
Written 1	1.88
Written 2	1.88
Written 3	2.25

**Test Statistics<sup>a</sup>**

N	12
Chi-Square	1.286
df	2
Asymp. Sig.	.526
Exact Sig.	.561
Point Probability	.022

- a. Friedman Test

**Ranks**

		N	Mean Rank	Sum of Ranks
Written 2 - Written 1	Negative Ranks	5 <sup>a</sup>	4.70	23.50
	Positive Ranks	5 <sup>b</sup>	6.30	31.50
	Ties	2 <sup>c</sup>		
	Total	12		
Written 3 - Written 2	Negative Ranks	3 <sup>d</sup>	4.83	14.50
	Positive Ranks	6 <sup>e</sup>	5.08	30.50
	Ties	3 <sup>f</sup>		
	Total	12		

- a. Written 2 < Written 1
- b. Written 2 > Written 1
- c. Written 2 = Written 1
- d. Written 3 < Written 2
- e. Written 3 > Written 2
- f. Written 3 = Written 2

**Test Statistics<sup>a</sup>**

	Written 2 - Written 1	Written 3 - Written 2
Z	-.416 <sup>b</sup>	-.979 <sup>b</sup>
Asymp. Sig. (2-tailed)	.677	.327
Exact Sig. (2-tailed)	.777	.422
Exact Sig. (1-tailed)	.389	.211
Point Probability	.043	.059

- a. Wilcoxon Signed Ranks Test
- b. Based on negative ranks.

## Appendix 21 Effect Size calculations

Data type	Measurement	Time Time 1 to 2 =baseline Time 2 to 3 =intervention	Direction of change (from Mean/ median scores)	Z	N	$\sqrt{N}$	Effect size (r) $r = \frac{Z}{\sqrt{N}}$	Effect Size
Observation data	Frequency of self-initiated observations	Baseline	Decrease	-0.81	14	3.74	-0.22	Small
	Frequency of self-initiated observations	Intervention	Increase	-0.35	14	3.74	-0.09	None
	Duration of interactions	Baseline	Increase	-0.03	14	3.74	-0.01	None
	Duration of interactions	Intervention	Increase	-0.60	14	3.74	-0.16	Small
VABS SD	Socialisation Domain	Baseline	Decrease	-0.82	12	3.46	-0.24	Small
	Socialisation Domain	Intervention	Increase	-2.16	12	3.46	-0.62	Large
	Socialisation Domain	Time 1 to 3	Increase	-2.56	12	3.46	-0.74	Large
	Subdomain: Play	Baseline	Decrease	-1.13	12	3.46	-0.33	Medium
	Subdomain: Play	Intervention	Increase	-2.53	12	3.46	-0.73	Large

	Measurement	Time Time 1 to 2 =baseline Time 2 to 3 =intervention	Direction of change	Z	N	$\sqrt{N}$	Effect size (r) $r = \frac{Z}{\sqrt{N}}$	Effect Size
	Subdomain: Play	Time 1 to 3	Increase	-2.36	12	3.46	-0.68	Large
	Subdomain: Interpersonal	Baseline	Decrease	-0.20	12	3.46	-0.06	None
	Subdomain: Interpersonal	Intervention	Increase	-2.53	12	3.46	-0.73	Large
	Subdomain: Coping	Baseline	Decrease	0.00	12	3.46	0.00	None
	Subdomain: Coping	Intervention	Increase	-1.24	12	3.46	-0.36	Medium
VABS CD	Communication Domain	Baseline	Increase	-0.35	12	3.46	-0.10	Small
	Communication Domain	Intervention	Decrease	-0.51	12	3.46	-0.15	Small
	Subdomain: Written	Baseline	Increase	-0.42	12	3.46	-0.12	Small
	Subdomain: Written	Intervention	Increase	-0.98	12	3.46	-0.28	Small
	Subdomain: Expressive	Baseline	Decrease	-0.64	12	3.46	-0.19	Small
	Subdomain: Expressive	Intervention	Decrease	-0.78	12	3.46	-0.22	Small
	Subdomain: Receptive	Baseline	Decrease	-0.84	12	3.46	-0.24	Small
	Subdomain: Receptive	Intervention	Increase	-1.19	12	3.46	-0.35	Medium

## Appendix 22 Follow-up observation data: descriptive statistics, tests of normality and statistical analyses

### Appendix 22i: Descriptive statistics and graphs

Descriptives			Statistic	Std. Error
Median duration of interactions 1	Mean		23.1143	6.70896
	95% Confidence Interval for Mean	Lower Bound	6.6981	
		Upper Bound	39.5305	
	5% Trimmed Mean		23.2103	
	Median		13.9000	
	Variance		315.071	
	Std. Deviation		17.75023	
	Minimum		.00	
	Maximum		44.50	
	Range		44.50	
	Interquartile Range		32.05	
	Skewness		.180	.794
	Kurtosis		-1.984	1.587
Median duration of interactions 2	Mean		27.2714	12.31155
	95% Confidence Interval for Mean	Lower Bound	-2.8538	
		Upper Bound	57.3967	
	5% Trimmed Mean		25.0071	
	Median		15.0500	
	Variance		1061.020	
	Std. Deviation		32.57330	
	Minimum		.00	
	Maximum		95.30	
	Range		95.30	
	Interquartile Range		33.10	
	Skewness		1.870	.794
	Kurtosis		3.873	1.587
Median duration of interactions 3	Mean		25.9500	5.81716
	95% Confidence Interval for Mean	Lower Bound	11.7159	
		Upper Bound	40.1841	
	5% Trimmed Mean		24.8389	
	Median		20.5000	
	Variance		236.876	
	Std. Deviation		15.39077	
	Minimum		13.60	
	Maximum		58.30	
	Range		44.70	
	Interquartile Range		16.30	
	Skewness		1.929	.794
	Kurtosis		4.075	1.587
Median duration of interactions 4	Mean		25.2643	4.93810
	95% Confidence Interval for Mean	Lower Bound	13.1812	
		Upper Bound	37.3474	
	5% Trimmed Mean		25.5075	
	Median		26.1000	
	Variance		170.694	
	Std. Deviation		13.06499	
	Minimum		2.60	
	Maximum		43.55	
	Range		40.95	
	Interquartile Range		17.40	
	Skewness		-.557	.794
	Kurtosis		.809	1.587

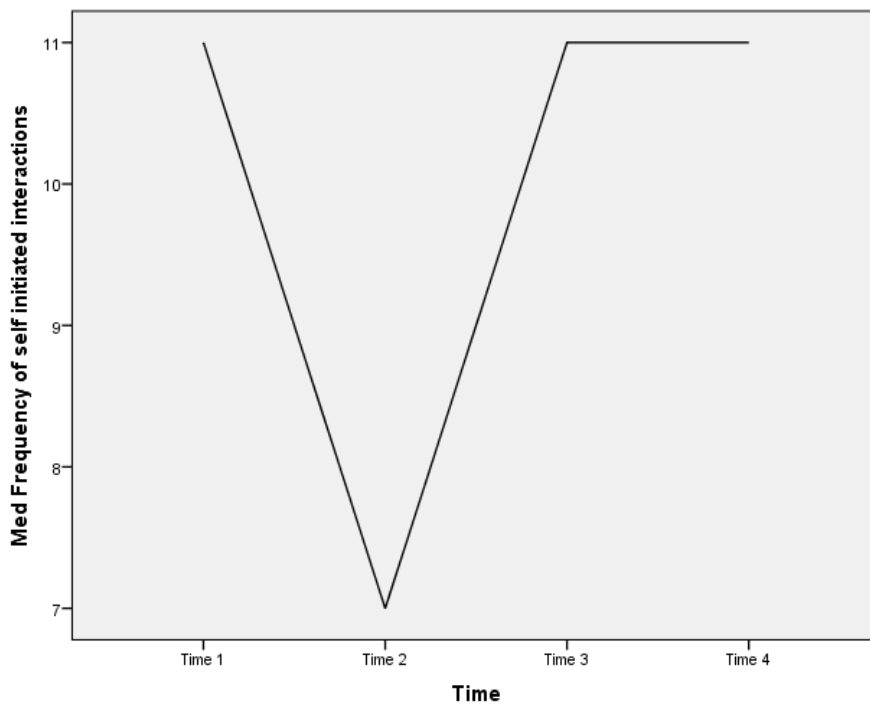
**Descriptives**

			Statistic	Std. Error
Frequency of self initiated interactions 1	Mean		10.00	2.320
	95% Confidence Interval for Mean	Lower Bound	4.32	
		Upper Bound	15.68	
	5% Trimmed Mean		10.06	
	Median		11.00	
	Variance		37.667	
	Std. Deviation		6.137	
	Minimum		0	
	Maximum		19	
	Range		19	
	Interquartile Range		8	
	Skewness		-.345	.794
	Kurtosis		.307	1.587
Frequency of self initiated interactions 2	Mean		8.57	3.558
	95% Confidence Interval for Mean	Lower Bound	-.13	
		Upper Bound	17.28	
	5% Trimmed Mean		8.08	
	Median		7.00	
	Variance		88.619	
	Std. Deviation		9.414	
	Minimum		0	
	Maximum		26	
	Range		26	
	Interquartile Range		14	
	Skewness		1.097	.794
	Kurtosis		.889	1.587
Frequency of self initiated interactions 3	Mean		9.71	1.973
	95% Confidence Interval for Mean	Lower Bound	4.89	
		Upper Bound	14.54	
	5% Trimmed Mean		9.90	
	Median		11.00	
	Variance		27.238	
	Std. Deviation		5.219	
	Minimum		1	
	Maximum		15	
	Range		14	
	Interquartile Range		8	
	Skewness		-.699	.794
	Kurtosis		-.702	1.587
Frequency of self initiated interactions 4	Mean		9.29	1.686
	95% Confidence Interval for Mean	Lower Bound	5.16	
		Upper Bound	13.41	
	5% Trimmed Mean		9.60	
	Median		11.00	
	Variance		19.905	
	Std. Deviation		4.461	
	Minimum		0	
	Maximum		13	
	Range		13	
	Interquartile Range		4	
	Skewness		-1.856	.794
	Kurtosis		3.722	1.587

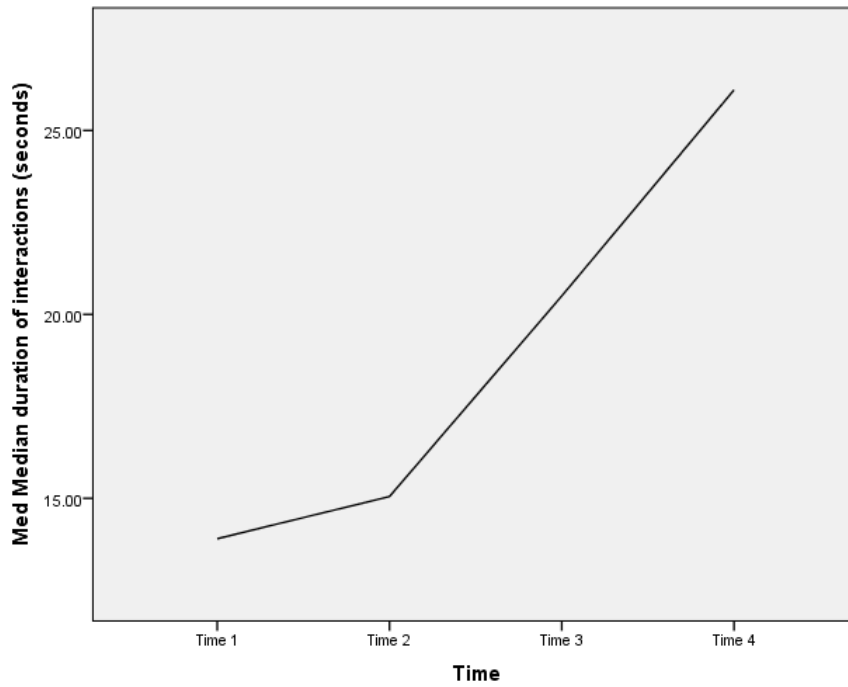


		Time 1 (N=7)	Time 2 (N=7)	Time 3 (N=7)	Time 4 (N=7)
<b>Frequency of self-initiated interactions</b>	Median (IQR)	11(8)	7 (14)	11(8)	11(4)
	Mean (SD)	10.00 (6.13)	8.57 (9.41)	9.71 (5.22)	9.29 (4.46)
<b>Duration of interactions (seconds)</b>	Median (IQR)	13.90 (32.05)	15.05 (33.10)	20.50 (16.30)	26.10 (17.40)
	Mean (SD)	23.11 (17.75)	27.27 (32.57)	25.95 (15.39)	25.26 (13.06)

Frequency of self-initiated interactions at follow-up



Median duration of interactions (seconds) at follow-up



Appendix 22ii Follow-up observation data: statistical analyses

**Frequency of self-initiated observations**

**Ranks**

		N	Mean Rank	Sum of Ranks
Frequency of Self Initiated interactions 4 - Frequency of Self Initiated interactions 3	Negative Ranks	4 <sup>a</sup>	4.25	17.00
	Positive Ranks	3 <sup>b</sup>	3.67	11.00
	Ties	0 <sup>c</sup>		
	Total	7		

- a. Frequency of Self Initiated interactions 4 < Frequency of Self Initiated interactions 3
- b. Frequency of Self Initiated interactions 4 > Frequency of Self Initiated interactions 3
- c. Frequency of Self Initiated interactions 4 = Frequency of Self Initiated interactions 3

**Test Statistics<sup>a</sup>**

	Frequency of Self Initiated interactions 4 - Frequency of Self Initiated interactions 3
Z	-.513 <sup>b</sup>
Asymp. Sig. (2-tailed)	.608
Exact Sig. (2-tailed)	.719
Exact Sig. (1-tailed)	.359
Point Probability	.055

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

**Median Duration of interactions****Ranks**

		N	Mean Rank	Sum of Ranks
Median duration of interactions 4 - Median duration of interactions 3	Negative Ranks	3 <sup>a</sup>	5.00	15.00
	Positive Ranks	4 <sup>b</sup>	3.25	13.00
	Ties	0 <sup>c</sup>		
	Total	7		

a. Median duration of interactions 4 < Median duration of interactions 3

b. Median duration of interactions 4 > Median duration of interactions 3

c. Median duration of interactions 4 = Median duration of interactions 3

**Test Statistics<sup>a</sup>**

	Median duration of interactions 4 - Median duration of interactions 3
Z	-.169 <sup>b</sup>
Asymp. Sig. (2-tailed)	.866
Exact Sig. (2-tailed)	.938
Exact Sig. (1-tailed)	.469
Point Probability	.063

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

## Appendix 23 Follow-up VABS data

### Appendix 23.i VABS descriptive statistics and graphs

	<b>Time 1 Mean standard score (SD)</b>	<b>Time 2 Mean standard score (SD)</b>	<b>Time 3 Mean standard score (SD)</b>	<b>Time 4 Mean standard score (SD)</b>
	N=6	N=6	N=6	N=6
<b>VABS-SD</b>	77.17(11.0)	74.67 (7.76)	83.5 (17.85)	80.83 (7.99)
<b>VABS-SD Play</b>	10.33(2.42)	9.50(1.87)	10.83 (3.20)	11.00 (1.55)
<b>VABS-SD Coping</b>	2.00(2.76)	11.67 (1.37)	12.33(2.25)	12.33 (1.97)
<b>VABS-SD Interpersonal</b>	10.67(2.25)	9.50 (1.87)	12.50 (3.83)	11.67 (2.07)
<b>VABS-CD</b>	91.83 (14.33)	93.5(19.69)	91.50 (13.60)	94.50 (11.22)
<b>VABS-CD Communication Expressive</b>	12.67 (1.86)	12.67 (3.33)	11.67 (2.50)	14.17 (1.47)
<b>VABS-CD Receptive</b>	12.33 (3.39)	11.83 (2.93)	12.17 (3.37)	12.50 (2.88)
<b>VABS-CD Written</b>	16.33 (3.33)	17.33 (4.27)	17.33 (3.01)	16.17 (2.48)

#### Report

	Vineland Socialisation 1	Vineland Socialisation 2	Vineland Socialisation 3	Vineland Socialisation 4	Vineland Communicati on Domain 1	Vineland Communicati on Domain 2	Vineland Communicati on Domain 3	Vineland Communicati on Domain 4
Mean	79.86	78.57	84.43	80.83	93.14	97.14	93.14	94.50
N	7	7	7	6	7	7	7	6
Std. Deviation	12.308	12.528	16.481	7.985	13.533	20.391	13.146	11.221

#### Report

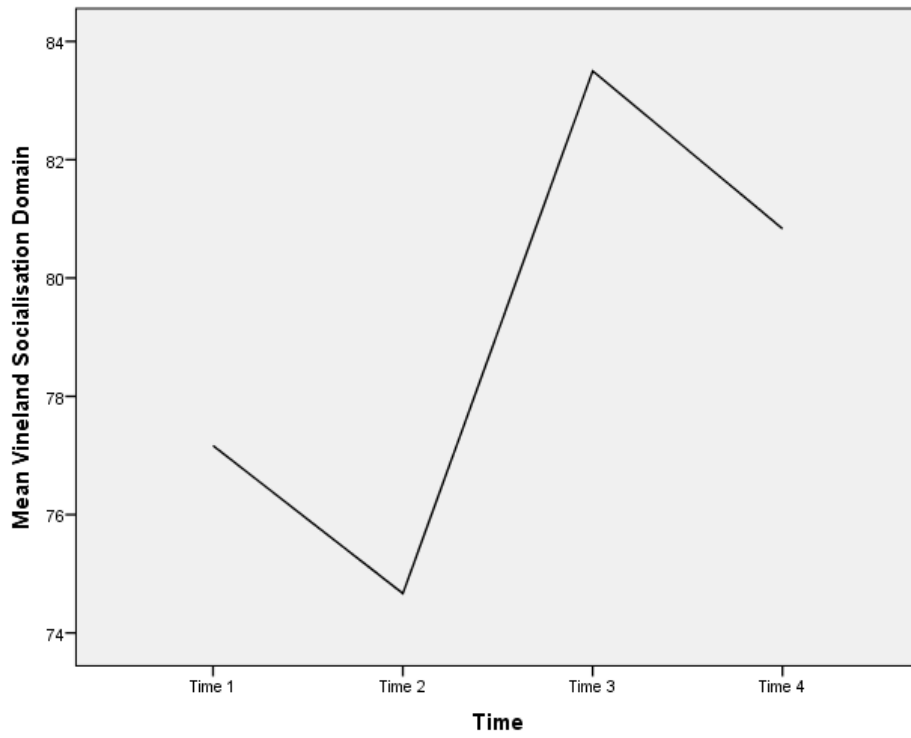
	Interpersonal 1	Interpersonal 2	Interpersonal 3	Interpersonal 4	Play 1	Play 2	Play 3	Play 4	Coping 1	Coping 2	Coping 3	Coping 4
Mean	11.29	10.14	12.86	11.67	10.86	10.14	11.14	11.00	12.43	12.29	12.29	153.29
N	7	7	7	6	7	7	7	6	7	7	7	7
Std. Deviation	2.628	2.410	3.625	2.066	2.610	2.410	3.024	1.549	2.760	2.059	2.059	372.929

#### Report

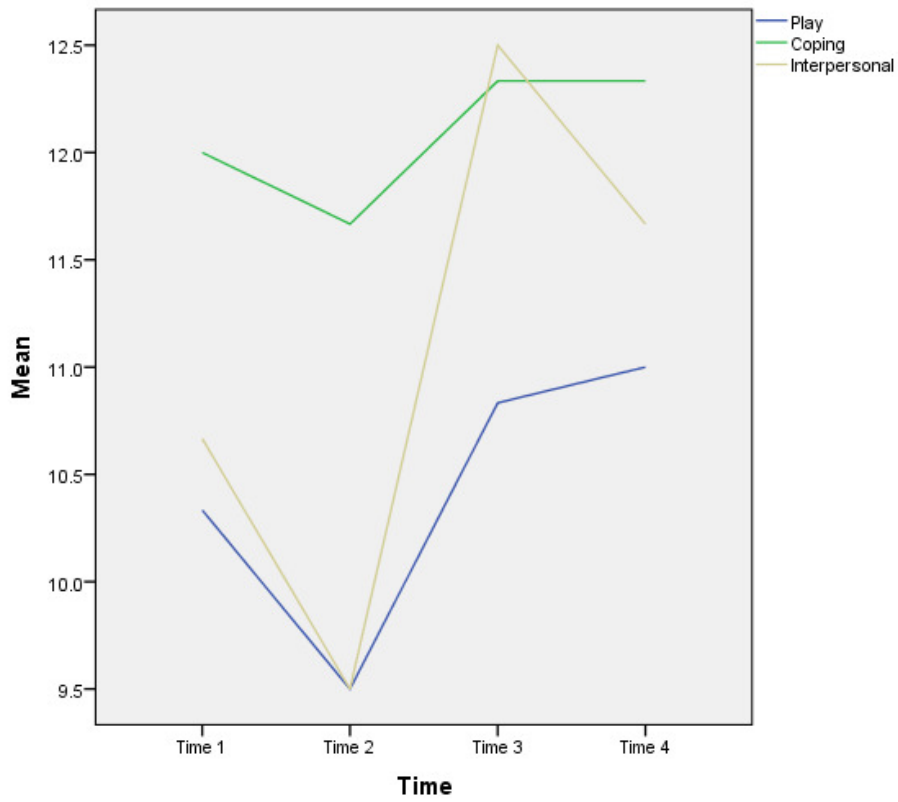
	Written 1	Written 2	Written 3	Written 4	Expressive 1	Expressive 2	Expressive 3	Expressive 4	Receptive 1	Receptive 2	Receptive 3	Receptive 4
Mean	16.57	17.86	17.86	16.17	12.57	13.00	11.71	14.17	12.86	12.71	12.43	12.50
N	7	7	7	6	7	7	7	6	7	7	7	6
Std. Deviation	3.101	4.140	3.078	2.483	1.718	3.162	2.289	1.472	3.388	3.546	3.155	2.881

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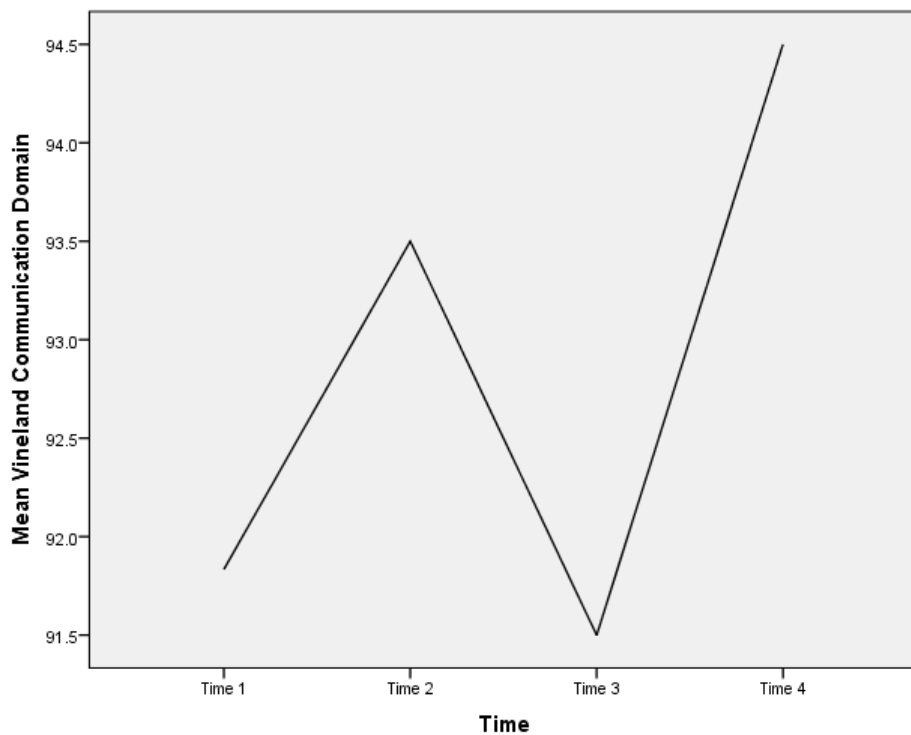
Adaptive Socialisation VABS standard scores at follow up



Mean Socialisation subdomain standard scores at follow-up

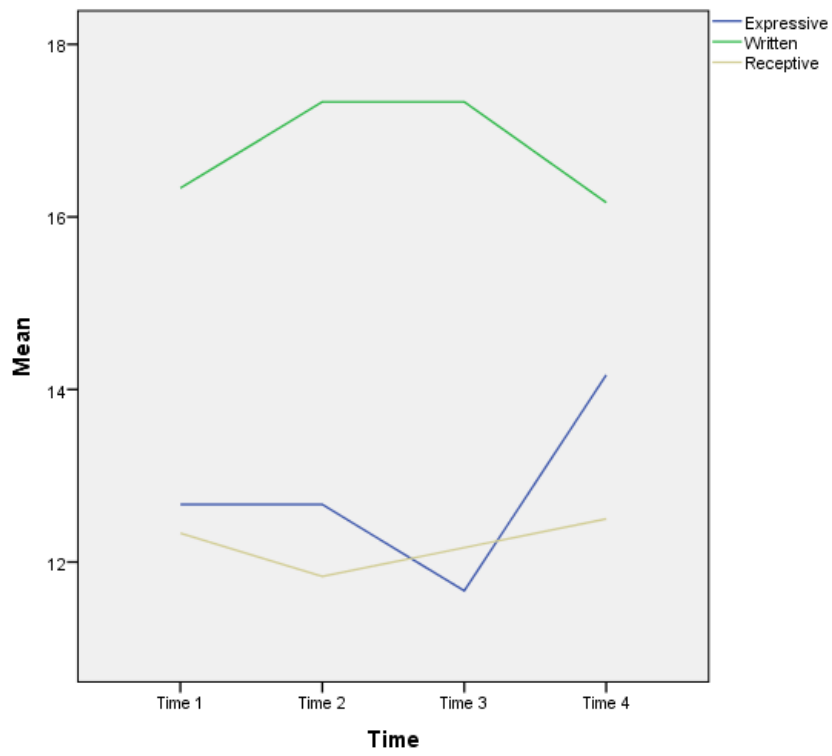


VABS Adaptive Communication standard scores at follow up



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Mean communication subdomain standard scores at follow up



## Appendix 23.ii VABS data normality assumptions

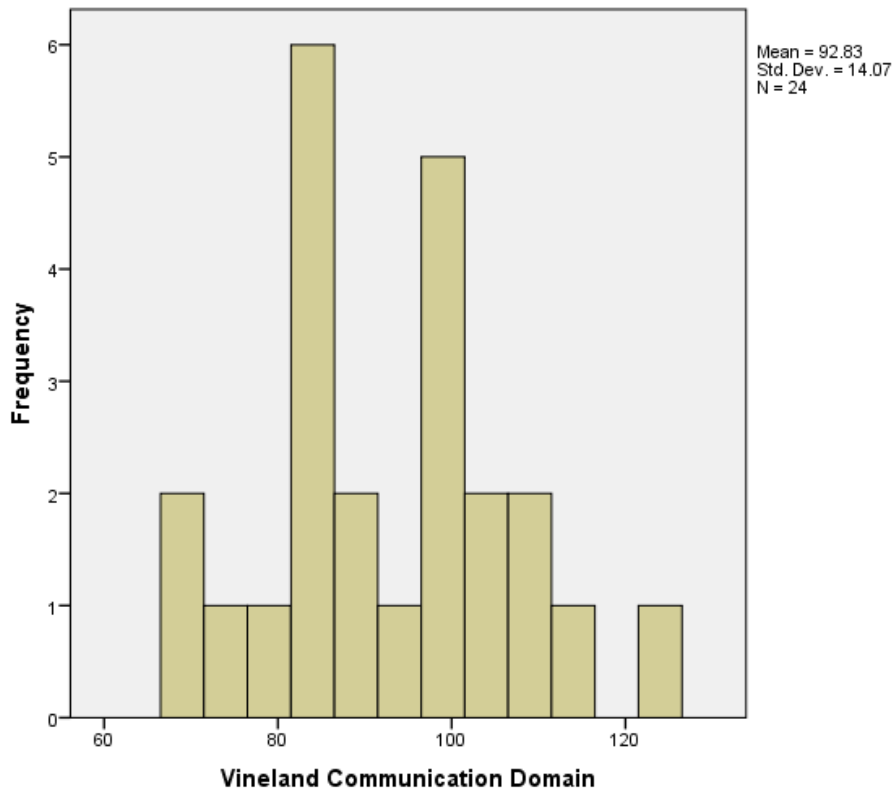
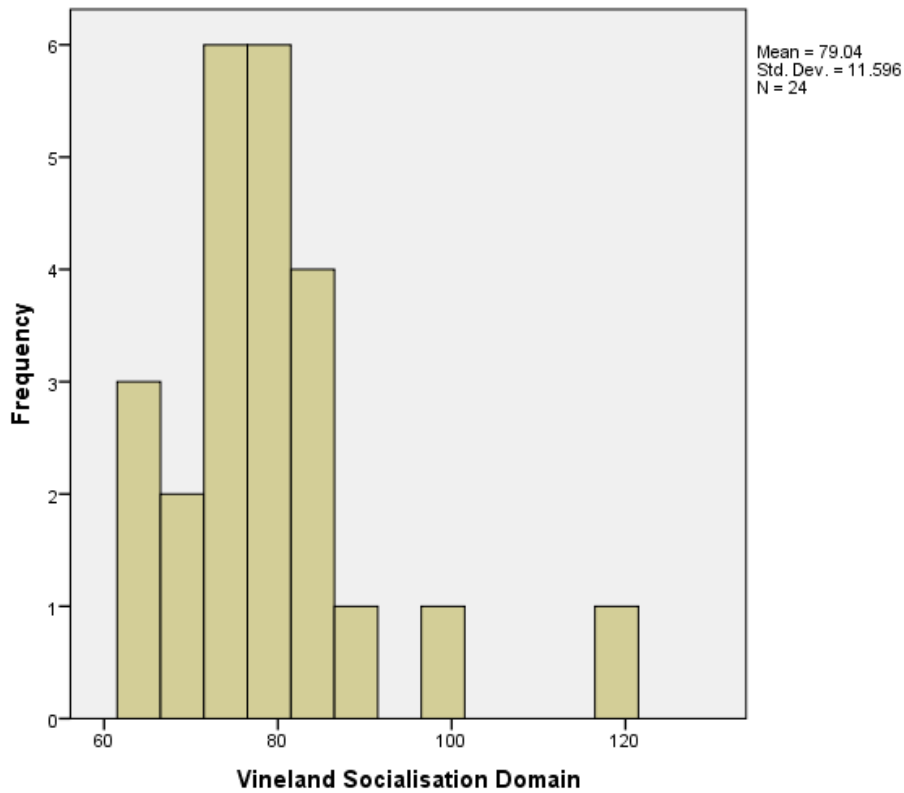
**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Vineland Socialisation 1	.303	6	.090	.894	6	.340
Vineland Socialisation 2	.235	6	.200 <sup>*</sup>	.954	6	.770
Vineland Socialisation 3	.345	6	.025	.786	6	.044
Vineland Socialisation 4	.199	6	.200 <sup>*</sup>	.968	6	.881
Vineland Communication Domain 1	.208	6	.200 <sup>*</sup>	.946	6	.710
Vineland Communication Domain 2	.185	6	.200 <sup>*</sup>	.969	6	.886
Vineland Communication Domain 3	.209	6	.200 <sup>*</sup>	.943	6	.683
Vineland Communication Domain 4	.181	6	.200 <sup>*</sup>	.947	6	.715
Interpersonal 1	.270	6	.194	.836	6	.121
Interpersonal 2	.272	6	.187	.815	6	.080
Interpersonal 3	.181	6	.200 <sup>*</sup>	.954	6	.769
Interpersonal 4	.293	6	.117	.915	6	.473
Play 1	.388	6	.005	.779	6	.038
Play 2	.272	6	.187	.815	6	.080
Play 3	.312	6	.068	.793	6	.051
Play 4	.241	6	.200 <sup>*</sup>	.913	6	.456
Coping 1	.333	6	.036	.857	6	.178
Coping 2	.430	6	.001	.709	6	.008
Coping 3	.217	6	.200 <sup>*</sup>	.905	6	.404
Coping 4	.302	6	.094	.775	6	.035
Written 1	.156	6	.200 <sup>*</sup>	.981	6	.955
Written 2	.207	6	.200 <sup>*</sup>	.964	6	.851
Written 3	.211	6	.200 <sup>*</sup>	.969	6	.888
Written 4	.153	6	.200 <sup>*</sup>	.957	6	.794
Expressive 1	.307	6	.081	.788	6	.045
Expressive 2	.246	6	.200 <sup>*</sup>	.934	6	.614
Expressive 3	.190	6	.200 <sup>*</sup>	.913	6	.459
Expressive 4	.214	6	.200 <sup>*</sup>	.958	6	.804
Receptive 1	.255	6	.200 <sup>*</sup>	.898	6	.361
Receptive 2	.234	6	.200 <sup>*</sup>	.889	6	.310
Receptive 3	.240	6	.200 <sup>*</sup>	.928	6	.565
Receptive 4	.141	6	.200 <sup>*</sup>	.973	6	.913
Median duration of interactions 1	.302	6	.091	.896	6	.351
Median duration of interactions 2	.316	6	.063	.741	6	.016
Median duration of interactions 3	.244	6	.200 <sup>*</sup>	.816	6	.082
Median duration of interactions 4	.219	6	.200 <sup>*</sup>	.924	6	.536
Frequency of self initiated interactions 1	.216	6	.200 <sup>*</sup>	.953	6	.765
Frequency of self initiated interactions 2	.247	6	.200 <sup>*</sup>	.869	6	.224
Frequency of self initiated interactions 3	.255	6	.200 <sup>*</sup>	.856	6	.176
Frequency of self initiated interactions 4	.300	6	.098	.767	6	.029
Total time of interactions 1	.192	6	.200 <sup>*</sup>	.937	6	.635
Total time of interactions 2	.186	6	.200 <sup>*</sup>	.927	6	.561
Total time of interactions 3	.292	6	.119	.786	6	.044
Total time of interactions 4	.184	6	.200 <sup>*</sup>	.966	6	.868

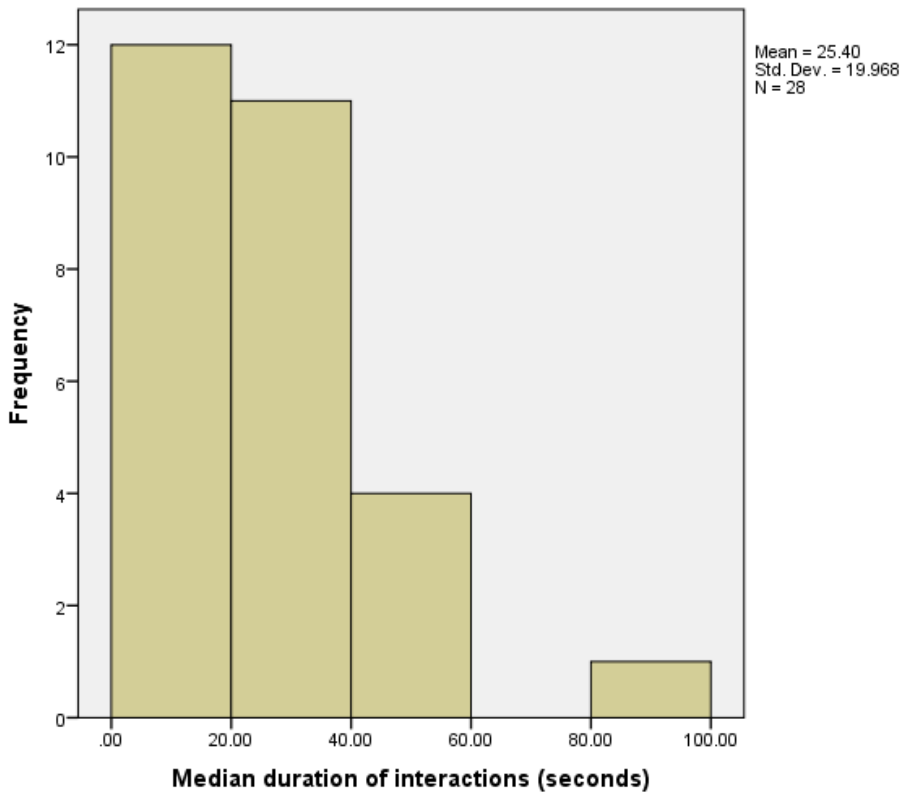
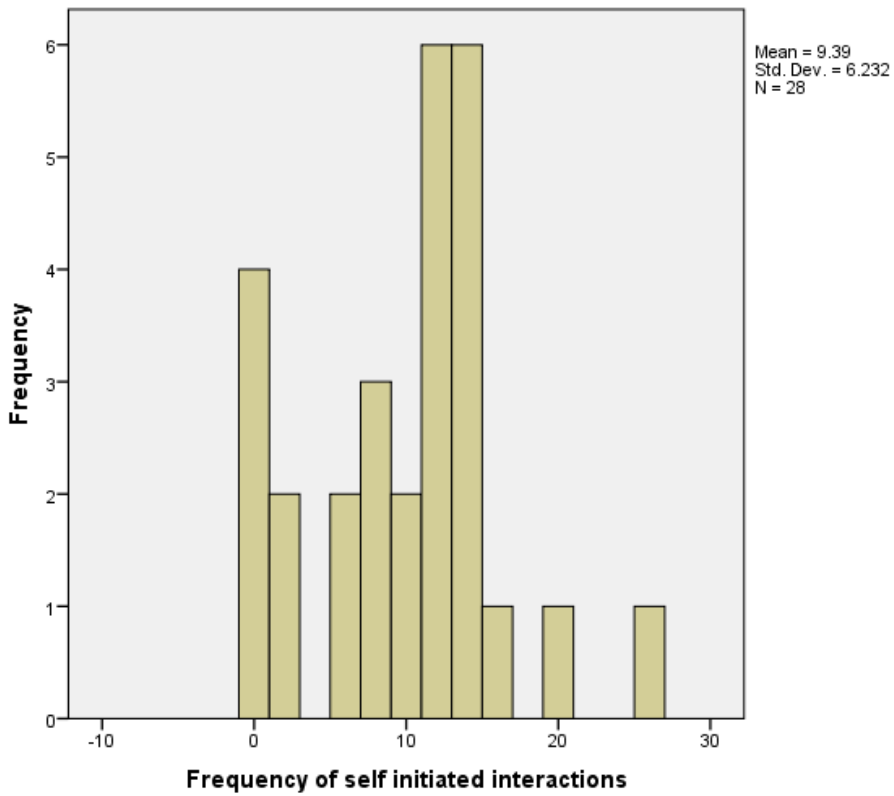
\*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction





Observation data



Appendix 23.iii Socialisation and Communication Domain: statistical analyses

**Socialisation**

**Ranks**

		N	Mean Rank	Sum of Ranks
Vineland Socialisation 4 - Vineland Socialisation 3	Negative Ranks	3 <sup>a</sup>	3.50	10.50
	Positive Ranks	3 <sup>b</sup>	3.50	10.50
	Ties	0 <sup>c</sup>		
	Total	6		

a. Vineland Socialisation 4 < Vineland Socialisation 3

b. Vineland Socialisation 4 > Vineland Socialisation 3

c. Vineland Socialisation 4 = Vineland Socialisation 3

**Test Statistics<sup>a</sup>**

	Vineland Socialisation 4 - Vineland Socialisation 3
Z	.000 <sup>b</sup>
Asymp. Sig. (2-tailed)	1.000
Exact Sig. (2-tailed)	1.000
Exact Sig. (1-tailed)	.531
Point Probability	.063

a. Wilcoxon Signed Ranks Test

b. The sum of negative ranks equals the sum of positive ranks.

**Communication**

**Ranks**

		N	Mean Rank	Sum of Ranks
Vineland Communication Domain 4 - Vineland Communication Domain 3	Negative Ranks	1 <sup>a</sup>	4.50	4.50
	Positive Ranks	4 <sup>b</sup>	2.63	10.50
	Ties	1 <sup>c</sup>		
	Total	6		

a. Vineland Communication Domain 4 < Vineland Communication Domain 3

b. Vineland Communication Domain 4 > Vineland Communication Domain 3

c. Vineland Communication Domain 4 = Vineland Communication Domain 3

**Test Statistics<sup>a</sup>**

	Vineland Communication Domain 4 - Vineland Communication Domain 3
Z	-.813 <sup>b</sup>
Asymp. Sig. (2-tailed)	.416
Exact Sig. (2-tailed)	.500
Exact Sig. (1-tailed)	.250
Point Probability	.063

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

## VABS Socialisation subdomain: Interpersonal

### Ranks

		N	Mean Rank	Sum of Ranks
Interpersonal 4 - Interpersonal 3	Negative Ranks	2 <sup>a</sup>	3.50	7.00
	Positive Ranks	3 <sup>b</sup>	2.67	8.00
	Ties	1 <sup>c</sup>		
	Total	6		

a. Interpersonal 4 < Interpersonal 3

b. Interpersonal 4 > Interpersonal 3

c. Interpersonal 4 = Interpersonal 3

### Test Statistics<sup>a</sup>

	Interpersonal 4 - Interpersonal 3
Z	-.137 <sup>b</sup>
Asymp. Sig. (2-tailed)	.891
Exact Sig. (2-tailed)	1.000
Exact Sig. (1-tailed)	.500
Point Probability	.094

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

## VABS Socialisation subdomain: Play

### Ranks

		N	Mean Rank	Sum of Ranks
Play 4 - Play 3	Negative Ranks	1 <sup>a</sup>	4.00	4.00
	Positive Ranks	3 <sup>b</sup>	2.00	6.00
	Ties	2 <sup>c</sup>		
	Total	6		

a. Play 4 < Play 3

b. Play 4 > Play 3

c. Play 4 = Play 3

### Test Statistics<sup>a</sup>

	Play 4 - Play 3
Z	-.365 <sup>b</sup>
Asymp. Sig. (2-tailed)	.715
Exact Sig. (2-tailed)	.875
Exact Sig. (1-tailed)	.438
Point Probability	.125

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

## VABS Socialisation subdomain: Coping

### Ranks

		N	Mean Rank	Sum of Ranks
Coping 4 - Coping 3	Negative Ranks	3 <sup>a</sup>	2.83	8.50
	Positive Ranks	2 <sup>b</sup>	3.25	6.50
	Ties	1 <sup>c</sup>		
	Total	6		

a. Coping 4 < Coping 3

b. Coping 4 > Coping 3

c. Coping 4 = Coping 3

### Test Statistics<sup>a</sup>

	Coping 4 - Coping 3
Z	-.272 <sup>b</sup>
Asymp. Sig. (2-tailed)	.785
Exact Sig. (2-tailed)	.938
Exact Sig. (1-tailed)	.469
Point Probability	.125

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

## VABS Communication subdomains

### Ranks

		N	Mean Rank	Sum of Ranks
Written 4 - Written 3	Negative Ranks	5 <sup>a</sup>	3.70	18.50
	Positive Ranks	1 <sup>b</sup>	2.50	2.50
	Ties	0 <sup>c</sup>		
	Total	6		
Expressive 4 - Expressive 3	Negative Ranks	1 <sup>d</sup>	2.50	2.50
	Positive Ranks	5 <sup>e</sup>	3.70	18.50
	Ties	0 <sup>f</sup>		
	Total	6		
Receptive 4 - Receptive 3	Negative Ranks	2 <sup>g</sup>	1.50	3.00
	Positive Ranks	2 <sup>h</sup>	3.50	7.00
	Ties	2 <sup>i</sup>		
	Total	6		

a. Written 4 < Written 3

b. Written 4 > Written 3

c. Written 4 = Written 3

d. Expressive 4 < Expressive 3

e. Expressive 4 > Expressive 3

f. Expressive 4 = Expressive 3

g. Receptive 4 < Receptive 3

h. Receptive 4 > Receptive 3

i. Receptive 4 = Receptive 3

---

**Test Statistics<sup>a</sup>**

	Written 4 - Written 3	Expressive 4 - Expressive 3	Receptive 4 - Receptive 3
Z	-1.725 <sup>b</sup>	-1.682 <sup>c</sup>	-.743 <sup>c</sup>
Asymp. Sig. (2-tailed)	.084	.093	.458
Exact Sig. (2-tailed)	.156	.125	.500
Exact Sig. (1-tailed)	.078	.063	.250
Point Probability	.063	.031	.063

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

c. Based on negative ranks.

**Appendix 24: Effect size calculations: Follow up data**

Data type	Measurement	Time	Direction of change	Z	N	√N	Effect size (r) $r = \frac{Z}{\sqrt{N}}$	Effect Size
Observation	Frequency of self-initiated observations	3-4 (Follow-up)	No Change	-0.51	7	2.65	-0.19	Small
	Duration of interactions	Follow-up	Increase	-0.17	7	2.65	-0.06	None
VABS Socialisation	Socialisation Domain	Follow-up	Decrease	0.00	6	2.45	0.00	None
	Subdomain: Play	Follow-up	Increase	-0.37	6	2.45	-0.15	Small
	Subdomain: Interpersonal	Follow-up	Decrease	-0.14	6	2.45	-0.06	None
	Subdomain: Coping	Follow-up	No Change	-0.27	6	2.45	-0.11	Small
VABS Communication	Communication Domain	Follow-up	Increase	-0.81	6	2.45	-0.33	Medium
	Subdomain: Written	Follow-up	Decrease	-1.73	6	2.45	-0.70	Large
	Subdomain: Expressive	Follow-up	Increase	-1.68	6	2.45	-0.69	Large
	Subdomain: Receptive	Follow-up	Increase	-0.74	6	2.45	-0.30	Medium

## Appendix 25 Intervention fidelity data

	Session Checklist: Frequency of occurrences by school ID (Maximum=8 sessions)											Standard Deviation
	1 (KF)	2 (AS)	3 (SL)	4 (EJ)	5 (IS)	6 (HN)	7 (GA)	8 (GG)	9 (LP)	Total for item	Mean item response	
Initial check-in/introductions	8	8	7	8	8	8	8	8	8	71	7.88	0.33
Names recorded	8	8	8	8	8	8	7	8	8	71	7.88	0.33
Rules displayed and mentioned	8	8	8	8	8	8	7	8	8	71	7.88	0.33
Roles assigned and role cards on display	8	8	8	8	8	8	8	8	8	72	8	0
30 minutes of instruction building	7	8	8	7	7	8	8	1	7	61	6.77	2.22
15 minutes freestyle building	6	7	8	5	5	8	7	1	7	54	6	2.18
Children tidy up	6	8	8	7	5	8	6	3	8	59	6.55	1.74
Summary/praise/certificates	4	6	7	7	4	8	6	4	6	52	5.77	1.48
Children working in a group of three	8	8	8	8	8	8	8	7	8	71	7.88	0.33
1 adult per three children	8	8	8	8	8	8	8	8	8	72	8	0
Children sitting around a table	7	8	8	8	8	8	8	8	8	71	7.88	0.33
Adult facilitating	8	8	8	8	8	8	8	8	8	72	8	0
Children play according to role	8	8	8	8	8	8	8	6	8	70	7.77	0.66
Children interacting with each other	8	8	8	8	8	8	8	8	8	72	8	0
Gives praise for good building	8	8	8	8	8	8	8	8	8	72	8	0
Gives praise for good social skills	8	8	8	8	8	8	8	8	8	72	8	0
Gets the children to help each other	8	8	8	8	8	8	7	8	8	71	7.88	0.33
Facilitates rather than directs	7	7	8	8	8	8	7	7	8	68	7.55	0.52



Helps children with difficulties	8	8	8	7	8	8	7	8	7	69	7.66	0.5
Highlights presence of a social problem	8	7	8	8	5	8	8	8	8	68	7.55	1.01
Prompts children to come up with solutions	8	8	7	7	8	8	7	8	7	68	7.55	0.53
Gives children opportunity to problem solve	8	8	8	8	8	8	6	8	8	70	7.77	0.66
Asks children to role play positive behaviour	7	7	2	5	8	8	0	5	6	48	5.33	2.74
Reminds children of strategies previously worked on	5	7	0	5	8	7	1	8	7	48	5.33	2.96
Highlights presence of a rule break	8	8	3	4	8	8	7	8	7	61	6.77	1.92
Prompts other children to remind group if a rule has been broken	4	7	5	3	8	6	4	4	5	46	5.11	1.62
Gives praise	8	8	8	8	8	7	8	8	8	71	7.88	0.33
Highlights successes to group	8	8	8	8	8	7	7	3	8	65	7.22	1.64
Total for school	205	216	199	201	210	219	190	185	211			
Mean score per school (SD)	7.32	7.71	7.10	7.17	7.50	7.82	6.78	6.60	7.53			
Standard Deviation	1.22	0.53	2.06	1.42	1.17	0.48	2.01	2.28	0.77			

### Appendix 26.i Chi Squared goodness of fit calculation for session checklist

Item	Observed (O)	Expected (E)	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Initial check-in/introductions	71	72	1	0.013
Names recorded	71	72	1	0.013
Rules displayed and mentioned	71	72	1	0.013
Roles assigned and role cards on display	72	72	0	0
30 minutes of instruction building	61	72	121	1.68
Minimum of 15 minutes freestyle building	54	72	324	4.5
Children tidy up	59	72	169	2.35
Summary/praise/certificates	52	72	400	5.55
Children working in a group of three	71	72	1	0.013
1 adult per three children	72	72	0	0
Children sitting around a table	71	72	1	0.013
Adult facilitating	72	72	0	0
Children play according to role	70	72	4	0.06
Children interacting with each other	72	72	0	0
Gives praise for good building	72	72	0	0
Gives praise for good social skills	72	72	0	0
Gets the children to help each other	71	72	1	0.013
Facilitates rather than directs	68	72	16	0.22
Helps children with difficulties	69	72	9	0.13
Highlights presence of a social problem	68	72	16	0.22
Prompts children to come up with solutions	68	72	16	0.22
Gives children opportunity to problem solve	70	72	4	0.06
Asks children to role play positive behaviour	48	72	576	8
Reminds children of strategies previously worked on	48	72	576	8
Highlights presence of a rule break	61	72	121	1.68
Prompts other children to remind group if a rule has been broken	46	72	676	9.38
Gives praise	71	72	1	0.013
Highlights successes to group	65	72	49	0.68
			$\chi^2 = \sum \frac{(O-E)^2}{E}$	$\chi^2 = 42.82$

**Appendix 26.ii Chi Squared goodness of fit calculation for schools**

School	Observed (O)	Expected (E)	(O-E) <sup>2</sup>	$\frac{(O-E)^2}{E}$
1	205	224	361	1.61
2	216	224	64	0.89
3	199	224	625	2.79
4	201	224	529	2.36
5	210	224	196	0.87
6	219	224	25	0.11
7	190	224	1156	5.16
8	185	224	1521	6.79
9	211	224	169	0.75
			$\chi^2 = \sum \frac{(O-E)^2}{E}$	$\chi^2 = 21.33$

**Appendix 27 Cohen’s Kappa calculations. Inter-rater reliability of session checklist data**

**Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Researchers rating * School staff rating	196	100.0%	0	0.0%	196	100.0%

**Researchers rating \* School staff rating Crosstabulation**

Count

		School staff rating		Total
		Not seen	Present	
Researchers rating	Not seen	14	3	17
	Present	14	165	179
Total		28	168	196

**Symmetric Measures**

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement Kappa	.577	.091	8.392	.000	.000
N of Valid Cases	196				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

**Appendix 28 Inter-rater reliability of session checklists by school**

**School 1**

**R1 ^ S1 Crosstabulation**

Count

		S1		Total
		0	1	
R1	0	1	1	2
	1	0	26	26
Total		1	27	28

**Symmetric Measures**

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement Kappa	.650	.322	3.672	.000	.071
N of Valid Cases	28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

**School 2**

**R2 ^ S2 Crosstabulation**

Count

		S2		Total
		0	1	
R2	0	3	0	3
	1	0	25	25
Total		3	25	28

**Symmetric Measures**

	Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement Kappa	1.000	.000	5.292	.000	.000
N of Valid Cases	28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

### School 3

**R3 \* S3 Crosstabulation**

Count

		S3		Total
		0	1	
R3	0	2	0	2
	1	3	23	26
Total		5	23	28

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement	Kappa	.523	.229	3.148	.002	.026
N of Valid Cases		28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

### School 4

**R4 \* S4 Crosstabulation**

Count

		S4		Total
		0	1	
R4	0	2	1	3
	1	0	25	25
Total		2	26	28

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement	Kappa	.781	.210	4.237	.000	.008
N of Valid Cases		28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

### School 5

**R5 ^ S5 Crosstabulation**

Count

		S5		Total
		0	1	
R5	0	1	0	1
	1	9	18	27
Total		10	18	28

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement	Kappa	.125	.116	1.366	.172	.357
N of Valid Cases		28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

**School 6**

**R6 ^ S6 Crosstabulation**

Count

		S6		Total
		0	1	
R6	0	2	0	2
	1	0	26	26
Total		2	26	28

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement	Kappa	1.000	.000	5.292	.000	.003
N of Valid Cases		28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

**School 7**

**R7 ^ S7 Crosstabulation**

Count

		S7		Total
		0	1	
R7	0	4	1	5
	1	1	22	23
Total		5	23	28

**Symmetric Measures**

		Value	Asymp. Std. Error <sup>a</sup>	Approx. T <sup>b</sup>	Approx. Sig.	Exact Sig.
Measure of Agreement	Kappa	.757	.164	4.003	.000	.001
N of Valid Cases		28				

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

---

## Appendix 29 Parental information letter for interviews

Dear Parents/Carers,

As you are aware, your child has been involved in a Lego therapy group at school over the past few months. The research period is about to come to an end, however, I hope that your child has found the intervention to be both beneficial and enjoyable.

As mentioned in the initial consent form I would be interested to speak with your child to find out how they found the experience. I am aiming to explore which elements of the intervention made it enjoyable for them, and also whether there were aspects of the Lego club that they did not enjoy.

The interviews will be held in the child's school and will be very informal and child friendly. The interviews will last for no longer than 30 minutes. I am interested in analysing the outcomes of the interviews for research purposes so it would be helpful for me to record the conversation. The recordings will be securely stored and will be kept confidential- only myself as the researcher will have access to the recording and the recordings will be erased after analysis. The analysis will be anonymised so that your child cannot be identified from the data.

Your child will be asked if they would like to talk to me before the interview, and there is no obligation for them to participate. They can also leave at any point throughout the conversation.

As you have already given formal consent there it is not necessary for you to complete another form. However, I wanted to provide you with the details of the interview to enable you to consider whether or not you are happy for your child to take part. If you do not wish your child to meet with me please inform your child's school before 9<sup>th</sup> July.

Please do not hesitate to contact me if you have any questions or concerns.

Yours Sincerely,



Ellie Brett  
Doctoral Trainee Educational Psychologist

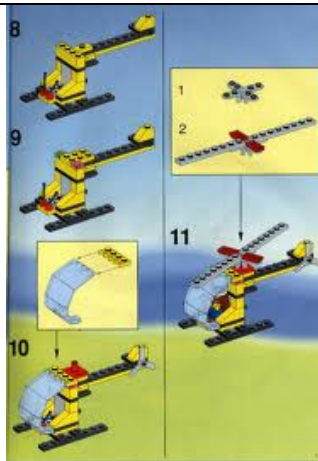
Appendix 30 Visual prompt cards



'freestyle' building



Building together



Building sets with instructions



**Lego Builder certificate**

.....  
has been awarded with a Lego Builder certificate for building together in Lego club. Well done!

Date:



Working towards certificates





### Lego Points

Name:

--	--	--	--	--



### Lego Rules

1. Build things together
2. If it gets broken, fix it or ask for help
3. If someone else is using a piece, ask first (don't take it)
4. Use indoor voices
5. Use polite words
6. Sit nicely (keep your hands and feet to yourself)
7. Tidy up and put things back where they came from
8. Do not put Lego in your mouth



Earning Lego points

Following the group rules

### Taking photos



Builder — Engineer

Supplier

Swapping roles and taking turns



### Lego Creator certificate

.....

has been awarded with a Lego Creator certificate for creating five models together in Lego club. Well done!

Date:



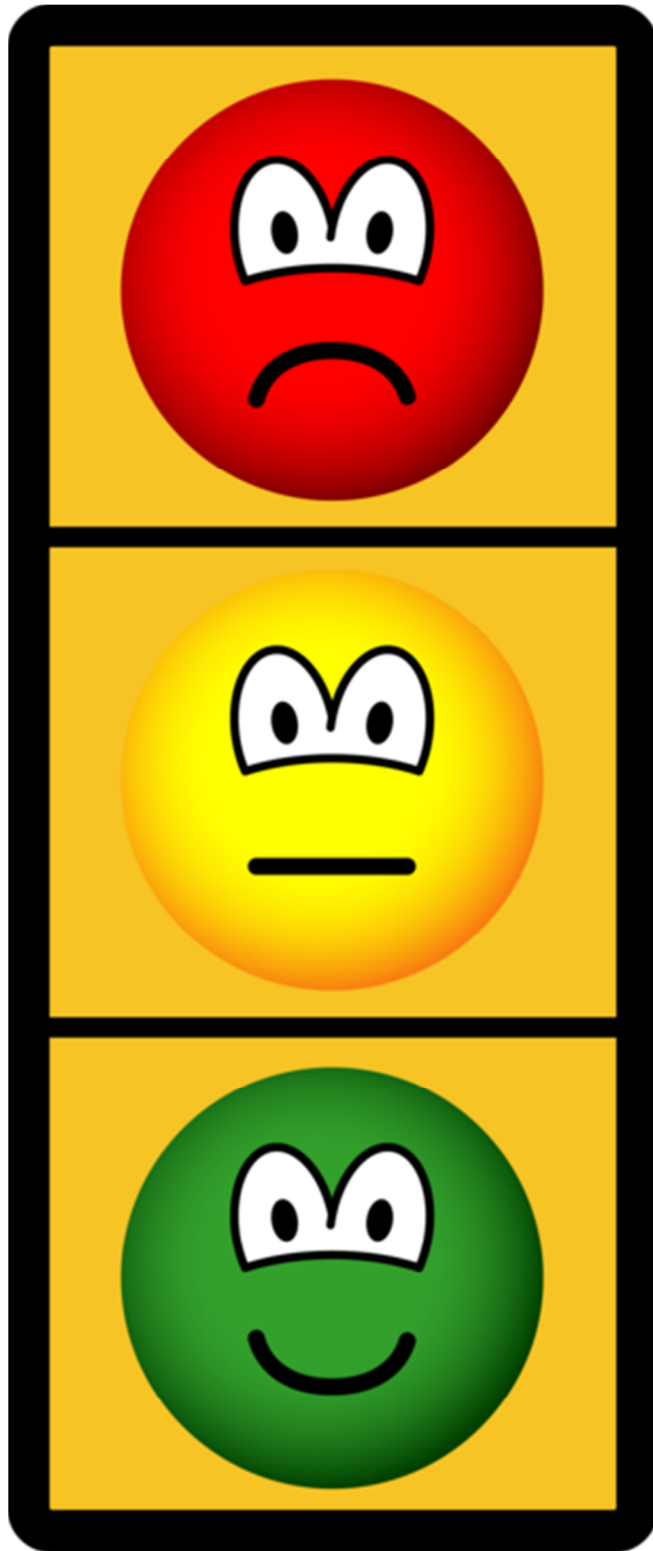
### Lego Helper certificate

.....

has been awarded with a Lego helper certificate for being helpful in Lego club. Well done!

Date:





---

### **Appendix 31 Debrief information**

Thank you for meeting with me today, it was nice to hear your thoughts on Lego Club. I am doing a project about Lego therapy and am interested in finding out what children thought about their Lego Club. The things we talked about today will be used to help me find ways to make Lego therapy better for children in the future. It was nice to hear about the things that you enjoyed and also about the things that you found difficult.

When I have finished my project I will send my findings to your school so that they can share them with you. Your name won't appear in the report, and others won't know who said the things that are in the report.

### **Appendix 32 Semi-structured interview schedule**

**Introduction-** "Hello, my name is Miss Brett and I'm here to talk to you today about Lego Club. I'm interested in finding out what Lego Club was like for you so that we can think about how to make it more enjoyable for children. I'd like to talk to you for about half an hour, and after that time I'll take you back to your classroom. It's up to you whether you choose to talk to me today; if you don't want to talk we can go back to your classroom now. You can also go back to your classroom anytime you like if you change your mind or if you've had enough. What do you think?"

#### **-Introduce consent form and obtain signature**

#### **Background information to ease child into process: Structured questions**

- a. Who helps you in Lego club? (adult)
- b. Who else was in Lego club with you?
- c. Were you friends with the other members of the group before Lego club started?
- d. Are you in the same class as the other members of the Lego club?

#### **RQ1: Obtaining children's views on Lego club**

Opening question: What was it like going to Lego Club?

#### **Prompt:**

- What were the things that you enjoyed the most?
- Were there things that you didn't enjoy?

---

**Scaling activity-** I've got some cards here to help you remember some of the things that you did in Lego Club. Each of these cards represents something that you did in Lego club, so we've got building Lego sets with instructions, free play, following the group rules, building together, working towards certificates, getting Lego points, swapping roles and taking turns (engineer, supplier, builder), and taking photographs. Can you put these cards in order, from the things that you enjoyed the most to the things that you enjoyed the least? I've got some faces to help you order them here- there's a happy, smiley face, an unhappy sad face, and this one in the middle. What sort of face do you think this one might be? So can you put them in an order from the things that you enjoyed the most over here (happy face) to the things that you didn't enjoy down here (sad face)

You've put.....(point to card) here under the smiley/sad face/in the middle, can you tell me why?

**Prompt:**

- Can you tell me more about why you enjoyed/didn't enjoy ...
- Why did you/didn't you enjoy....
- Why was ...fun?
- What was it that made....difficult/boring etc..
- You said that.....was fun, can you tell me why you enjoyed.....
- For dislikes: What could we change to make.....more enjoyable?

**Prompts for specific cards:**

Building sets with instructions:

Can you tell me about the sets that you built in lego club?

Why did you enjoy building the Lego sets?

What sort of sets would you like to build?

Building together

What was it like building with the other children?

Did the group get on with each other?

Why was it fun/difficult building with other children?

'freestyle' building

Do you know why you enjoyed/didn't enjoy 'freestyle' building?

What did you enjoy about 'freestyle' building?

Why was 'freestyle' building more/less fun than building sets with instructions?

Following the group rules

Can you tell me a bit more about what it was like having rules to follow?

What might have happened if there weren't rules?

RQ2: The role of rewards in Lego Club

You've put working towards Lego points/certificates here, can you tell me why?

---

**Prompt**

Why did you enjoy/not enjoy getting certificates/points?

What was it like getting certificates/points?

When you were in lego club did you get given any of these certificates? (show pictures)

What did you get the certificates/points for?

Did you know what you needed to do to get a certificate/point?

**RQ 3: Improvements:**

What could we do to make Lego Club more enjoyable?

**Prompts**

You said that you didn't like.... What could we do to make that more enjoyable?

If you could change anything about Lego Club what would it be?

How would....make Lego club more enjoyable?

What else could have been done to make....better?

**Final questions:**

Is there anything else that you would like to say about Lego Club?

---

### Appendix 33 Interview transcription

***Hello, my name is Miss Brett and I'm here to talk to you today about Lego Club. I'm interested in finding out what Lego Club was like for you so that we can think about how to make it more enjoyable for children. I'd like to talk to you for about half an hour, and after that time I'll take you back to your classroom. It's up to you whether you choose to talk to me today; if you don't want to talk we can go back to your classroom now. You can also go back to your classroom anytime you like if you change your mind or if you've had enough. What do you think?***

Yep that's fine

***Ok, so, who was in Lego club with you first of all?***

Jimmy and Tom.

***So Jimmy and Tom, were you friends with either of them before Lego club started?***

Kind of with Jimmy but Tom's getting really annoying now that's the thing. That's why I don't like Lego Club because it's so annoying, Tom's always winding you up

***So you and Tom didn't get on so well? Were you friends with Tom beforehand?***

Kind of

***And how about now?***

No way.

***No way, okay. So Jimmy, are you friends with Jimmy?***

Yeah, he's actually one that is kind, he's brilliant, he's not annoying.

***So you're still friends now, lovely. But Tom you didn't get on with so well?***

Yep

***Do you know why? Why was it that you didn't get on?***

Because Tom keeps annoying me, he keeps saying, before we did Lego club, like, one week ago he said 'I can't wait til Lego club, I get to annoy you'

***Did he?***

Yes. I'm glad it's one that I have a PTFA with me, because I am prone to going to beat someone up.

***Are you? And what's a PTFA?***

Mrs Shep helps me with it, she works to help calm me down.

***Does she? And does she work with you in the lesson too?***

Yeah

---

***And she was with you in Lego club too?***

Yeah

***Okay. So you said you're glad you had her with you because she can calm you down.***

Yes, because if you talk to some people they know that I am prone to have violent outbreaks. And that's not my fault, I'm a bit like Vinnie and Tom, they always attack when they get annoyed. I'm basically a time bomb, if you know me I go off.

***So Tom would wind you up and make you feel cross?***

Yep. One time he winds me so up that me and Jimmy just said we're not doing this. We cannot take this anymore.

***I think I might have been in that one with you actually, I think you left the room at one bit because you'd had enough. So you said that you don't enjoy Lego club because Tom would wind you up. Were there any parts of Lego club that you enjoyed?***

I enjoyed the group building, and I enjoyed the 'freestyle' building. But it's just that Tom would just take the stuff and put them together to make mini models. And its just really annoying when I'm builder and he's supplier. We always tell him and then he always goes for a wrong part. He just annoys me.

***Ok. I've got some cards here to help you remember some of the things that you did in Lego Club. Each of these cards represents something that you did in Lego club, so we've got building Lego sets with instructions, free play, following the group rules, building together, working towards certificates, getting Lego points, swapping roles and taking turns (engineer, supplier, builder), and taking photographs. Can you put these cards in order, from the things that you enjoyed the most to the things that you enjoyed the least? I've got some faces to help you order them here- there's a happy, smiley face, an unhappy sad face, and this one in the middle. What sort of face do you think this one might be?***

In between.

***That's right, it's not happy and it's not sad- it's somewhere in between. So we'll have a look through them first then we'll put them in order afterwards. So we've got swapping roles and taking turns.***

(Child starts to order)

***We'll have a look through them all first then we'll put them in order. Building sets with instructions..***

Are we going to do this model?

***No, no I don't think you are. You did some helicopters didn't you but not yellow helicopters.***

***Building sets with instructions- so this is about all the different models that you built with the instruction sheets.***

Yeah

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***Building together, so there's a picture of three boys there playing Lego. So that's when you all played together. Working towards certificates. Lego rules, so following the group rules. Earning Lego points. Taking photos. Did you take photos in your lego group?***

Yep

***And finally 'freestyle' building.***

Alright

***So can you put them in an order from the things that you enjoyed the most over here (happy face) to the things that you didn't enjoy down here (sad face).***

(Child begins to put into order)

Top is funnest, bottom is baddest.

***Okay, and that's the same with that is it? So this one is the very least fun? And that's the very most fun. So could you read the cards out for me in order?***

'Freestyle' building, taking photos, building sets with instructions, building together, following the group rules, swapping roles and taking turns. Earning lego points, working towards certificates.

***Lovely, that's great thank you. So with the 'freestyle' building, this was the thing that you said was the very most fun. Do you know why that was?***

It's because you don't have to keep swapping roles which was really annoying. Like Tom might have said no, I want to have it. He always annoys us.

***Okay, so you didn't have to keep swapping roles in this one. And when you were in 'freestyle' building did you build with anyone else?***

Yes I did build with Tom but he had really bad ideas and he always said 'no I'm having this' and takes it away from me. Like the aliens, he says 'no, my turn'. And like the Lego rules –don't take it, he takes those things really easily.

***So with the 'freestyle' building bit did you build with Jimmy or did you build by yourself usually?***

I built with Jimmy.

***What was that like?***

Really fun.

***So we've got 'freestyle' building at most fun and you did some building with Jimmy as well in that. The next bit you've got is taking photos, why was that?***

Because it means we can remember stuff.

***Did you take the photos yourself?***

No



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***Did Mr Hamblin take the pictures?***

Yeah

***But you liked having the pictures of the things that you'd built?***

Yeah.

***Okay, great. So the next thing we've got is building sets with instructions. You've got that as your third favourite thing. Can you tell me a bit about that?***

It's fun at home because I like building with instructions.

***Okay, and if this was just about Lego club where would you put it?***

There

***So you'd swap those two around?***

I wouldn't swap it, it's in between that one and that one. Sometimes it's fun because you don't have to worry about anything. Excuse me.

***Where are you going to?***

Toilet

***Oh right (interview paused until child returns)***

***Are you ok to keep going?***

Yeah

***Okay, so can you tell me about this one, you've said building together was ok, it was in the middle.***

Because it was alright if Tom was not there because then it's a bit easier because when you're the builder it's a lot funner. And the supplier but it's not that fun Tom was the supplier because he always build things or builds wrong, he knows where it is he just places it in the wrong place on purpose.

***So this bit here, building together, does that depend on which roles you are all in?***

Yes

***And which roles did you enjoy playing the most?***

I enjoyed playing the builder

***Ok, so if we think about the sets that we built in Lego club, could you tell me which sets that you liked building and which sets you didn't like building?***

I quite liked building the racing sets.

***The racing ones. Were there any others that you liked?***

The things that I didn't like were the three ones, because those take longer and it's annoying when Tom.... Because like we're on the last piece on Tom's turn and he keeps keeps keeps doing the wrong places so he can stay there longer.

---

***What do you mean by the three ones?***

The three ones where you've got three sets and you've got a choice of which ones to build.

***Okay, so when you had the choice of three it was harder?***

Yeah, because Tom was able to like say he didn't know when it was the end of his turn as builder and it took longer because it took more time and he was able to fiddle and he got more chance because he had longer time.

***So was that to do with swapping, when you swapped turns or to do with the sets?***

It's should be just one (instruction per turn) because then Tom can't go like 'does it go here'. If he doesn't know it should be passed on.

***So was three turns too long?***

Yeah because Toms turns just got longer and longer and longer

***And what about the actual sets that you built, if you had the choice of any sets what sort of sets would you like to build?***

I'd quite like to build the mini star wars models ones like this one here. Because they're small but actually fun to do. Like if you get the two sets which have like two vehicles you can put them together and play with them.

***So you can play with them?***

Yeah, they need to be like, a bit bigger. Cos then it's a lot funner cos you're doing it a bit longer.

***So a bit longer building?***

Yeah.

***Okay, and next we've got the group rules. Can you tell me a bit about those?***

1,2,3,4,6,8 I liked. I didn't like use polite words and tidy up because, well polite words, when people are annoying me I usually do say bad words. Not swear words but like bad words.

***So did you find it tricky to follow that rule?***

Yeah because at school I usually get annoyed that much and sometimes I swear, that's not my fault I just keep getting annoyed annoyed annoyed annoyed annoyed and then I swear.

***Okay. So that was a bit tricky for you.***

7, I said I didn't like 7

***Okay, do you want to tell me a bit about that one, why didn't you like tidying up?***

Because Tom always chucks things into the things you're tidying

***So he'd make a mess?***

Yeah and it's really really really annoying.

---

***And then finally we've got the taking turns bit here.***

We already talked about that in the building one

***I think we did a little bit didn't we***

It's the same there, it's alright when you're the builder or supplier but otherwise it's really annoying.

***So over here we've got the Lego points and the Lego certificates as the least enjoyable, did you get any of these certificates, the creator, builder and helper?***

No

***How about the Lego points?***

Yeah sometimes, but it was really annoying because Tom always had different ideas, we'd always built something, a design.

***So what did you have to do to get Lego points?***

Work together in free play

***And how many Lego points did you get?***

1 or 2, because Tom really annoyed us.

***And did it make you want to build with Tom so you could get a Lego point or not?***

No, because you only got a certificate and then very annoyingly Tom would break up your models that you tried to build with him and he wouldn't listen to any of our ideas.

***So it was annoying building with Tom so you didn't want to get the Lego points, you'd rather build by yourself?***

Yeah, or with Jimmy.

***And how about these certificates, did you know what you had to do to get these certificates?***

No, we weren't told about the creator or the helper certificates

***What about this one, the builder one. Do you know about this one?***

Yeah

***Did you get this one?***

Don't know.

***So you've put the certificates on the Lego points down here as the very least enjoyable, can you tell me how come?***

Because they were not that fun to do because I enjoyed free play and taking pictures because you had a bit more choice, but with those if you want only had to build with someone who was annoying. That's why. Like getting the points, because Tom is really annoying.

---

***So it was about what you had to do to get the points that made you put the Lego points down here?***

Yeah

***And the certificates as well?***

Yeah

***Would you have liked to have got the certificates or were you not that fussed?***

Yes, but I wouldn't like to work with Tom because he's really annoying.

***So you'd like to get them but not if it meant working with Tom?***

Yeah

***What could have been done to make this more enjoyable for you, the points and the certificates?***

Like, work with someone else but not with the whole group, because then I'll quite like it because when I have choice I don't get that annoyed.

***So if you got points for just working with Jimmy it would have been better?***

Yeah

***Okay, is there anything else you could have done to change it?***

No

***And what about Lego club as a whole, is there anything else you'd like to change about Lego club?***

Yes, the choice of people. Because if you're told the first time who you are going with you could say 'I don't like him could we like have someone watching him' because then they don't get that annoying.

***So a choice of who else is in the group, and someone watching that person?***

Yeah

***Okay, is there anything else you would like to change?***

No

***Okay. Is there anything else that you want to talk about that we've not already covered?***

Hmm.. No

***Ok, and one final question, if you could continue doing Lego therapy would you want to or not?***

It depends on the people I'm working with.

***Okay, if it was continuing with the group as it was would you want to carry on?***

Probably not. I'll probably do a few more weeks and then I'd give up because Tom would start annoying me

---

***What about if Tom wasn't in the group, would you want to do it then?***

Yeah, I would want to do a lot more because then it is fun, because you don't have someone there annoying you. Or someone at school saying I can't wait till Friday I'm going to annoy you

***What you think Lego club might be like Tom wasn't there?***

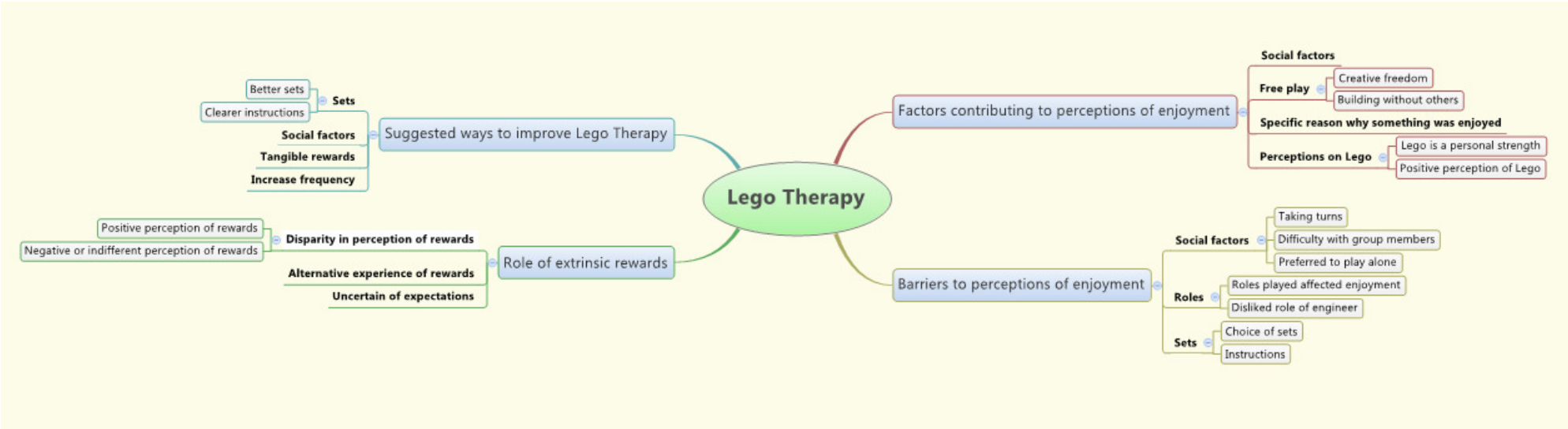
Really fun, especially if it was someone that I liked.

***Okay. Well thank you very much for talking to me today, we'll take you back to the hall now.***

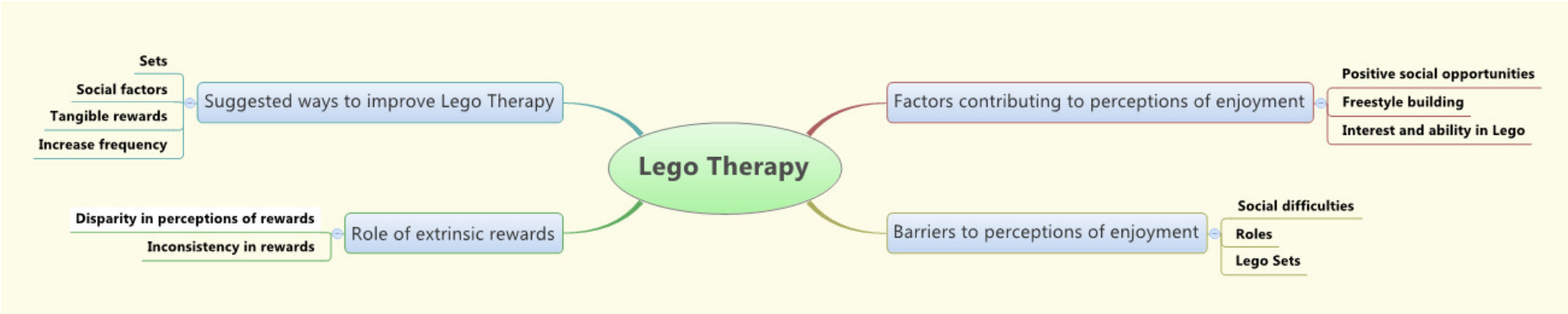
## Appendix 34 Justification of qualitative analysis

Method of analysis	Advantages	Disadvantages	Other considerations
<b>Thematic analysis</b>  (Braun and Clarke, 2006)	<ul style="list-style-type: none"> <li>• Flexible and suitable for interview data</li> <li>• Relatively quick method to learn and apply</li> <li>• Suitable for researchers with little experience</li> <li>• Useful for use in participatory research</li> <li>• Able to summarise large quantities of data (Robson, 2011)</li> </ul>	<ul style="list-style-type: none"> <li>• Analysis is broad, which can lead to difficulties identifying which aspects to focus on</li> <li>• Frequently limited to description without interpretation</li> <li>• Method has lower status than other methods (Robson, 2011)</li> </ul>	Inductive, deductive or hybrid approaches to analysis can be applied to data- enabling analysis to be exploratory or confirmatory
<b>Grounded theory approach</b>	<ul style="list-style-type: none"> <li>• Exploratory rather than confirmatory so suitable when there is little existing research</li> <li>• Enables hypotheses to be generated (Guest, MacQueen, &amp; Namey, 2011)</li> </ul>	<ul style="list-style-type: none"> <li>• This study is based upon previous research and underpinned by theoretical assumptions which warrant further exploration.</li> </ul>	
<b>IPA(Smith &amp; Osborn, 2003)</b>	<ul style="list-style-type: none"> <li>• Provides a detailed explanation of participants lived experience</li> <li>• Explores individual perceptions in detail</li> </ul>	<ul style="list-style-type: none"> <li>• In-depth analysis of individual cases is required, interviews often last an hour or longer</li> </ul>	Research suggests that responses elicited from children with ASC often lack detail and children have difficulty expressing personal preferences. Depth of data may therefore be insufficient for IPA. Children may also find it difficult to participate in long interviews

Appendix 35 Initial thematic map



Appendix 36 Refined thematic map





## Appendix 37 Comparison of initial codes between raters

Quote	Initial code: Researcher	Initial code: inter-rater	Final code following discussion
"Because I like building and stuff. On my own".	<b>Prefers to play alone</b> <i>The child was happier when building without the others</i>	<b>Enjoyed independent playing</b> <i>The child preferred playing without the others</i>	<b>Prefers to build alone</b> Justification: The child was referring to building Lego, they may like playing with others generally but prefer to be alone when playing with Lego
"That one, don't put Lego in your mouth. And that one Sit nicely, keep your hands and feet to yourself And that one Use indoor voices And that one If someone else is using a piece ask first don't take it, that was tricky too was it And that one I really hate it, I really really didn't like it"	<b>Disliked group rules</b> <i>The child disliked many of the rules that they were required to follow</i>	<b>Challenging to follow rules</b> <i>The child found it difficult to follow the group rules</i>	<b>Dislikes following the group rules</b> Justification: The child expressed a dislike of the rules but didn't imply reasons why
"Because Owen he says (undecipherable) and just shoves a thing to me" I: "The Lego pieces?" "And he sometimes says nasty things about me".	<b>Negative perception of others in the group</b> <i>The child experienced difficulties with others-other children were unpleasant</i>	<b>Attributes preventing friendships</b> <i>The child's perspective of others in the group prevents them from forming friendships</i>	<b>Difficulty with others in the group</b> Justification: The child experienced social difficulties with others in the group.

Quote	Initial code: Researcher	Initial code: inter-rater	Final code following discussion
<p>“Because they’re not mean to me. Because I get, because then I get to not make things that they make, because then I get to stay out their way”. (talking about building alone in ‘freestyle’ building)</p>	<p><b>Disliked building together</b> <i>The child disliked building with others because of social difficulties, and preferred to play alone</i></p>	<p><b>Independent play to avoid confrontation with other children</b> <i>The child avoided collaborative play because they experienced difficulty with others</i></p>	<p><b>Prefers to build alone and Difficulty with others in the group</b>  Justification: Two themes apply to this quote; the child is expressing a preference for playing alone, and this is due to social difficulties with others in the group</p>
<p>“No, okay. Are you friends with any of them now?” “Nope, still not cos they’re really mean”.</p>	<p><b>Negative perception of others in the group</b> <i>The child experienced difficulties with others-other children were unpleasant</i></p>	<p><b>Attributes preventing friendships</b> <i>The child’s perspective of others in the group prevents them from forming friendships</i></p>	<p><b>Difficulty with others in the group</b>  Justification: The child experienced social difficulties with others in the group.</p>
<p>Can you tell me why you really didn’t like this one, swapping roles and taking turns? Because it’s..because I don’t get to be builder.</p>	<p><b>Disliked taking turns</b> <i>The child didn’t like taking turns because they were not able to be the builder all of the time</i></p>	<p><b>Preferred role of the builder</b> <i>The role of the builder was their favourite and taking turns prevented them from playing in this role</i></p>	<p><b>Role played affected enjoyment and turn-taking</b> The child preferred playing the role of the builder, and didn’t like taking turns because they didn’t get to play in preferred role</p>

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### **Appendix 38 Reflexivity of the researcher**

Lego therapy was chosen as the topic for my doctoral research due to an interest in ASC. My interest has stemmed from a previous role working as an Applied Behaviour Analysis (ABA) tutor, and as a current trainee EP supporting a large number of children with ASC in mainstream schools. Working with children in schools in the local authority highlighted a need for a greater range of quality, evidence-based interventions that can be delivered within the school environment. Lego therapy is currently delivered to schools in the Local Authority, despite there being no research evidence to evaluate its effectiveness when delivered outside of the clinic.

Aside from the time invested in delivering the programme, I have no investment in the intervention. However, the intervention was already established in 11 schools in the local authority. Consequently there may be an implicit pressure to demonstrate effectiveness of the intervention. It is important to be consciously aware of this pressure throughout the research process, in order to minimise the chances of it inadvertently biasing the interpretation of the data.

**CONSENT FORM**

Miss Brett would like to talk to you about the Lego Club that you have been taking part in. She would like to talk to you for about half an hour, and after this time you will be taken back to your classroom.

It is up to you whether you choose to talk to Miss Brett- you do not have to talk to her if you don't want to. You can ask to go back to your classroom at any time.

The things that you tell her will not be shared with your teachers or with other children; they will be used to help her find out what children thought about Lego club. Miss Brett will only share the things that you say if she has any concerns about your safety or wellbeing.

Miss Brett will be recording what you say to help her remember the things that you talked about. Your name won't be used when Miss Brett writes the project.

If you are happy to talk to Miss Brett please could you write your name below

.....

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## Appendix 40 RQ1i. Themes

*Which aspects of Lego therapy did children perceive to be interesting and enjoyable?*

Key theme	Definition	Illustrative data
<b>Positive social opportunities</b>	Children described working with others positively. Children spoke about enjoying the company of others, belonging to a team and forming new friendships.	<p>It's because I think I'm actually, cos when you're doing it by your own you're quite bored aren't you but when you're together it's quite fun because when you're building you can do funny things like Jamie did- really fun things.</p> <p>Building together is fun because you're not alone.</p> <p>It's not just about me building, it's about everyone building. I like being in a team.</p> <p>Because I can be with my friends when I'm doing Lego</p> <p>Well, we'll got to know more about each other and we got to do stuff together</p> <p>Really its cos if you were like playing a game on your own you probably would lose, but if you were with someone else it make you a little bit more happy, because you can win the game that you are playing. Because you've got someone else in your team.</p> <p>We get to share things. Normally I...I say Charlie build this, I'm the supplier is Jack is the engineer. It's really fun.</p>

Key Theme	Description	Illustrative Data
<b>Freestyle building</b>	<p>Freestyle building was commonly referred to as the children's favourite aspect of Lego therapy. The freedom to build whatever they chose was described as a reason for enjoying freestyle building. The opportunity to build alone was also given as a reason for enjoying freestyle building</p>	<p>Well, I quite liked being able to choose what to build and that. It's what we do at home.</p> <p>Because you get to build your own things. It's just whatever you want to do.</p> <p>Because you got to build whatever you liked pretty much. We tried to build a city but we only built four things so it was more like a hamlet.</p> <p>We get to build anything that we want</p> <p>Easy because I could just leave most of it to the other two, and I could just build a fish or something.</p> <p>We were still building together but we were building separate models.</p> <p>Yeah by ourselves, we tried to connect it up but mine couldn't really connect up. Mine had bits that wouldn't connect on. We did try with Richard's and Callum's but they all smashed up at the end.</p> <p>Well, it was because there was no one to tell you what to do</p> <p>Because I like building and stuff. On my own.</p> <p>Because they're not mean to me. Because I get, because then I get to not make things that they make, because then I get to stay out their way</p>

Key Theme	Description	Illustrative Data
<p><b>Interest and ability in Lego</b></p>	<p>Children spoke passionately about Lego and described how they played with it outside of sessions. They perceived themselves to be good at building Lego</p>	<p>I like Lego, I think when I get home I'm going to try and build a replica of my 3DS. And I'm going to need a lot of the red.</p> <p>I just like building it, I mean first chance I get a probably be grabbing some rare pieces as we call them. They're things like purple, brown, light green, see-throughs, sort of.. is it?...I can't remember the scientific term but I know I've heard it before.</p> <p>My favourite thing about Lego is that there's about a jillion pieces of Lego in the world. It's like you can build anything you want with it because there's just so much pieces.</p> <p>I've got a huge box at home. It's just free play Lego.</p> <p>Because it is so fun and I can play with it all day. My dad bought like millions of Lego at Christmas. There is more than 1 million pieces of Lego that I've got</p> <p>They were building some mad skyscrapers which could fall over at a touch, whereas I was building some huts with actually proper sort of walls that go round and door and a roof and all that. So they were very stable, but I think the skyscrapers could fall over just by being touched.</p> <p>Yeah, I'm the only one who could do it. Why did I have to come to Lego Club?</p> <p>Well, I find it quite easy to build very hard stuff. Like I could probably build a chair. Not a full size chair but a mini chair. I could build a candy machine that works, like you put candy in the top and then you put money in. If you were to put the candy in then press the button the money doesn't come out because you put the money in and it pushes the candy down a chute. I used to build soda machines as well. The soda machines are a lot harder</p>

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Key Theme	Description	Illustrative Data
	Children perceived themselves to be good at building Lego, and better at Lego than other children	

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## Appendix 41 RQ1ii: Themes

1.ii. Which aspects of the intervention did children perceive to be a barrier to enjoyment and participation?

Key Theme	Description	Illustrative Data
<b>Social Factors</b>	Children spoke negatively about other children, and relationships with others hindered enjoyment of Lego therapy. Children spoke about how they preferred to play in their own company. Other children made building more difficult and less enjoyable	<p>Yeah because when Will is the supplier or the engineer or the builder he was an idiot. He's literally like 'I don't know what this piece is'</p> <p>Kind of with Steve but Tom's getting really annoying now that's the thing. That's why I don't like Lego club because it's so annoying, Tom's always winding me up</p> <p>Because Tom keeps annoying me, he keeps saying, before we did Lego club, like, one week ago he said 'I can't wait til Lego club, I get to annoy you'</p> <p>Well every time I saw someone doing something wrong I put my hand up but no one noticed me until Miss Green saw. The other two didn't notice me. I'm like the builder's helper. And the engineers helper.</p> <p>Because they're a bit, you know. Because they really don't like me so I didn't really play with them that much</p> <p>Also I find it, well I do like Lego but I find it hard to work as a team.</p> <p>I preferred to build on my own because I like doing things on my own quite a lot.</p> <p>I don't like building together because, well I just naturally tend to prefer to do things on my own.</p> <p>Yes well usually when I'm building at home, it takes me about five minutes</p> <p>Yes because that boat is huge, it probably took me about an hour to complete it. I was reading the instructions, putting it together and, well getting the bricks at the same time. Yes, that's sort of the way</p>

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that we always do it. We never tend to work together, I think that's only at Lego club that I have to do that.

Or maybe because it takes about an hour or so to do, to do one because they're messing around all the time.

I found it okay but mainly that's because of the way I was doing it. When I have the option of doing it I prefer to do things on my own

No, it's not that I want to be social I just don't like being social.

Key Theme	Description	Illustrative Data
Role	<p>Children thought enjoyment was affected by the role that they were playing. Being the builder was preferred. Children described the role of the engineer as being difficult. Children did not enjoy taking turns because they wanted to build all of the time</p>	<p>No, I do find it quite difficult to take turns because I've got Asperger's.</p> <p>I said already, I want to be the builder all the time.</p> <p>Well it was quite boring at the same time because there were a lot of times where I was just sitting there waiting for my turn.</p> <p>There is some times when you have to wait a long time when the other two are building and you have to be patient</p> <p>There was some that I liked better than others. Sometimes depending on which position I was in, because sometimes the engineer finds things quite difficult to describe, like I did with the today's model.</p> <p>Yes, probably, depending on which job I had and how much I liked the job.</p> <p>Yeah building together, but I really really really just want to be the builder all the time, because its really really fun.</p> <p>Yep. Me, I liked to build the Lego. I think everyone liked building the Lego.</p> <p>The engineer can be quite a tough job because it's hard to describe the bricks.</p> <p>I don't really like describing because then it takes a bit of time for people to understand because I'm not very good at it.</p> <p>I didn't really like doing the describing because it took a long time because I'm not really that good at describing</p> <p>It was tricky because some bits are quite hard to describe sometimes and people pick up the wrong bit</p>

Key Theme	Description	Illustrative Data
Sets	Sets too simple and not enough choice Instructions were not clear enough	<p>Because the little ones are a bit too easy</p> <p>I would like to build.. well, we built like vehicles every day so I would like to build something else.</p> <p>Yeah and helicopters. Like building more things than just vehicles. We only got build one person and then we had to do vehicles.</p> <p>I like bigger sets. I like to spend longer doing it instead of just building little things.</p> <p>I liked the really big ones, and ones that are like games. The little ones are too boring they're just too easy to build</p> <p>Working with instructions- medium, because sometimes sometimes they don't show clear.</p> <p>Because they're not very well laid out. Because the colours sometimes get mixed up like grey and black. And sometimes when Josh says to get a piece you always pick up a piece that has two like that, two bits like that and it's actually a bit like that, but then Daniel picks up something else.</p> <p>Well in the ninjago set it had instructions like this big, like a little booklet and it's tiny.</p> <p>Well, because normally it's just a picture picture picture picture picture picture and then it has little square has a few bits in them then the next page it's got a picture picture picture and a picture of what is done and it's really quite complicated some of the time.</p> <p>Well, the background could be a little bit more funny and it could be a little bit more helpful, because it's got a picture and then a picture and you've just got to try and find it is so sometimes it goes wrong.</p>

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## Appendix 42 RQ2: Themes

*What role did extrinsic rewards play in promoting motivation to engage in social interaction within sessions?*

Key Theme	Definition	Illustrative data
<b>Disparity in perception of rewards</b>	Some children spoke about feeling proud when they received rewards, and enjoyed sharing them with others. Other children were not concerned about whether or not they got rewards	<p>“Getting certificates is fun because then you can show them off.”</p> <p>“I quite like them because I feel proud when I get a Lego point.”</p> <p>“Researcher: So if you got a certificate you’d want it laminated to take home then? Child: Yes, to go on the wall. A trophy.”</p> <p>“Well you can take them home to show your parents what you’ve done.”</p> <p>“No because they’re just a bit of paper”</p> <p>“ you only got a certificate”</p>

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**Inconsistency in rewards**

Children couldn't remember getting certificates, were given tangible rewards, or received rewards according to alternative criteria. Children were also unsure about behaviours required to obtain extrinsic rewards

"I like getting the certificates, because then I get to go on the ps3 at home."

"Because the more get, we've got enough for free play at break time and an ice lolly."

"Yeah we got one for good listening"

"I don't know if I did get a certificate"

"This one, we never got that one (points to creator)" "I: *How about this one, builder. Did you get this one?*" Child shakes head. "I: *You didn't get that one. How about this one, Lego helper?*" "No"

"Building together with instructions got you a Lego point"

I: *"You said that you got Lego points, can you tell me a bit about that?"* "Well, when you do it every Thursday each week we get to do a sticker. Put a sticker on it." *"And do know you what you had to do to get Lego point?"* "You have to be really good with the team" *"And was it for free play or building with instructions?"* "The building sets bit."

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## Appendix 43 RQ 3: Themes

*How can Lego therapy be developed to further promote interest and motivation to participate in the group intervention?*

Key theme	Definition	Illustrative data
<b>Sets</b>	Children wanted more variety, more complex sets, and sets that could be used. The sets would be motivating to children if they were more interested in them. However, instructions were too complex and confusing. Improving instructions would make building easier and more enjoyable, and more complex sets could then be attempted.	<p>Clearer instructions I guess. And maybe make it a bit bigger. Because I know Daniel can't see very well, he's going to get glasses in the summer holidays. So I think bigger instructions might help him.</p> <p>Well, also what I imagine Lego being is also a picture of what the model would look like when you've finished it so I can know what it looks like at the finish when I'm doing it</p> <p>I think the engineer doesn't have so complex instructions. Make it smaller steps at a time.</p> <p>Probably, um ... put different parts...Put.. quite maybe you could, because it was more steps you might be at put slightly more complex parts on the models. Because it could actually be more interesting to look at and play with having more complex parts.</p> <p>Yeah. I think this time we should do some more complicated ones.</p> <p>Yeah, salt water crocodile, bald eagle that sort of thing. That's what I would really like the Lego to be.</p> <p><i>Did you often play with the models after you'd finished building them?</i> No, not really but it would help if we actually could during free play</p> <p>This time can we have ones with motors and stuff.</p>
<b>Tangible</b>	Children would like to work towards	Maybe a few minutes of free play then go on the computer. I love going on the computer <i>Do you? How</i>

<b>rewards</b>	something	<p><i>would that have made it better?</i> In a way it would have because I wouldn't really mind what job I did</p> <p>If you get a certificate you could get two models to keep.</p> <p><i>And if you could change anything to make Lego club better what would that be?</i> Once you've built a model you can keep it.</p> <p>I'd like to change this, the rules should be that to get certificates you just have to get one sticker to get a certificate.</p> <p>When I get home and show it to my mummy I get to go on the PS3. And then I do more Lego stuff</p>
<b>Social factors</b>	Building alone, or changing group members	<p>Make some of the people not too crazy, just so they put their head down so we got to get a lot of sets</p> <p>Yes, the choice of people. Because if you're told the first time who you are going with you could say 'I don't like him could we like have someone watching him' because then they don't get that annoying.</p> <p>I think that we could make a little model each.</p>
<b>Increase frequency</b>	Children referred to increasing time in Lego club when asked how it could be improved	<p>It would be quite better if we had more time, and more time in the free play. So if we did like a set every week. Eight sets.</p> <p>It would be quite good if it could keep going after the half term</p> <p>Maybe if we could have more sessions, twice per week. <i>So you'd want them more often?</i> Yeah, because there was a 5 day wait. 7 day wait actually. Like a Monday and Friday and then you'd only have to wait 4 days til the next one</p> <p>Do it every day, do it every Monday and Friday.</p>



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## Appendix 45 Ethics Form (paper one)

STUDENT HIGHER-LEVEL RESEARCH  
DISSERTATION/THESIS



Graduate School of Education

### Certificate of ethical research approval

To activate this certificate you need to first sign it yourself, and then have it signed by your supervisor and finally by the Chair of the School's Ethics Committee.

For further information on ethical educational research access the guidelines on the BERA web site: <http://www.bera.ac.uk/publications/guidelines/> and view the School's statement on the GSE student access on-line documents.

**READ THIS FORM CAREFULLY AND THEN COMPLETE IT ON YOUR COMPUTER** (the form will expand to contain the text you enter). **DO NOT COMPLETE BY HAND**

Your name: Ellie Brett

Your student no: 600035760

Return address for this certificate: eb347@exeter.ac.uk

Degree/Programme of Study: DEdPsy

Project Supervisor(s): Andrew Richards and Margie Tunbridge

Your email address: eb347@exeter.ac.uk

Tel: 07403 455116

I hereby certify that I will abide by the details given overleaf and that I undertake the research to respect the dignity and privacy of those participating in this research.

I confirm that if my research should change radically, I will complete a further form.

Signed: E. Brett Date: 1/2/12

*NB For Masters dissertations, which are marked blind, this first page must not be included in your work. It can be kept for your records.*

Chair of the School's Ethics Committee  
updated: April 2011

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**Title of your project:**

An evaluation of Lego therapy, a play based social skills intervention for children with Autism Spectrum Conditions.

**Brief description of your research project:**

The research aims to evaluate the effect of Lego therapy on social skills development in children with ASC in mainstream primary schools. The research will consist of three phases; a baseline phase, an intervention phase and a follow up phase. Standardised measures of social skills and observation data will be collected at the end of each of these three phases.

**Give details of the participants in this research (giving ages of any children and/or young people involved):**

The participants in this research are 18 children with a diagnosis of an Autism Spectrum Condition (ASC), aged between 7 and 11 years of age.

**Give details (with special reference to any children or those with special needs) regarding the ethical issues of:**

Consideration has been paid to the British Psychological Society Code of Conduct and Ethics (BPS, 2009). Informed consent, confidentiality, the right to withdraw, debriefing and protection from harm are of particular significance, and will be outlined below in relation to the proposed study.

Informed consent: It is essential that all participants are aware of what their involvement in the research might entail, and that they provide their consent to participate. Consent will be obtained from the parents, the head teacher, the TA's who will deliver the programme and the class teacher. The children should also consent to participate in Lego therapy, as the success of the intervention relies on the children enjoying working in the Lego group. As all child participants have ASC, measures will be taken to ensure that they have a

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full understanding of the intervention and their involvement. Written consent will be obtained from all adults, and this will be stored securely throughout and after the research process. Records will be kept of how, when and from whom consent was obtained. Parents and school staff will also be made aware of how the research findings will be used, and will be informed that they have the right to withdraw themselves and their data from the research at any time.

Confidentiality: Any data obtained from observations and questionnaires will remain confidential and will be anonymised. Data obtained from participants will be coded so that no one other than the researcher would be able to determine which participant the data was obtained from. All data (including digital and audio recordings) will be stored securely, either in a locked filing cabinet or on a secure, password protected computer system. All data will be destroyed after analysis.

Protection from harm: Children will only remain in the research process if they are happy to be part of the process. If any child exhibits adverse consequences from receiving the Lego therapy intervention they will be removed from the research. The well-being of the child participants will be monitored by the TA's and class teacher, and school staff will be asked to share any concerns with the researcher. Parents will also be given the researchers contact details and encouraged to make contact if they have any concerns.

Debriefing: All participants and parents of participants will be informed of the full purpose of the study at the end of the research process. The overall findings from the research will also be shared with anyone involved who is interested in seeing them. The debriefing process will also be used to identify any potential harm that may have occurred through participation, and to identify appropriate channels of support if required.

---

**Give details of the methods to be used for data collection and analysis and how you would ensure they do not cause any harm, detriment or unreasonable stress:**

**Method of data collection:**

Observation:

- Participants will not be informed that they are being observed in the playground as it is felt that this may alter the participant's behaviour and invalidate observation data. A degree of deception is apparent, so it is important that participants are informed that they had been observed in the debriefing process. Participants will be offered the opportunity to ask any questions that might arise through the debrief process. Parents and school staff will be informed of when the observations will occur, and reminded that they can withdraw the child or their data at any time in the research process.

Standardised data collection: (GARS, Vineland)

- Parents and school staff will be informed of what their involvement will require prior to consenting to involvement
- Parents and school staff will be informed how the data gathered will be used
- Parents and school staff will be informed that they can withdraw the data at any time throughout the research process
- All data will be stored securely throughout the research process and destroyed securely at the end of the research process.

**Give details of any other ethical issues which may arise from this project (e.g. secure storage of videos/recorded interviews/photos/completed questionnaires or special arrangements made for participants with special needs etc.):**

The data will be held only by researchers and personal details will be destroyed once the data has been analysed and conclusion drawn. No individual children will be identifiable except to the researchers.

---

**Give details of any exceptional factors, which may raise ethical issues (e.g. potential political or ideological conflicts which may pose danger or harm to participants):**

This project has been discussed with the child's parents and teacher in advance to ensure support is available to them. We will also provide the children with a full debrief and provide additional time to answer any of their concerns or questions.

The baseline period of eight weeks is essential to obtain a control measure of the child's social skills. This means that the child will be without social skills intervention throughout this period, and if they have been selected for inclusion they have a need for additional support. An ethical issue associated with this is that the research process is potentially limiting the support available to the child. Children will not be included in the study if inclusion in Lego therapy research will prevent access to an alternative and more immediate social skills intervention.

**This form should now be printed out**, signed by you on the first page and sent to your supervisor to sign. Your supervisor will forward this document to the School's **Research Support Office** for the Chair of the School's Ethics Committee to countersign. A unique approval reference will be added and this certificate will be returned to you to be included at the back of your dissertation/thesis.

---

**N.B.** You should not start the fieldwork part of the project until you have the signature of your supervisor

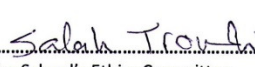
---

This project has been approved for the period: 1 Feb 2012 until: 31 Dec 2012

By (above mentioned supervisor's signature)  date: .....

**N.B. To Supervisor:** Please ensure that ethical issues are addressed annually in your report and if any changes in the research occur a further form is completed. - 1 FEB 2012

GSE unique approval reference: ..... D/11/12/31

Signed:  Date: 08/02/2012  
Chair of the School's Ethics Committee

---

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Chair of the School's Ethics Committee  
updated: April 2011



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Appendix 46 Ethics Form (paper two)

*STUDENT HIGHER-LEVEL RESEARCH  
DISSERTATION/THESIS*



Graduate School of Education

## Certificate of ethical research approval

To activate this certificate you need to first sign it yourself, and then have it signed by your supervisor and finally by the Chair of the School's Ethics Committee.

For further information on ethical educational research access the guidelines on the BERA web site: <http://www.bera.ac.uk/publications/guidelines/> and view the School's statement on the GSE student access on-line documents.

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**READ THIS FORM CAREFULLY AND THEN COMPLETE IT ON YOUR COMPUTER** (the form will expand to contain the text you enter).  
**DO NOT COMPLETE BY HAND**

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**Your name:** Ellie Brett

**Your student no:** 600035760

**Return address for this certificate:** eb347@exeter.ac.uk

**Degree/Programme of Study:** DEdPsy

**Project Supervisor(s):** Andrew Richards and Margie Tunbridge

**Your email address:** eb347@exeter.ac.uk

**Tel:** 07403 455116

---

**I hereby certify that I will abide by the details given overleaf and that I undertake the research to respect the dignity and privacy of those participating in this research.**

**I confirm that if my research should change radically, I will complete a further form.**

**Signed:**  **Date:...**19<sup>th</sup> June 2012.....

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***NB For Masters dissertations, which are marked blind, this first page must **not be included** in your work. It can be kept for your records.***

---

# Certificate of ethical research approval

**Your student no:**

600035760

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**Title of your project:**

Lego Therapy: an exploration of the child's perspective

**Brief description of your research project:**

The research aims to explore the perceptions of children who participated in an 8 week Lego therapy intervention in school. The research will use qualitative methods to gain the children's views on their participation in the Lego groups. The research aims to discover which elements of the programme were intrinsically motivating for the children and whether extrinsic rewards were necessary to promote positive behaviour. The research also aims to identify factors which contributed to the child's response to the intervention and consequent outcomes, from the perspective of the child. An exploration of the child's view aims to discover implications for future practice, and highlight factors to consider when implementing Lego therapy in a school setting.

**Give details of the participants in this research (giving ages of any children and/or young people involved):**

The participants in this research are 6 children with a diagnosis of an Autism Spectrum Condition (ASC), aged between 7 and 11 years of age.

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**Give details (with special reference to any children or those with special needs) regarding the ethical issues of:**

Consideration has been paid to the British Psychological Society Code of Conduct and Ethics (BPS, 2009). Informed consent, confidentiality, the right to withdraw, debriefing and protection from harm are of particular significance, and will be outlined below in relation to the proposed study.

Informed consent: It is essential that all participants are aware of what their involvement in the research might entail, and that they provide their consent to participate. Consent will be obtained from the parents and the head teacher. As all child participants have ASC, measures will be taken to ensure that they have a full understanding of the intervention and their involvement. Written consent will be obtained from all adults, and this will be stored securely throughout and after the research process. Records will be kept of how, when and from whom consent was obtained. Parents and school staff will also be made aware of how the research findings will be used, and will be informed that they have the right to withdraw themselves and their data from the research at any time.

Confidentiality: Any data obtained from interviews will remain confidential and will be anonymised. Data obtained from participants will be coded so that no one other than the researcher would be able to determine which participant the data was obtained from. All data (including digital and audio recordings) will be stored securely, either in a locked filing cabinet or on a secure, password protected computer system. All data will be destroyed after analysis.

Protection from harm: Children will only remain in the research process if they are happy to be part of the process. If any child exhibits adverse consequences from participation they will not participate. Parents will also be given the researcher's contact details and encouraged to make contact if they have any concerns.

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Debriefing: All participants and parents of participants will be informed of the full purpose of the study at the end of the research process. The overall findings from the research will also be shared with anyone involved who is interested in seeing them. The debriefing process will also be used to identify any potential harm that may have occurred through participation, and to identify appropriate channels of support if required.

**Give details of the methods to be used for data collection and analysis and how you would ensure they do not cause any harm, detriment or unreasonable stress:**

**Method of data collection:**

Interviews:

- The child will be provided with information about how long they will talk to me for, and where and when it will take place prior to the interview. This is to prepare the children for a change to routine, and to provide them with the opportunity to consider whether or not they wish to participate.
- Children will be asked if they are happy to talk to me prior to the interview commencing
- Children will be told that participation is optional and that they can return to their classroom at any time
- Parents and school staff will be informed of when the interviews will occur, and reminded that they can withdraw the child or their data at any time in the research process.
- All data will be stored securely throughout the research process and destroyed securely at the end of the research process.

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**Give details of any other ethical issues which may arise from this project (e.g. secure storage of videos/recorded interviews/photos/completed questionnaires or special arrangements made for participants with special needs etc.):**

- The data will be held only by researcher and personal details will be destroyed once the data has been analysed and conclusion drawn. No individual children will be identifiable except to the researcher.
- Interviews will be recorded with the child's permission and the copies of the recordings will be securely stored by the researcher. Once the data has been transcribed the original recordings will be destroyed and transcripts will be stored securely by the researcher. Once the research has been completed the transcripts will be destroyed.

**Give details of any exceptional factors, which may raise ethical issues (e.g. potential political or ideological conflicts which may pose danger or harm to participants):**

An information brief will be provided at the beginning of the interview and it will be stressed that participation is entirely voluntary and participation can be withdrawn at anytime. This project has been discussed with the child's parents and teacher in advance to ensure support is available to them. I will also provide the children with a full debrief and provide additional time to answer any of their concerns or questions.

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**This form should now be printed out**, signed by you on the first page and sent to your supervisor to sign. Your supervisor will forward this document to the School's **Research Support Office** for the Chair of the School's Ethics Committee to countersign. A unique approval reference will be added and this certificate will be returned to you to be included at the back of your dissertation/thesis.

**N.B.** You should not start the fieldwork part of the project until you have the signature of your supervisor

---

This project has been approved for the period: 15 Jun 2012 until: 31 August 2013

By (above mentioned supervisor's signature):  date: 15 Jun 2012

**N.B. To Supervisor:** Please ensure that ethical issues are addressed annually in your report and if any changes in the research occur a further form is completed.

---

GSE unique approval reference: 2/11/12/60

Signed:  Date: 28/06/2012  
Chair of the School's Ethics Committee

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Chair of the School's Ethics Committee  
updated: April 2011

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## Appendix 47 Literature Review

This literature review has been marked and examined **separately** from the examination of this thesis. It is appended here for completeness and to give coherence to the whole thesis.

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## Introduction

This paper presents a review of the literature regarding social skills interventions for children with Autism Spectrum Disorder (ASD), specifically Asperger Syndrome (AS) and High Functioning Autism (HFA). The review provides a theoretical and empirical framework for my research study and enables a critical analysis of the published research. Critical analysis of research provides important implications for the current research study, and enables the current research to extend and build upon existing research studies and literature.

The research study consists of two phases; the first is an evaluation of Lego therapy as a social skills intervention for children with Asperger Syndrome and High Functioning Autism, and the second is an exploration of the experiences and perceptions of the children and school staff involved in the research study. The second phase of the research aims to explore which elements of the intervention were successful, and what impact it may have had upon the children's perceptions of their own social competence. This literature review thus seeks to explore the literature to support both phases of the research study.

Section two of the literature review justifies the current topic as an area for further exploration, and outlines its relevance to Educational Psychologists and other educational professionals. Section three explores and critiques the current published research in the field. Section four outlines the theoretical basis for Lego therapy. Existing Lego therapy research is explored and critiqued. Finally, section five considers the existing gaps in the research literature, and clarifies ways in which the current study will fulfil the need for further research in the field.

The search engines and terms used are shown in figure 1. In addition to this, a manual search of *The Journal of Autism and Developmental Disorders* was also conducted. Research papers were excluded from the review if they were not relevant to the research questions, if they were not specific to Autism or

Asperger Syndrome, or if they did not hold particular relevance to the British education system.

**Figure 1: Search engines and search terms**

Search Engines	Search Terms
<ul style="list-style-type: none"> <li>• Psycinfo</li> <li>• APA PsycNET</li> <li>• EBSCO</li> <li>• Education Research Complete</li> <li>• Google Scholar</li> <li>• Web of Knowledge</li> </ul>	Autism; ASD; ASD; Asperger; High Functioning Autism; Social skills; Social Competence; Social Development; Social skills intervention; Social skills programme; Co-operative play; Lego therapy; Lego club; Lego play therapy; Friendship; Intrinsic motivation; Systemizing; and

## 2. Relevance of the Topic within the Educational, Political and Psychological context

The inclusion of children with Special Educational Needs (SEN) is a fundamental part of the British educational system, and the right to an inclusive education is enshrined in law. The Salamanca statement called upon governments to prioritise inclusive education, and established a universal framework for inclusive practice. It stated that “schools should accommodate all children regardless of their physical, intellectual, social, emotional, linguistic or other conditions”(paragraph 3, UNESCO, 1994), firmly establishing inclusive education as a human right. However, the social difficulties experienced by children with Autism are a barrier to inclusion in a mainstream setting (Greenway, 2000); Koegel, Koegel, Frea, and Fredeen (2001) advocate the inclusion of children with developmental delays in mainstream education

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settings, but believe that inclusion in mainstream settings alone does not result in social competence.

Support for developing social skills in children with ASD in schools was also promoted in the government document 'Best Practice Guidelines in Autism Spectrum Disorders' (DfES, 2002). The document recommends both direct and indirect teaching of social skills and social understanding, and suggests that Individual Education Plans (IEPs) should target social skills development, communication and social understanding.

Supporting the inclusion of children with Asperger Syndrome is a significant challenge for Educational Psychologists in the United Kingdom (Greenway, 2000). The prevalence of Autism is thought to be increasing, and whilst there is a great deal of contention surrounding this issue, suggested reasons for the increase include an increasing awareness and diagnosis, changing diagnostic criteria, and increasing age of mothers at childbirth (Weintraub, 2011). However, additional reasons for the apparent increase are still largely unknown (Weintraub, 2011). Regardless of the reasons for the increasing prevalence, a significant issue for Educational Psychologists is finding effective ways to support the needs of children with Autism, and to enable children to be successfully included within mainstream settings.

## **Exploration and Critique of Research**

### **Definition of Terms**

#### **3.1i Autism**

Autism is currently classified as a Pervasive Developmental Disorder on the DSM-IV-TR (APA, 2000), a term which encompasses Autistic Disorder (AD), Childhood Disintegrative disorder, Asperger's Disorder and Pervasive Developmental Disorder not otherwise specified (PDD-NOS). A diagnosis of Pervasive Developmental Disorder requires the presence of difficulties in social communication, social interaction and social imagination. These three

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social difficulties form the triad of impairments, proposed by Wing and Gould (1979).

It is important to note that the DSM-IV-TR will be superseded by the DSM V in May 2013 (APA, 2012). It is proposed that Autism and Asperger Syndrome will be merged into one single category of diagnosis. The term Autism Spectrum Disorder (ASD) will encompass autistic disorder, childhood disintegrative disorder, pervasive developmental disorder not otherwise specified and Asperger's disorder (APA, 2012). The proposed criteria will place these four disorders on a continuum from mild to severe, with degree of severity specified alongside a diagnosis. The triad of impairments will also be combined into two categories; impaired social interaction and communication, and restricted and repetitive behaviour (APA, 2012). Wing, Gould, and Gillberg (2011) highlight a potential difficulty with merging Asperger's disorder into a single category of ASD. They argue that many people with Asperger's would strongly object to their label of Asperger's being replaced with a label of ASD as they see themselves differently to those with an Autism diagnosis.

For the purposes of this research the terms Asperger Syndrome (AS) and High Functioning Autism (HFA) will be used. The reason for this is that these are the terms that commonly feature in current published research studies in the United Kingdom.

The distinction between AS and HFA is an issue of contention in the research as HFA and AS have many commonalities, including social deficits, repetitive behaviours and restricted interests (Carpenter, Soorya, & Halpern, 2009). Asperger Syndrome is distinguished from Autism (including High Functioning Autism) by the presence of early language development (APA, 1994). A diagnosis of Aspergers requires single words to have been used at the age of 2, and at the age of 3 the child must have been able to speak in phrases (APA, 1994). High Functioning Autism is not an official diagnostic category but is a term used to describe individuals with Autism who have an IQ above 70

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(Carpenter et al., 2009). Children with HFA may have experienced delays in language development in early childhood. This research will focus on both HFA and AS.

Greenway (2000) describes how some researchers have avoided using the terms Asperger Syndrome and High Functioning Autism, either because of the difficulty associated with distinguishing between Asperger Syndrome and Autism, or for philosophical reasons associated with categorising individual needs according to medical criteria. Molloy and Vasil (2002) argue that the use of medical labels such as Autism and Asperger Syndrome place emphasis on deficits rather than strengths, and believes that applying medical terminology to developmental disorders is counter-productive. Whilst the arguments outlined by Molloy and Vasil (2002) hold certain validity, Greenway (2000) makes an equally valid point. Greenway (2000) argues that the tendency to avoid medical classifications in research makes it difficult for educational professionals to discover appropriate research. Educational research plays a vital role in enabling professionals to recommend educational practices that are evidence-based. Educational professionals therefore need to be able to determine which children an intervention is suitable for, and medical classifications have a role to play in this. When interpreting research in the field of ASD it is important to consider the wide degree of variability in the individual needs of participants, and to consider the views expressed by Molloy. The proposed research recognises that every child with AS and HFA is different, and findings should not claim to be generalisable to all children with AS and HFA.

### **3.1ii Definitions Relating to Social Functioning**

Regardless of the disparity in opinions surrounding diagnosis, there seems to be little dispute about the inclusion of social difficulties in both ASD and Asperger Syndrome. Impairments in social functioning form part of the diagnostic criteria of the DSM-IV-TR (APA, 2000) and ICD 10 (WHO, 1993), and are a central part of the triad of impairments (Wing & Gould, 1979).

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Spence (2003) provided a differentiation between social skills and social competence. Social skills refers to the verbal and non-verbal skills required for social interaction, such as eye contact, turn taking, joining in conversations and selecting appropriate topics for conversation (Spence, 2003). Social competence refers to the positive outcomes that are achieved as a result of an interaction with others, for example, sustained and reciprocal interactions (Spence, 2003). Harpur, Lawlor, and Fitzgerald (2006) define social competence in AS as “the extent to which their social interactions and outcomes with other people are mutually satisfactory and positive” (p.27). Sigman and Ruskin (1999) described the extent to which children engage with peers as a crucial element of social competence. LeGoff (2004) operationalised social competence as initiation of contact with peers, duration of social contact and levels of aloofness and rigidity. For the purposes of this study, social skills will refer to the skills required to initiate and maintain interaction, and social competence will refer to the quality of interaction with others, which includes the amount of interactions, duration of interactions and reciprocity.

### **3.2 Social Skills and Social Competence in Children with Asperger Syndrome and High Functioning Autism**

The social skills and problem behaviours of primary school children of children with AS and children with HFA were compared to see if there were substantial differences between the groups (Macintosh & Dissanayake, 2006b). No significant differences between the two participant groups were found, and both groups exhibited significant social skills deficits when compared to the standardisation sample of the SRSS (Gresham and Elliot, 1990). The authors concluded that HFA and AS belong on a single spectrum, a belief which is consistent with the changes proposed by the DSM V (APA, 2012). Therefore the social skills of HFA and AS will be considered concurrently in this review.

Children with AS and HFA show reduced eye contact during interactions and are less likely to smile (Lord & MaGill-Evans, 1995). Children with AS and HFA

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were found to initiate fewer social interactions, and were less likely to receive a reciprocal response to interactions (Church, Alisanski, & Amanullah, 2000; Lord & MaGill-Evans, 1995). Lord and MaGill-Evans (1995) also report a lack of spontaneous engagement in games with peers. However, Macintosh and Dissanayake (2006a) found that although children with HFA and AS were more socially isolated than typically developing peers, an ability to spontaneously engage socially with peers was seen.

Knott, Dunlop, and Mackay (2006) explored perceived social skills and competence in children with ASD in mainstream settings. The views of 19 children and their families were sought through the use of self-report measures. Findings indicated that the children recognised that they have difficulties with both social skills and social competence, but that parents reported lower levels of social competence than the child self-reports. Participants reported to have friendships in school, although friendships were reported to be problematic. The authors concluded that children with ASD may experience success in friendships in childhood but may have more difficulty sustaining friendships as they move into adolescence. A suggested reason for this was that children with ASD lack the socio-emotional skills to sustain friendships as the nature of friendships change in adolescence. This highlights the importance of developing social skills in childhood. This study did not employ a control measure, and used a standardised measure of social skills and competence that was not designed to be used with an ASD population.

It is important to consider whether children with AS and HFA desire social interaction, as it could be argued that socialisation is a construct imposed on children with ASD by educational professionals. Molloy and Vasil (2002) argue that AS is commonly constructed as an impairment rather than a difference, and professional interventions seek to normalise the child by treating their social deficits. Kanner (1943) described how children with ASD hold a strong desire to be alone, and if this is the case, social skills interventions may be

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imposing skills on individuals that they do not care to possess. More recent research has sought to explore the perceptions of children with Asperger Syndrome and High Functioning Autism. Carrington, Templeton, and Papinczak (2003) explored friendships in children with AS using semi-structured interviews. Emergent themes led the researchers to conclude that children placed value on friendships, although the nature and reciprocity of friendships did not appear to be understood by children. Attwood (2006) suggests that children with Asperger Syndrome are troubled by a lack of friendships and often experience loneliness. Attwood (2006) describes how children with Asperger Syndrome are often either socially isolated on the school playground, or actively involved with other children but in a way that peers perceive to be socially intrusive. Attwood's comments on the nature of social interactions in children with AS are not substantiated with research evidence and appear to be based upon his own experience. However, Church et al. (2000) found a similar pattern of social interaction. Children were thought to exhibit one of two patterns of interaction; either they were quiet and withdrawn or they were forceful and intrusive socially. There was a tendency for social skills to improve with age, with more children reporting to have a best friend later on in childhood. However, many children enjoyed spending time alone and frequently engaged in solitary activities. This study used a retrospective review of medical records to gather the information; thus findings may not be a valid reflection of lived experience.

It is important to recognise that the social profiles seen in children with AS and HFA are heterogeneous; whilst research suggests that there is an association between ASD and social difficulties, each child with AS or HFA may present with very different social needs. Church et al. (2000) described the social, emotional and behavioural experiences of 40 children with Asperger Syndrome, and noted great variability in both experiences between individuals and consistency over time. Despite the variability, social skills and interaction continued to be the most significant of the difficulties experienced. Bellon-Harn and Harn (2006) conducted in-depth, qualitative



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analysis of the social communication difficulties experienced by two children with AS. The children presented with different patterns of social communication, leading the authors to conclude that children with AS are a heterogeneous population.

The aforementioned research studies suggest that children with AS and HFA desire friendships and see the value in having friends, yet their experiences of, and understanding about social interaction are more limited in comparison to typically developing peers of the same age. Children with AS and HFA may therefore require additional support to improve the quality of their social interactions, and thus their emotional wellbeing. There is therefore a need for effective, evidence based interventions to develop social skills and social competence in children with AS and HFA.

### **3.3 Social Skills Interventions**

#### **3.3.i Social Skills Interventions: Meta-analyses**

There is a substantial amount of published literature on social skills interventions for children with ASD, however, the effectiveness of interventions varies between research studies. Meta-analyses show minimal positive effects and question the effectiveness of social skills interventions for children with ASD (Bellini, Peters, Benner, & Hopf, 2007; Rao, Beidel, & Murray, 2008).

Bellini et al. (2007) aimed to identify participant, setting and procedural factors that resulted in the most positive outcomes in school based social skills interventions. 514 studies were identified from an initial search, although after exclusion criteria were applied 55 studies were selected for quantitative analysis. The quantitative analysis demonstrated low treatment and generalisation effects, and moderate maintenance effects for children with ASD. This suggests that although gains made were small, gains were maintained after a period of non-intervention. No differences in treatment effect were found between studies that used group intervention and those

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that used individual intervention, although individual interventions produced higher generalisation effects. No significant relationships were found between outcomes and treatment length, duration and total hours. Interventions conducted in the child's classroom environment produced greater treatment, maintenance and generalisation effects than interventions that took place outside of the classroom in 'decontextualised' settings. Only 14 of the 55 studies included in the meta-analysis measured treatment fidelity, so it is not possible to ascertain whether or not the intervention was delivered successfully or not. Treatment fidelity data is essential to help determine whether low treatment effects can be attributed to poor treatment implementation or the treatment itself. This meta-analysis included interventions for children on the Autism Spectrum and did not specify which interventions were of particular relevance to children with HFA or AS.

Rao et al. (2008) conducted a literature review of social skills training for children with High Functioning Autism or Asperger Syndrome, and drew similar conclusions to Bellini et al. (2007). Rao et al. (2008) reviewed ten empirical research studies evaluating Social Skills Training (SST) interventions for children with AS or HFA. SST encompassed direct teaching of skills, social stories, and social scripts. Rao et al. (2008) found that 7 out of the 10 studies found positive outcomes as a result of SST. However, within each study positive outcomes were often limited to a subset of participants or outcome measures, thus firm conclusions about effectiveness were often not made. 3 out of 10 studies analysed found no evidence of positive outcomes. Rao et al. (2008) concluded that there is minimal empirical support for SST interventions for children with AS and HFA. Rao et al. (2008) highlighted some common flaws found in research evaluating SST; namely a lack of agreement over which skills are incorporated into the term social skills, a lack of control measures, small sample sizes, and the use of un-blinded observer ratings to determine the outcome of the intervention. Finally, only one study obtained follow up measures to determine whether gains were maintained. These

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findings have important implications for future research, and the proposed research will attempt to address the criticisms made by Rao et al. (2008).

Research studies evaluating interventions designed to develop social skills and social competence in children with HFA or AS will now be explored. A comparison of the reviewed research is presented in Figure 2 on page 13, and conclusions and implications from the reviewed research will be considered.

### **3.3.ii Social Skills Interventions for Children with AS and HFA: Direct Teaching of Social Skills**

Direct teaching of social skills is a common feature of social skills interventions for children with Autism. DeRosier, Swick, Davis, McMillen, and Matthews (2010) tested the efficacy of a social skills intervention named 'Social Skills GRoup INtervention-High Functioning Autism' (S.S.GRIN-HFA). The S.S.GRIN-HFA uses Cognitive-Behavioural and Social Learning approaches to build peer relationships and social skills. Children are taught specific social skills through 15 sessions, which follow a curriculum outlined in the intervention's manual. There are three modules in the programme; Communication, Working with Others and Friendship Skills. Participants were randomly allocated to either the S.S.GRIN-HFA intervention group, or the Social Skills Group Intervention (SS.GRIN); an existing social skills intervention for typically developing children. Children who participated in the S.S.GRIN-HFA group showed significant increases in mastery of social skills in comparison to the SS.GRIN group. The researchers concluded that group based social skills programmes are effective for children with HFA. Results from this study suggest that children with HFA show greater response to interventions when the intervention addresses specific aspects of social skill functioning that are of particular relevance to children with HFA. This study used a large sample size and a comparison group. However, a follow up study was not conducted so it is not possible to comment upon whether treatment gains were maintained.

Spence (2003) suggested that Social Skills Training (SST) alone is unlikely to result in lasting improvements in social competence, and direct teaching of

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social skills is more effective when it forms part of a multi-component approach. Beaumont and Sofronoff (2008) developed a multi-modal programme for children with Asperger Syndrome, titled 'The Junior Detective Training Programme'. The programme incorporated a computer game, parent training sessions, a hand out for teachers and small group sessions. Parental reports indicated greater improvements in social skills in the intervention group in comparison to the wait list control group, and teacher ratings indicated significant gains in social functioning after participation on the programme. These gains were maintained 5 months after the end of the intervention period. This study used a large sample size, a control measure, and also obtained follow up measures to see if gains had been maintained. This research demonstrates that social skills interventions can be effective over a relatively short time frame, with gains that are maintained over time.

### 3.3.iii Social Skills Interventions for Children with AS and HFA: Social Stories

Social stories are often recommended as an intervention to promote pro-social behaviour in children with Autism (Greenway, 2000). However, Hanley-Hochdorfer, Bray, Kehle, and Elinoff (2010) found no evidence to suggest that Social Stories are an effective intervention for children with Autism and Asperger Syndrome. Reynhout and Carter (2006) conducted a review of published research measuring the effectiveness of social stories and concluded that the effectiveness is highly variable. They were unable to determine which components of social stories were effective, and suggested future research should explore elements of efficacy further.

Sansosti and Powell-Smith (2006) presented evidence to demonstrate positive effects of social stories on social behaviour. The social stories were tailored to each individual's needs, and were read to the boys twice a day by parents. The intervention was evaluated on the basis of the total time each boy spent engaged in positive interaction related to the targeted social behaviours, during play time. Significant increases in positive behaviour were seen in two out of the three boys. The sample size of this study was small, which limits the

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potential to generalise these findings to other children. Positive changes in behaviour may have been the result of social maturation over time, and control measures were not taken to help eliminate this possibility.

Research exploring the effectiveness of social stories is mired by methodological weaknesses, and further research into their effectiveness is required before Educational Psychologists can recommend them as an effective intervention for children with ASD (Styles, 2011).

### **3.3.iii Social Skills Interventions: Use of Peers**

In recent years there has been a growing recognition of the importance of a supportive peer group for promoting educational and social outcomes (Greenway, 2000). Greenway (2000) reviewed social skills interventions of particular relevance to Educational Psychologists promoting the inclusion of children with ASD in the mainstream classroom. Greenway (2000) suggested that Circle of Friends is an effective intervention for children on the Autism spectrum.

Circle of Friends is an approach which aims to facilitate and promote the development of friendships, through enlisting the help of classmates (Frederickson, Warren, & Turner, 2005). Whitaker, Barratt, Joy, Potter, and Thomas (1998) conducted a qualitative study exploring the impact of inclusion within a Circle of Friends group. Emergent themes suggested the target child experienced improved social integration, increased peer contact, and increased empathy from peers.

Frederickson et al. (2005) conducted an empirical research study to measure the effectiveness of the Circle of Friends intervention. The intervention consisted of a whole class meeting followed by weekly meetings with a smaller group of children. Frederickson found that acceptance increased and rejection decreased in class mates after the whole class meeting. However, such gains were not maintained and the initial gains reduced throughout the

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small group intervention period. This suggests that a Circle of Friends approach may be useful in promoting social acceptance when delivered as a whole class approach, but gains may not be long lasting. This research provided little evidence to suggest that the weekly Circle of Friends sessions were beneficial for social acceptance and inclusion. No changes were found in the behaviour of the focus children, suggesting that the Circle of Friends approach influences the attitudes of the other children and not the behaviour of the focus child.

Only one child in this study had a diagnosis of ASD. However, this study has particular relevance when considering interventions to promote inclusion of children with ASD as the intervention proved particularly successful for this child. The members of this child's circle were educated about the social and communicative difficulties that children with ASD often experience. They were also encouraged to take a directive rather than supportive approach to assisting the child with meeting weekly targets. This suggests that peers can be beneficial for children with ASD, however, the greatest changes are likely to be seen in the attitudes and behaviour of the peers rather than the social behaviour of the child.

Whilst the benefits of promoting social acceptance in peers is indisputable, Dodge, Pettit, McClaskey, Brown, and Gottman (1986) cyclical model of social competence suggests that positive changes in social acceptance are not likely to be maintained if behaviour change does not occur in the child. This, and the fact that gains were not maintained in Frederickson et al. (2005) study, suggests that further intervention to improve social competence is required for children who have difficulty forming and maintaining social relationships.

**Figure 2: Summary of reviewed research.**

Inclusion Criteria: Participants should be of primary school age (4-11), with Asperger Syndrome or High Functioning Autism. Intervention should target social skills, social interaction and/or social behaviour.

Author(s)	Intervention	Diagnosis	Number of participants and age	Control measure	Measurement	Duration of intervention	Statistical Outcome	Follow up
Barry et al. (2003)	Outpatient clinic based social skills	HFA (IQ>70)	N=4, aged 6-9	No	Social Skills Rating Scale (Gresham & Elliott, 1990), Social Support Scale for Children (Harter, 1985), Loneliness Scale (Asher & Wheeler, 1985) Parent interview and 5 minute structured play observation	8 weeks	Greeting skills: positive change Conversation skills: No significant improvement Play skills: positive SSRS: no change Social Support: No change Loneliness: No significant improvement	Not measured
Bauminger (2002)	CBT to develop socio-emotional understanding and social interaction	HFA (IQ>70)	N=15, aged 8-17	No	15 minute playground observation, using the Behaviour Coding Scheme (Hauck, Fein, Waterhouse, & Feinstein, 1995) Social Skills Rating Scale-Teacher Version SSRS-T (Gresham & Elliott, 1990) Problem solving Measure (Lochman & Lampron, 1986) and emotional inventory (Seidner, Stipek, & Feshbach, 1988)	7 months, 3 times per week	Social understanding and problem solving: positive Emotional understanding: positive Social interaction (initiating and responding): positive SSRS-T: Positive	Not measured
Beaumont and Sofronoff (2008)	The Junior Detective programme, a multi-component social skills intervention	Asperger Syndrome, IQ >85	N=49, aged 7.5-11 N=26 on intervention, N=23 on wait list control	Yes, matched on age, IQ and symptom severity	Social Skills Questionnaire SSQ (Spence, 1995a) Emotional Regulation and Social Skills Questionnaire (reference not cited in paper), and the Assessment of Perception of Emotion from Facial Expression and from posture cues (Spence, 1995b).	7 weeks	SSQ: positive Emotional Recognition: No effect	Yes, 5 months. Gains maintained

Author(s)	Intervention	Diagnosis	Number of participants and age	Control measure	Measurement	Duration of intervention	Statistical Outcome	Follow up
DeRosier et al. (2010)	Social Skills Group Intervention	HFA IQ>85	N=27, aged 8-12 N=28 control group, aged 8-12	Control group= Alternative, non-autism specific social skills group	Social Responsiveness Scale(SRS; Constantino & Gruber, 2005) Achieved Learning Questionnaire (ALQ; DeRosier & Gilliom, 2007) Social Dissatisfaction Questionnaire (Asher & Wheeler, 1985) Social Self-efficacy Scale (Ollendick & Schmidt, 1987)	15 sessions, 1 hour each	SRS: Positive ALQ: Positive Social dissatisfaction: No effect	Not measured
Frederickson et al. (2005)	Circle of Friends	1 child with ASD, 14 children with other Special Educational Needs	N=15, aged 6-11	No	The LITOP Questionnaire from the Social Inclusion Survey (SIS) (Frederickson & Graham, 1999) Adaption of the Guess Who peer assessment measure (Coie & Dodge, 1988)	6 weeks, once per week	No significant effects seen	Yes, 18 week follow up
Hanley-Hochdorfer et al. (2010)	Social Stories	Autism and Asperger Syndrome	N=4, aged 6-12	No	Structured behavioural observations of verbal initiations and response to peers	4x per week, total number of occasions ranged from 9-19 between participants.	No effects seen	Yes, 6 week follow up
LeGoff (2004)	Lego therapy, group and individual sessions	ASD, PDD-NOS, AS	N=47, aged 6-16	Waiting list control of 3 or 6 months- Repeated measures	Structured playground observations, Social Interaction subscale of GARS (Gilliam, 1995)	60 minutes Individual Lego therapy weekly, 90 minutes group Lego therapy weekly for 12 or 24 weeks.	Frequency of interaction: Statistically significant gains Duration of interaction: statistically significant gains Aloofness and rigidity: statistically significant reductions.	Reported in a separate study (LeGoff & Sherman, 2006)



Author(s)	Intervention	Diagnosis	Number of participants and age	Control measure	Measurement	Duration of intervention	Statistical Outcome	Follow up
LeGoff and Sherman (2006)	Lego therapy, group and individual sessions	ASD, PDD-NOS, AS	N=60 mean age 9:3, N=57 children in control group, mean age 10:1	Matched comparison sample, receiving comparable non-Lego therapy	GARS, Social Interaction subscale (Gilliam, 1995), Vineland Adaptive Behaviour Scales, Socialisation Domain (VABS-SD; Sparrow, Balla, & Cicchetti, 1984)	60 minutes individual Lego therapy and 90 minutes group Lego therapy, weekly for 36 months	Significant improvements in social competence on VABS-SD and GARS-SI	N/A
Owens, Granader, Humphrey, and Baron-Cohen (2008)	Lego therapy group sessions	AS, HFA	N=47, aged 6-11. N=16 Lego N=16 control N=17 comparison intervention	Yes	VABS Socialisation, Communication and Maladaptive domains (Sparrow et al., 1984), GARS, Social Interaction subscale (Gilliam, 1995), parent evaluation questionnaire and structured playground observations.	60 minutes per week, 18 weeks	Significant increase in duration of interactions, no significant differences in socialisation on VABS-SD pre and post intervention, significant decrease in Maladaptive Behaviour	No
Sansosti and Powell-Smith (2006)	Social Stories	Asperger Syndrome	N=3, aged 9-11	Between groups baseline design control period	Structured behavioural observations measuring occurrence of focus behaviours	Twice per day during intervention period (intervention range 13-20 days)	Positive effects seen in targeted social behaviours, although gains were not measured for statistical significance. Follow up: gains not maintained.	2 week follow up
Whitaker et al. (1998)	Circle of Friends	Autism and Asperger Syndrome	N=7, aged 7-15	No	Structured interviews, questionnaire, discussion	Range of occasions = 3-17 sessions	Improved social integration, increased peer contact, increased empathy from peers. Data was qualitative so statistical analysis was not conducted.	No

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### **3.4 Strength Based Model for Social Skills Interventions**

Interventions designed to build social skills and social competence commonly focus on modifying some of the social deficits associated with AS and HFA. Bianco, Carothers, and Smiley (2009) argue that children with AS exhibit many strengths, and educational interventions should pay attention to a child's strengths, talents and interests whilst supporting development in areas of weaknesses. Utilising a child's passion and interest enhances opportunities to teach both academic and social skills through such areas, because the child remains interested and motivated (Bianco et al., 2009).

Winter-Messiers (2007) interviewed children with Asperger Syndrome about their special interests. They noted positive relationships between talking about special interests and improvements in social, emotional and communication skills. Children used more appropriate verbal language, social interaction and body language when talking about their area of special interest. All children showed improvement in at least one area previously highlighted as a deficit area. This suggests that utilising special interests could help to develop areas that are thought to be challenging for children with Asperger Syndrome. The authors created a strength based model of Asperger Syndrome and argued that teachers should value and utilise the special interests held by children.

The above research suggests that interventions will be more successful if the child's strengths and interests are considered. Lego therapy is a social skills intervention which utilises the inherent strengths and interests often found in children with Asperger Syndrome (Owens et al., 2008). Lego therapy, and the theory that underpins it will now be considered.

## **4. Lego Therapy**

### **4.1 An Overview of Lego Therapy**

Lego therapy is a social skills intervention designed for use for children with ASD, and was first outlined by LeGoff (2004). Lego therapy is designed to be delivered weekly, with a trained adult to facilitate social interaction between three group members. The presence of rules and roles are a crucial component to promote appropriate social interaction in group members. Each child plays the role of either an 'engineer', a 'supplier' or a 'builder'. The engineer is given a set of directions, and is required to instruct the builder. The supplier

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provides the builder with the required pieces. The assignment of roles allows the children to practice social interactions in a safe environment, and encourages the development of skills essential for social interaction. Lego therapy aims to develop turn-taking skills, joint attention, problem solving and communication in its members (LeGoff, 2004). A further element of Lego therapy is 'freestyle' building, where the children design and build an object together. This encourages communication of ideas, perspective taking and compromise (LeGoff, 2004).

#### **4.2 The Theoretical Basis for Lego Therapy**

LeGoff (2004) found that children were highly motivated to participate in Lego therapy and described how Lego therapy was inherently rewarding for children with ASD. However, at the time LeGoff (2004) was not certain why children with ASD were so attracted to Lego, and recommended that future research should investigate this further. Owens et al. (2008) explained the motivation to participate in terms of Baron-Cohen's hyper-systemizing theory (Baron-Cohen, 2006).

Baron-Cohen (2006, 2008) suggested that children with ASD have a strong drive to systemize. The purpose of systemizing is to predict patterns and changes in lawful events (Baron-Cohen, 2008). The hyper-systemizing theory suggests that we all have a systemizing mechanism, and that individuals possess the mechanism to differing degrees (Baron-Cohen, 2006). The systemizing mechanism enables an individual to look for input-operation-output relationships and to detect laws and patterns from these relationships (Baron-Cohen, 2006).

The theory suggests that males exhibit a greater degree of systemizing, and a lower degree of empathizing than females (Baron-Cohen, 2008). It also proposes that individuals with ASD have a strong drive to systemise. The hyper-systemizing theory explains why children with ASD prefer things that don't change, or that change in lawful and predictable ways. Individuals with ASD are attracted to predictable, rule-based systems. The hyper-systemizing theory also explains why children with ASD dislike things that lack predictability, such as social interaction and emotions (Baron-Cohen, 2008).

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### 4.3 Current Research in Lego Therapy

LeGoff (2004) investigated the effect of group Lego therapy on Social Competence in children with ASD. Social competence was thought to consist of the motivation to initiate social contact with peers, the ability to sustain an interaction with peers, and overcoming aloofness and rigidity. LeGoff (2004) believed that these three aspects of social competence are required for improvement in social ability.

The ability to initiate and maintain social interaction was measured through observation of the child with peers, and rigidity and aloofness was measured with the Social Interaction subscale of the Gilliam Autism Rating Scale (GARS-SI, Gilliam 1995). Observation occurred in unstructured periods in the school environment, where the children had access to familiar peers. Frequency of initiations were measured through a frequency count within a 30 minute period at lunchtime. Duration of interaction was measured during an hour long observation during after school recreation time. These interactions were not required to be initiated by the child. Criteria for both duration and initiation were given to ensure consistency across observations. Measurements were taken at 12 and 24 weeks. Improvements in frequency and duration of social interaction and aloofness were found on all three measures, at both 12 and 24 weeks, and no improvements were noted during the waiting list period. This suggests that Lego therapy is a promising intervention for developing social competence in children with ASD.

LeGoff (2004) suggested that future research should investigate whether improvements in social competence were generalised to other contexts. LeGoff (2004) also suggested that future research should explore why Lego was an effective intervention for children with autism, and also to discover why it sustained the interest of children for such extensive periods of time.

LeGoff and Sherman (2006) conducted a further study to investigate whether the gains in social competence would be sustained over a longer period, and whether they would affect a wider range of social behaviours in a wider range of contexts. Social skills were measured over a three year period whilst participants were receiving Lego therapy, and compared to social skills interventions that did not use Lego. Pre and post measures were taken, and a matched control group was employed. Children in the comparison group received both

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individual and group therapy on a weekly basis, and both groups received comparable levels of speech and language therapy, occupational therapy and physiotherapy. The Vineland Adaptive Behaviour Socialisation Domain (VABS-SD, Sparrow, Balla, & Cicchetti, 1984) and GARS-SI (Gilliam, 1995) was completed to obtain pre and post measures of socialisation and autistic behaviours. LeGoff and Sherman (2006) found that children in both the Lego and the control group showed significant improvements on both the VABS-SD and the GARS-SI. The Lego group made significantly greater gains on both the VABS-SD and GARS-SI than the comparison group did, so it was concluded that Lego therapy participants showed relatively greater improvement in a broad range of social skills and a reduction in autistic behaviours over a 3 year period.

The generalisation of behaviours from the therapy setting to natural setting was assumed from the adaptive behaviour scores obtained on the VABS-SD. However, no observations of the child's behaviour in the natural environment were conducted to validate this assumption.

Owens et al. (2008) compared Lego therapy to the Social Use of Language Programme (SULP) in children with High Functioning Autism (HFA) and Asperger Syndrome (AS). A no-intervention control group was also established, with children matched on age, IQ, verbal IQ and autism symptom severity. Playground observations were conducted to measure generalisation of social skills from the clinic to the school environment. Observation data measured the frequency of self-initiated social contact with peers and the duration of such interactions. A coding scheme was used to inform observations. Observation data was not available for the matched control group. Both Lego therapy and SULP occurred for an hour a week for 18 weeks in a clinic outside of the school day. No individual therapy sessions were provided in this study. Three children were included in each group, and each session the children played the role of either the 'engineer' the 'supplier' or the 'builder'. Children rotated roles throughout the programme.

After the intervention period the Lego group showed a significant improvement in the scores on the GARS-SI, suggesting that autism specific social difficulties reduced following Lego therapy. The children receiving the Lego therapy intervention also showed significantly less maladaptive behaviour post intervention. However, significant improvements were

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seen in the Sulp group on the communication and socialisation domains of the VABS, whereas no significant differences were seen in the Lego or control groups. Direct observations of behaviour in the playground showed a small but significant increase in the duration of interactions for the Lego group, suggesting that there may have been some generalisation of skills learnt from Lego therapy to the school playground. However it is important to note that there were no significant differences in the two groups at time 1 and time 2, and data was not collected to allow for comparison to the control group on this measure. The observation period was only 10 minutes, and was conducted by the same researcher that delivered the Lego therapy intervention. This leads to the possibility of bias in interpreting children's behaviour on the playground. The author recommended that observations are carried out for a longer period of time and by a blind observer. The authors concluded that both Lego therapy and Sulp have potential benefits for improving social behaviour in children with ASD, and both have the potential to be used as an intervention within schools. LeGoff and Sherman (2006) also described how Lego therapy has the potential for use within the school, and argued that it could be adapted to school settings with ease.

## **5. Conclusions and Future Directions for Research**

Research demonstrates a clear need for interventions addressing social skills and social competence in children with Asperger Syndrome and High Functioning Autism (Lord & MaGill-Evans, 1995). Current research investigating interventions for children with AS/HFA frequently reports mixed findings about usefulness of the intervention (Rao et al., 2008). Social skills research is frequently marred with methodological difficulties, including small sample sizes, a lack of inter-observer ratings, no control measures and a lack of follow up measures (Rao et al., 2008). The current research will seek to address some of the issues raised in the current published research. A power calculation will be conducted to determine how many participants are required (Cohen, 1988), a measure of inter-observer reliability will be obtained, a control measure will be taken, and follow up data will be collected.

Existing social skills interventions rarely use the child's strengths as a tool for engaging them in the intervention. Children with Autism possess a strong drive to systemise (Baron-Cohen,

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2006, 2008), thus are often interested in objects that are predictable and stable. Lego therapy research has demonstrated the benefits of using construction toys to engage children in an intervention designed to build social skills, and has demonstrated success in improving social competence and adaptive social functioning (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). However, Lego therapy research is a relatively new intervention, and has only been investigated within clinical settings thus far. As Lego therapy is an easy to implement and relatively low-cost intervention, it has the potential to be a successful school based intervention for improving social skills in children with Asperger Syndrome and High Functioning Autism. My research study aims to address these current gaps in the research literature, and to contribute to the research base for educational professionals who use research evidence to guide their practice. The current research study will explore whether the same gains in social skills and social competence are seen when Lego therapy is delivered in schools, by school staff. Phase two of the current study will explore the perceptions of the children that received Lego therapy and the staff that delivered Lego therapy.

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