Doctoral Thesis

Sociality in Autism: Building Social Bridges in Autism Spectrum Conditions through LEGO®-based therapy

by

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Abstract

Background: Autism Spectrum Conditions are associated with difficulties in core social communication and social interaction (American Psychiatric Association, 2013) and comorbid psychopathology (Simonoff, Pickles, Charman, Chandler, Loucas & Baird, 2008). These problems are often exacerbated in middle childhood and adolescence owing to the increased complex social milieu for children on the spectrum. The present study aimed to evaluate the effectiveness of a short-term LEGO®-based therapy for children and adolescents with high functioning Autism Spectrum Conditions. Another interesting and novel aspect of this study is the application of repertory grid technique (Kelly, 1955) to explore psychological changes in construing over the course of the LEGO®-based therapy.

Methods: Twenty-five high functioning children and adolescents with Autism Spectrum Conditions (M =12.40, SD = 2.02) took part in an eight-week, clinic based LEGO®-based therapy sessions within an outpatient, mental health setting. Baseline, pre- and post-intervention outcome measures, including parent- and self-reports and repertory grid technique, were administered to assess changes during the eight-week baseline period with that during the eight-week intervention period in the area of autism specific social behaviours, adaptive functioning, psychopathology, and construing.

Results: On average, participants made significant gains across autism specific social behaviours, adaptive social and maladaptive behaviour, psychopathology, and coping following LEGO®-based therapy but not during the baseline period. In addition, participants also showed some changes in construing, including the way they viewed themselves and person with ASC, a loosening of construing and an overall change in construing from pre- to post-intervention. Effect sizes (Pearson's *r*) for these statistical significant results ranged from medium to large. Correlations between construing and psychopathology were also noted but not for autism-specific social behaviours or adaptive functioning.

Conclusions: Overall, LEGO®-based therapy was a highly attended group (M = 89.5%) and well received by participants and their parents. These findings suggest that LEGO®-based therapy is feasible, cost-effective and can be set up in mental health services as part of the treatment plan for children and adolescents with high functioning Autism Spectrum Conditions. Future studies should focus on the effectiveness of LEGO®-based therapy with girls on the spectrum or children with social related conditions and conduct large scale randomised controlled trials.

Key words*: Autism Spectrum Conditions, LEGO®-based therapy, social skills, high functioning, psychopathology, construing.*

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As I will be closing this thesis chapter behind me, a new chapter begins…

Camilla Nguyen – soon to be Lu

This thesis is dedicated to all children and young people with ASC and their families.

To Prakash, my trek guide, dear friend, and brother. You made me believe I could climb any mountains in this world and that nothing was impossible or too far out of reach. I owe you for your forever inspiring support through some of the most challenging time in my life, physically, emotionally, psychologically, in the Himalayas. I hope you found your peace in the clouds.

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Chapter 1: Introduction

1.1 Overview

Central to Autism Spectrum Conditions (ASC) are difficulties in social communication and social interaction (American Psychiatric Association; APA, 2013). While improving social competence should be a high priority on any service provider agenda working with this clinical population (National Research Council, 2001), only few social skills interventions are considered evidence-based practice (Wang & Spillane, 2009). Given the dearth of social skills intervention, in particular for adolescents with ASC (Reichow & Volkmar, 2010), this study presents an evaluation of the effectiveness of a short-term LEGO®-based therapy (referred to as LEGO therapy from here and throughout the thesis) with older children and adolescents with high functioning ASC. In addition, and an extension of previous work in this area, is the exploration of children's and adolescents' abilities to construe self and others, given the importance of this in the development of sociality, using the repertory grids (Kelly, 1955).

To provide a context for this study, this chapter begins with a brief overview of the current changes to the psychiatric definition and prevalence rate of ASC. Next, the manifestation of social impairment will be defined and conceptualised with reference to social subtypes and linking social impairment to cognitive theories, namely, the mindblindness theory (Baron-Cohen, 1995), the empathising-systemising theory (Baron-Cohen, 2002), and Personal Construct Psychology (Kelly, 1955). This is followed by an overview of the effectiveness of social skills group interventions, followed by a systematic literature review about the effectiveness of LEGO therapy for children and adolescents with ASC. The chapter concludes with a summary of the overall aims, how the current gaps will be addressed, and the research questions of this study.

1.2 Psychiatric definition of ASC

The conceptualisation of ASC continues to be based on a set of behavioural phenotypes owing to the fact that there is no identified biological marker that is deemed universal to ASC yet (Hewitson, 2013). Ironically, for a specific group of people who share a desire for 'sameness' and 'repetitiveness', the latest edition of the Diagnostic and Statistical Manual of Mental Health Disorders-5th Edition (DSM-V; APA, 2013) has gone in the complete opposite direction and introduced some of the most dramatic changes to its content and structure yet in the history of the psychiatric definition of ASC.

The new DSM-V (APA, 2013) has removed all the previous subcategories under pervasive developmental disorders (PDD), including Asperger's Syndrome (AS), autistic disorder (AD), childhood disintegrative disorder (CDD) and pervasive developmental disorder-Not Other Specified (PDD-NOS), and replaced them with a single, broad category of Autism Spectrum Disorders.[1] The removal of AS has in particular created concern regarding disenfranchisement for individuals who are currently diagnosed with this condition (Lord & Jones, 2012; Parsloe & Babrow, 2016). That said, there is limited evidence supporting the notion that the categorical diagnostic subtypes can be discriminated reliably between clinicians or across sites (Lord et al., 2012).

Along this line, the manifestation of ASC as a triad of symptoms was also open to criticisms owing to the notion that the separation of symptoms into either social or communication was rather arbitrary (Gotham, Risi, Pickles & Lord, 2007; Lord & Bishop, 2015). Hence, the reduction in the DSM-V from three to two factor dimensions, subsumed under social (social communication and social interaction) and non-social behaviours (restrictive and repetitive patterns of behaviour, interests and activities) has been well-received and supported by a number of studies using confirmatory factor analysis (Frazier et al., 2012).

Finally, the application of stringent criteria is perhaps the most controversial yet. In order to meet the new criteria for ASC, both the social (all three behavioural criteria) and the non-social dimensions (at least two out of four behavioural criteria) need to be present and accompanied by a severity level. See Appendix A for a detailed description of the new criteria of ASC. Whilst the new changes to the DSM-V show excellent specificity there are still concerns that these criteria might be overly stringent when it comes to sensitivity (Carrington et al., 2014; Lai, Lombardo, Chakrabarti, & Baron-Cohen, 2013). As the changes to the DSM-V are still relatively in the infancy stage, it will be interesting to see within the next few years how this might impact on service access and delivery, diagnostic practice, and prevalence estimates.

1.3 Prevalence estimates of ASC

In terms of prevalence estimates of ASC, two findings are clearly documented in the literature. Firstly, the prevalence rate of ASC in the general population continues to increase over time, suggesting that ASC is no longer considered a rare condition but a public health issue (Center for Disease Control & Prevention; CDC, 2007). One of the most recent and largest

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[1] Given that the author does not construe individuals with autism as having a 'disorder', she will continue to use the term ASC throughout this thesis to reflect the nature of the condition.

epidemiology studies, based on the National Health Interview Survey, indicated that there has been a significant increase in the overall estimated prevalence rate of ASC in the general population from 1.25% to 2.24%, between year 2011-2013 and 2014 data, in the United States (Zablotsky, Black, Maenner, Schieve & Blumberg, 2015). Secondly, the prevalence rate of ASC is five times more common in males than females (CDC, 2012). One explanation, although controversial, suggests that males and females differ in cognition because ASC is essentially an extreme form of the male brain (Baron-Cohen, 2002). When compared to males, the accumulating evidence suggests that the diagnostic process for females may be delayed (Beeger et al., 2013) or even missed completely by clinicians (Dworzynski, Ronald, Bolton & Happe, 2012). These findings feed into the debate whether our current diagnostic tools are specific enough to consider different behavioural phenotype presentations between males and females (Nguyen & Ronald, 2014).

1.4 ASC and cognitive functioning

There is also evidence that comorbid Intellectual Disabilities (ID) are high in individuals with ASC. It has been suggested that 31.5% of school-age children with a diagnosis of ASC also have a comorbid ID (Intelligence Quotient (IQ) ≤ 70), followed by 24.5 % in the borderline range (IQ = 71-85), and the remainder of the children with ASC (43.9%) within the average or above average intellectual functioning (IQ > 85; Christensen et al., 2012). Since the 1990's there has been a shift to study mainly high functioning individuals with ASC in the autism literature, as this allows identification of autism specific impairments, which are not confounded by intelligence (Baron-Cohen, Wheelwright, Lawson & Hill, 2002). The term high functioning ASC (HFASC) will be used to refer to all individuals with average or above average intelligence functioning. Given that the changes to the DSM-V took place relatively recently, the author will also make reference to AS or HFA when this has been used in past research studies.

1.5 Autistic disturbances of affective contact

In 1943, Kanner gave an account of a case series of eleven children who all shared a striking clinical presentation of aloofness and indifference to others, which he referred to as '*inborn autistic disturbances of affective contact*' (*p*. 250). While the conceptualisation of ASC has continued to evolve and expanded from Kanner's (1943) first observation of infantile autism to what we now refer to as a spectrum of conditions, it is rather remarkable that social interaction deficit still remains in the forefront of the ASC. By definition, the presence of social communication and social interaction deficits is manifested as follows: i) deficits in social-emotional reciprocity, ii) deficits in non-verbal communicative behaviours used for social

interaction, and iii) deficits in developing and maintaining relationships, appropriate to age and developmental level (APA, 2013). The new DSM-V has purposefully incorporated a smaller number but looser set of criteria within the social domain to reflect how the manifestation of ASC is affected by age and developmental levels and their environment (Lai et al., 2013; Lord & Bishop, 2015). While it is important to consider similarities, which the DSM-V clearly does, it is argued here that it is equally important to consider social differences within ASC. Lai et al. (2013) proposed a call for a parallel behavioural characterisation system alongside the DSM-V to capture heterogeneity within ASC. Thus, the next section will review Wing and Gould's (1979) subclassification of ASC.

1.6 Types of Social Interaction

According to Wing and Gould (1979), the manifestation of social interaction impairment in children with autism can be divided by types of qualitative social interactions: *aloof and indifferent, socially passive, and active but odd.* Children with an aloof style tend to display a lack of interest and awareness of others, apart from when they want access to physical comfort or stimulation (Wing, 1997). In contrast, children with an active but odd type actively seek social behaviour with others but they conduct themselves in a very odd, bizarre, and repetitive manner. The conversations with this group of children tend to be one-sided and guided predominantly by their special interests. The socially passive group of children, on the other hand, neither actively seek nor avoid social contact. When they do participate, however, they tend to take a passive role in the social play (Wing & Gould, 1979).

The work by Wing and Gould (1979) provided an immensely valuable contribution in this area. They extended the notion of Kanner's (1943) earlier work and classic image of children with autism as being socially aloof to include the passive and active but odd types to capture the social diversity within the autism spectrum. Furthermore, while the original study by Wing and Gould (1979) was based on lower functioning children, subsequent empirical studies have also demonstrated the clinical relevance of this subclassification and diversity of interaction types within the subgroup of higher functioning individuals with ASC across the lifespan (e.g. Ghazuiddin, 2008; Scheeren, Koot & Beeger, 2012). A weakness of this subclassification, however, is that there is no clear indication to why these social interaction types might be unique to ASC only.

In brief, the deficit in social interaction behaviours is profound and persistent across cognitive functioning and ages. Many children with AS become more curious in the social world as they grow older (Attwood, 2007). Nonetheless, difficulties with social interaction persist as they enter adolescence (Seltzer, Shattuck, Abeduto & Greenberg, 2004). The next

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section will look specifically into the problems affecting children in middle childhood and adolescence.

1.7 Problems affecting school-aged children and adolescents with ASC

Forming meaningful peer relations is a crucial social development in middle childhood and adolescence. Children with ASC who engage socially with peers make greater improvement in social skills than children with ASC who engage less with peers (McGovern & Sigman, 2005). However, research suggests that friendship is the area with the least improvement in adolescence (Seltzer, Wyngaarden-Krauss, Shattuck, Orsmond, Swe & Lord, 2003).

While children and adolescents with HFASC clearly show a strong desire to form social friendships (Bauminger & Kasari, 2000), owing to their social deficit they might find themselves instead on the periphery of social networks, having poorer quality of friendships (Kasari, Locke, Gulsrud & Rotheram-Fuller, 2011), greater experience of loneliness, bullying, and social rejection than their typically developing (TD) peers (Bauminger & Kasari, 2000; Van Roekel, Scholte & Didden, 2010). Advancements in neuroimaging studies also bridge the gap about what we know about the social brain and the behavioural responses to social rejection in children and adolescents with HFASC. Sebastian (2015) reported that children and adolescents with HFASC show behavioural distress following social rejection, to the same extent as TD peers, despite showing less neural responses (hypoactivity) in the brain regions associated with social rejection.

From a clinical perspective, it is clearly important to improve social competence for this subgroup of HFASC who clearly want to fit in socially but not knowing how to do so because of their deficit in social interaction. But in order to implement effective social skills intervention, it is important to understand the underlying theories explaining the difficulties in the social domain of ASC. Given no clear underlying biological markers for ASC, our understanding around the core deficit in social communication comes predominantly from social cognitive theories.

1.8 Social-cognitive theories of ASC

This section will discuss the Mindblindness theory (Baron-Cohen, 1995) and the empathising-systemising (E-S) theory (Baron-Cohen, 2002) and the extent to which they can account for the core deficit in the social and non-social domain of ASC.

1.8.1 The Mindblindness theory. The Mindblindness theory (Baron-Cohen, 1995), also known as the theory of mind (TOM), proposes that the inability to attribute mental states to self and others is a universal phenomenon amongst individuals with ASC. There is a wealth of research, mainly from developmental studies, supporting this notion. Compared to TD children, children with ASC shows delayed development on simple first order tests of false belief attribution (Baron-Cohen. Leslie & Frith, 1985) and more advanced mindblindness tests such as detecting faux pas (Baron-Cohen, O'Riordan, Stone Jones & Plaisted, 1999) and recognising emotions from the eyes (Baron-Cohen, Wheelwright, Scahill, Lawson & Spong, 2001).

However, it has been suggested that the development of TOM changes significantly over time in ASC (Pellicano, 2010) and is less impaired in high functioning adolescents with ASC (Scheeren, Rosnay, Koot & Beeger, 2013). This notion that TOM changes over time and is less apparent in certain subgroups of age and cognitive functioning is problematic for the mindblindness theory, which makes reference to a universal deficit in TOM. Another criticism of the mindblindness theory is that a deficit in TOM is not unique to ASC but has also been found in other conditions such as schizophrenia (Sprong, Schothorst, Vos Joop Hox & Van Engeland, 2007). In the light of these limitations of the mindblindness theory coupled with the notion that it can only account for the difficulties in the social but not in the non-social domain, Baron-Cohen (2002) developed the Emphasising-Systemising (E-S) theory.

1.8.2 The Empathising-Systemising (E-S) theory. The E-S theory suggests that individuals with ASC show weaknesses in the empathising factor but rather remarkable strengths in the systemising factor, and it is the discrepancy between these two factors (S > E) that is indicative of ASC (Baron-Cohen, 2002). Empathising is essentially an extension and refinement of the mindblindness theory (Baron-Cohen, 1995) by incorporating cognitive empathy along with affective empathy to explain the impairment in the social domain by reference to delays and deficit in *understanding* and *responding* to emotion and mental states of others (Baron-Cohen et al., 2005).

The research evidence for cognitive empathy (TOM) has already been reviewed in the previous section. With regards to the affective empathy component, studies show lower levels of empathy in adolescents and adults with ASC, relative to the comparison groups, on the Emotional-Quotient questionnaire[2] (e.g. Auyeung, Wheelwright, Atkinson, Samarawickrema & Baron-Cohen, 2009; Lai et al., 2011). So far, studies have investigated cognitive and affective

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[2] The Emotional-Quotient is a self-report questionnaire that was developed by the Autism Research Centre team to measure empathy in individuals with ASC.

empathy separately. In a relatively recent study, Schwenk et al. (2012) compared a group of high functioning boys with ASC ($N = 55$) to boys with conduct disorders with either high ($N = 36$) or low ($N = 34$) antisocial behaviours, and TD boys ($N = 67$) on tasks related to cognitive and affective empathy. As expected, the groups of boys differed in their empathy profiles, but what was surprising is that boys with ASC showed impairment in cognitive empathy but not affective empathy relative to the other groups. Two subsequent studies also reported that adolescents with ASC or HFASC had poorer cognitive empathy but performed relatively similar to the comparison TD group on tasks related to affective empathy (Jones, Happe, Gilbert, Burnett & Viding, 2010; Mazza et al., 2014). In light of these more recent findings, it might be possible to have faulty cognitive empathy while affective empathy remains preserved, especially in high functioning adolescents with ASC.

In contrast, systemising is driven by the ability to construct, analyse, and predict rule-based systems, which are highly accessible in the environment and come in all kind of shapes and forms, whether they are mechanical systems (e.g. riding a bicycle), collectable systems (e.g. collecting rubber bands), or musical systems (e.g. playing the same tune over and over again). Detailed explanation of systems has been provided elsewhere (see Baron-Cohen, 2009a). All systems have one thing in common, namely, they are governed by rules and regularities. Rule identification is a crucial aspect of systemising because this allows predictability and control of behaviours in systems. Evidence for intact or even superior skills in systemising comes from several sources. In both the adolescent and adult versions of the Systemising Quotient (S-Q) questionnaire [3], adolescents and adults with ASC scored significantly higher on systemising than comparison group of typical adolescents and adults (Auyeung, Allison, Wheelwright & Baron-Cohen, 2012; Baron-Cohen, Richler, Bisarya, Gurunathan & Wheelwright, 2003).

Historically, a superior attention to detail in ASC has been associated with a weak central coherence (see Frith, 1989), suggesting that individuals with ASC have a tendency to process information on a local rather than global level (Pelicano, Mayberry, Durkin & Maley, 2006; Shah & Frith, 1993). However, Baron-Cohen (2009a) argues that the superior attention to detail in ASC also taps into systemising. After all, the ability to systemise requires a good attention to detail. Unlike the Weak Central Coherence theory (Frith, 1989), the E-S theory frames this superiority in attention to detail in ASC in a rather more positive framework and

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[3] The Systemising-Quotient is a self-report questionnaire that was developed by the Autism Research Centre to assess systemising in individuals with ASC.

suggests that individuals with ASC, regardless of cognitive ability, are genuinely motivated to understand the rules governed by the whole system.

Evidence of neurological differences in empathising and systemising has also started to emerge in the research literature. In a sample of 88 adult males from the general population, Lai et al. (2012) reported that the greater grey matter volume in the cingulate and dorsal medial pre-frontal areas was associated with the S>E profile whereas larger hypothalamic and ventral basal ganglia regions were associated with the E>S profile. These findings are indicative of distinctively different cognitive process for empathising and systemising respectively in the brain structure.

Overall, there is good empirical evidence in support of the E-S theory to explain poor empathising but intact or even superior systemising in ASC. On a behavioural level, this is translated into weakness in the social domain while the non-social domain is considered a relative strength in ASC. This may explain why individuals with ASC are generally more attached to objects than to people. As long as rules can be followed and implemented, systems are straightforward and predictable. However, applying systematic ways of thinking and understanding to the social world is near impossible because it does not work in a systemising friendly fashion, which can make things less predictable and perhaps even more frustrating for individuals on the spectrum.

1.8.2.1 Clinical implications of the E-S theory. The E-S theory also has clear implications when it comes to informing social skills interventions for individuals with ASC. Teaching empathy through systemising play or activities is likely to suit individuals with ASC, and not to say autism-friendly, given their strengths in understanding systems (Baron-Cohen, 2009a). Over the past decade, some very interesting social skills interventions such as the Transporter DVD (Golan & Baron-Cohen, 2006) and LEGO therapy (LeGoff, 2004) have been developed using the principles of this theoretical framework to improve social competence in children and young people with ASC. With regards to the Transporter DVD, this was developed for pre-school children in mind, and uses mechanical systems, animated vehicles moving along tracks with real faces attached to the vehicles, to encourage younger children to learn emotions. The Transporter DVD is also supported by empirical evidence. For example, Golan et al. (2010) reported that children with ASC ($N = 20$), aged 4-7, who watched the Transporter DVD on a daily basis for a month did significantly better on emotion recognition than the control group of children with ASC ($N = 18$) who did not watch the Transporter DVD, and they performed comparably to TD children ($N = 18$). This study suggests that empathising, in particular the

cognitive empathy component, can be taught to younger children with ASC by using the predictability of computer-based, mechanical systems.

For school-age children with ASC and above, LEGO therapy is considered more suitable, yet still uses the E-S principles. LEGO can be seen as a constructional system, and once the rules of LEGO are understood, the imagination and creativity of bricks are endless. According to the E-S theory, individuals with ASC are drawn to LEGO because it makes full use of their strength in systemising (Baron-Cohen, 2009a). While LEGO therapy might be a promising new social skills intervention for children and young people with ASC, the evidence base for this intervention needs to be reviewed first. Before this, the thesis will first review the application of Personal Construct Psychology (PCP) to ASC.

1.9 Construing Autism through the Personal Construct Psychology lens

PCP, along with Cognitive Behavioural Therapy, is recommended in clinical work with children with AS (Attwood, 2007). Despite the potential usefulness of PCP in clinical practice with this subgroup, PCP has received surprisingly little attention in autism research (Procter, 2001). The aim of this section is to provide an overview of PCP and how this theoretical framework can be applied to understand the experience of anxiety in relation to poor sociality in autism as well as the potential usefulness of the repertory grid technique in autism practice. Owing to its systemising nature to elicit personal constructs, the author suggests that repertory grid technique might be a valuable systemising tool in clinical and research work with individuals with ASC.

1.9.1 PCP and Autism. PCP is underpinned by the philosophical assumption of *constructive alternativism* (Kelly, 1955), suggesting that people do not only construct their internal and social worlds but these constructions are also up for reconstruction. Of important note, these so called constructs are always bi-polar by nature (e.g. good-bad; ugly-beautiful). While constructs are unique to each individual, there might also be some shared constructs within the same culture or even within people suffering from the same condition. Attwood (2007) reported that some constructs are more commonly featured than others with adults with AS, such as the personal construct of intelligence. In clinical practice this might then be translated into offering appraisal for their intelligence instead of their altruistic behaviour, as the latter might be less motivating or meaningful to them. However, this notion of common construct factors within ASC has yet to be tested empirically. Following from this, another key idea of PCP is the fundamental postulate, emphasising the *anticipation of events.* Akin to a scientist, people are perceived as active agents who set out hypotheses about themselves, others and their environment. These hypotheses are tested and revised based on the evidence collected,

which can either validate or invalidate the initial hypotheses (constructions). On the basis of this, Kelly presented 11 corollaries (see Appendix B), but this section will only discuss the sociality corollary in relation to anxiety and autism.

1.9.2 Sociality, anxiety and autism. Interestingly, and possibly less known, Kelly (1955) also recognised the importance of sociality (analogous to cognitive empathy or TOM) and suggested that social interaction cannot take place without sociality. From a PCP perspective, one can hypothesise that poor sociality might also contribute to comorbid experience of anxiety in autism. Anxiety is characterised by worries and fears and includes a range of manifestations such as separation anxiety, social anxiety, specific phobia, agoraphobia, panic disorder, panic attack, and generalised anxiety (APA, 2013).

Kelly (1955) emphasised different emotions associated with transitional periods in person's life, including anxiety, hostility[4], guilt[5] and threat[6]. Hence, the transitional period between middle childhood and adolescence might possibly create new, and possibly difficult, negative emotions for young people on the spectrum. These emotions arise because the construct system is in need of revision, elaboration or change (Butler & Green, 2007). Butler (2009) highlighted that poor sociality in children and adolescents with HFASC can deprive them of psychological understanding. In the light of this, and owing to the increasingly complex social milieu of puberty, one can assume that older children and adolescents with HFASC are likely to experience in PCP term 'Kellyan anxiety', referring to the awareness that one's constructs do not allow one to make meaning (or anticipate) or predict events. In PCP, it is the interpretation of anxiety rather than the psychological or physiological state of anxiety that is of significance. If children and adolescents with HFASC have underdeveloped sociality, as one suspects they do, they might interpret social situations as being beyond their 'range of convenience' within their own personal construct system and this may then lead to anxiety (Cridland, Caputi, Jones & Magee, 2014; Cridland, Caputi, Jones & Magee, 2015). Put simply, the more children and adolescents with HFASC find social situations difficult to anticipate, the more likely are they to experience anxiety in social situations.

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[4] Hostility = the continued effort to extort validational evidence in favour of a type of social prediction which has already been recognise as failure (p. 43, Butler & Green, 2007). For example, to continue to believe that autism is caused by the 'refrigerated' mother or the MMR vaccine despite limited empirical evidence in support of these hypotheses.

[5] Guilt = the awareness of acting in ways at odds with core construing (p. 40, Butler & Green, 2007) such as a doctor fails to save a patient's life.

[6] Threat = the awareness of imminent comprehensive change in core constructs (p. 38, Butler & Green, 2007). An example of this is when an additional sibling is born and the young person has to change the way he/she construes self within the family system.

This notion is also in line with Procter's (1981) group corollary, suggesting that construing of others in a group format is complex and requires one to have a sophisticated construct system in place because it requires the ability for the person to construe their own construing while at the same hold constructs of not only one other, but several other persons in mind. Children with ASC, in particular, may find the ability to construe group relations difficult. This might also explain their difficulties on the playground with peers and why they find group participation less enjoyable and perhaps anxiety provoking, to say the least (Procter, 2001).

While this relationship between poor anticipation (or construing) of social situations and anxiety in ASC has not been tested directly using a PCP framework, Bellini (2004) reported a negative relationship between assertive social skills and social anxiety in adolescents with HFASC. However, such a relationship is possibly bi-directional in nature. This association between social skills and anxiety in ASC has important clinical implication, suggesting that social skills interventions might not only improve social competence but also reduce anxiety in individuals with ASC (Bellini, 2004; Ratcliffe, Wong, Dossetor & Hayes, 2015).

In sum, a particular strength of using the PCP framework in ASC is the notion that each person with ASC has a unique set of constructs, and possible shared construct patterns or themes within the autism spectrum. In addition, PCP provides a framework to understand anxiety in social situations for children and adolescents with HFASC and explain this in relation to their difficulties of anticipating social situations. However, there are also some shortcomings of PCP as a whole. For example, Kelly was rather vague on how constructs are developed in the first place and how they evolve over time. In addition, Kelly never emphasised how constructions might change across the different developmental stages (Fransella & Neimeyer, 2005). Only subsequent PCP theorists have attempted to fill this gap and applied PCP to children and adolescents with ASC (Cridland et al., 2014; Procter, 2001) and without ASC (Truneckova & Viney, 2012). Unlike the theoretical framework of PCP, the application of repertory grid technique has received more attention.

1.9.3 Repertory grid technique (RGT). Repertory grid technique is essentially a two-dimensional representation of an individual's system of constructs, involving elements[7] and constructs. Detailed administration of repertory grid technique is given in the Method section 2.5.3. Repertory grid technique has been used with a wide range of clinical and non-clinical populations, such as adults with psychosis (Randal, Bucci, Morera, Barrett & Pratt, 2015),

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[7] Elements can be individuals (e.g. self, parent), objects, or events.

adults with ID (McNair, Woodrow & Hare, 2015) and former child soldiers (Goins, Winter, Sundin, Patient & Aslan, 2012). In clinical practice, repertory grid technique is extremely versatile and can be used simply as an assessment tool to access different levels of cognitive awareness in a person's construct system (Winter, 2003) or to explore psychological change over time, as in pre- and post-intervention for example, both at an individual and group level. The most common way to use repertory grid technique, however, is to examine the distance between elements, in particular between the elements *self* and *ideal self,* whereby a closer distance between these elements following intervention suggests greater self-esteem. Another way of using repertory grid technique is to explore tightness in construing. Individuals with tight construing are suggested to be more rigid in their anticipations of events. While they might be more confident in the way that they anticipate events, they are also less likely to be able to think of alternatives, which can therefore lead to invalidation (McNair, Woodrow & Hare, 2015) and subsequent experience of psychological distress (Feixas-Viaplana, Cipriano & Dominguez, 2007). Repertory grid technique can also be used to identify implicative dilemmas[8] in a person's construct system. Greater symptom severity is often related to the presence of implicative dilemmas (Feixas, Saúl & Avila-Espada, 2009). As shown, there are many ways in which repertory grid technique can be used in clinical practice.

1.9.3.1 Repertory grid technique and autism. It is a well-known fact that individuals with ASC struggle with information presented orally (Myles & Simpson, 1988), yet, qualitative interviews often present information in such a format to elicit the views of the child. Repertory grid technique, on the other hand, has the possibility to capture the construing of children and adolescents with HFASC but in an autism-friendly, systemising format. However, only three studies so far have applied repertory grid technique in this area. Two studies administered repertory grid technique to adults with AS to assess the efficacy of the technique with individuals on the spectrum and their construing of self and others (Hare, Jones & Paine, 1999; Tilki, 2013) whereas the third study administered repertory grid technique to explore 25 mothers' construals of raising a child with ASC (Sharma, Winter & McCarthy, 2013). According to Hare et al. (1999), the repertory grid technique was intrinsically motivating for the participants to complete and offered an insight into both personal and interpersonal issues in the construing of individuals with AS. In line with the E-S theory, one could perhaps explain the intrinsic motivation in adults with AS to complete the repertory grid in relation to the numerical systemising of the repertory grid, designed to allocate mathematical scores between constructs and elements. Currently, there is a lack of clarity regarding the cognitive

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[8] Implicative dilemma = a positive change in the view of the self in one construct is related to an undesired change in another construct.

functioning required to complete repertory grid technique in ASC, and moreover, no studies so far have addressed the efficacy of using repertory grid with children and adolescents with ASC despite the notion of repertory grid technique being '*well suited to the mindset of people with AS*' (Attwood, 2007, p.326).

1.10 Smorgasbord of social skills groups

As indicated in the literature, the increasing number of children and adolescents with ASC combined with the profound social difficulties that they are experiencing, which is often exacerbated in adolescence due to the increasing complex social milieu, clearly shows that psychological services need to prioritise on improving social competence[9] and promoting social skills[10] in this subgroup if further social and emotional problems are to be prevented. A specific avenue of social skills intervention is delivered in a group format. There are a myriad of group-based social skills interventions for school age children and adolescents with ASC, yet there is a lack of research studies evaluating the effectiveness of social skills group for children with ASC, and even less so for adolescents with ASC, who have historically been an under-researched population (Reichov & Volkmar, 2009). For example, in a recent review of the current literature on social skills group interventions for adolescents with ASC, Miller, Vernon, Wu and Russo (2014) identified 44 studies in peer-reviewed journals. According to Miller et al. (2014), the target social skills in these studies varied in that some targeted global social competence whereas others targeted more on specific social areas including social cognition (e.g. increasing social awareness), theory of mind skills (e.g. placing oneself in someone else's shoes, use of imagination), emotional expressiveness, social and emotional perspective taking, conversation skills, and friendship skills, etc. The researchers concluded that overall there is evidence supporting the usefulness of such interventions for adolescents with ASC, but more research is still needed in this area.

In a recent Campbell Systematic Review, Reichow, Steiner and Volkmar (2012) also reported the effectiveness of social skills group interventions, but for a wider age range between 6 and 21 years old. The researchers only focused on Randomised Controlled Trials (RCT) in this area. The review yielded only five RCT trials, which included four RCT trials (Frankel, Myatt, Sugar, Whitham, Gorospe, & Laugeson, 2010; Koenig et al., 2010; Lopata et al., 2010; Solomon, Goodlin-Jones & Anders, 2004) with children in middle childhood (aged 8-11 years) and one RCT trial (Laugeson, Frankel, Mogil & Dillon, 2009) with adolescents (aged 11-17

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[9] Social competence is defined as the 'ability to recognise, understand, and engage in appropriate reciprocal interchange with one or more individuals' (Contugno, 2009, p.44)

[10] Social skills are referred to here in the thesis as the tools or skills needed for social communication and social interaction.

years) with high functioning ASC. The group duration (5-20 weeks) and curriculum varied greatly between the RCTs but they all targeted a wide range of social skills, which were practiced throughout the sessions.

The review revealed that children and adolescents with HFASC in the group-based social skills group made greater improvements in social competence and friendship quality as compared to waitlist control or no treatment. However, no follow-up data or generalisation of skills to other settings was reported in any of these RCT trials, which limits our understanding around generalisation and maintenance of social skills. In sum, the review of RCTs adds understanding to this area and indicates that social skills groups may be used to teach children and adolescents with HFASC social skills. The next section will review the current evidence base for one particular social skills group, namely, LEGO therapy.

1.11 Current evidence base for LEGO therapy

   1.11.1 Overview of LEGO therapy. LEGO therapy was originally developed by Clinical Psychologist LeGoff (2004) in the United States. In line with the E-S theory of ASC (Baron-Cohen, 2002), the idea behind LEGO therapy is to use LEGO, a material that children and young people on the spectrum are naturally drawn to due to its structured, systematic and predictable nature. Using LEGO materials might therefore encourage building together with peers in a naturalistic way to promote social skills such as verbal and non-verbal social communication, social interaction, joint attention, task focus, and collaborative problem-solving (LeGoff, 2004; Owens et al., 2008). By building together in groups and each person having a specific role, this further reinforces structure, rules, and predictability to the constructional system (Baron-Cohen, 2009a).

   1.11.2 Systematic literature review of the effectiveness of LEGO therapy. A systematic literature review was conducted to identify the number of studies that have used LEGO therapy to promote social competence in school-aged children and adolescents with ASC. The search strategy, selection criteria and analysis of the review are shown in Appendix C. The search procedure yielded a total of ten studies. The focus of this section is to critically evaluate these ten studies and identify limitations and gaps in the research literature, and then provide some further recommendations in this area. Table 1.1 displays a summary table of all of the studies that met the inclusion criteria of this review.

Table 1.1 Summary of LEGO research with children and adolescents with Autism Spectrum Conditions.

Author (year)	Sample characteristics	Settings	Study Design	Intervention duration & intensity	Outcome measure	Primary Findings	Limitations
Andras (2012)	*N*=8 (7 boys, 1 girl) Diagnosis: ASC Age range: 6-11	School, UK	Repeated measure/waiting list design. Clinician-led group sessions.	10 weeks, 45 minutes per session	Coded behavioural observations	Greater gains in social interaction were reported during the intervention than during the baseline period, and the social gains were maintained at the follow-up period.	Small sample size. Use of different school staff to deliver the groups. Lack of blind raters. No report of IQ, confidence intervals or effect size.
Barakova, Bajracharya, Willemsen, Lourens & Huskens (2015)	*N*=6 (all boys) Diagnosis: A, PDD-NOS Age range: 8-12 IQ not specified	Clinic, Netherlands	Repeated measure/waiting list design. Robot-led group sessions.	5 weeks, 30 minutes per session	Coded behavioural observations	Increase in frequency of social initiation during the intervention period but all social behaviour gains were lost in the follow-up period when the robot was absence.	Small sample size. Combination of robot and LEGO therapy puts doubt to what contributed to the social change. No report of IQ, confidence intervals or effect size.
Brett (2013)[a]	*N*=14 (13 boys, 1 girl) Diagnosis: AS Age: M = 9.1	School, UK	Study 1: Repeated measure/waiting list design Study 2: thematic analysis, qualitative design Teacher-led group sessions.	8 weeks, 45 minutes per session	Study 1:Coded behavioural observations & standardised measures: VABS-SD, VABS-CD. Study 2: Semi-structured interviews.	Improved adaptive social functioning and play was reported following LEGO therapy. Participants reported that they had enjoyed the social aspects and freestyle building in the session. Participants were also inherently drawn to LEGO. *(Table continues next page)*	Small sample size. Use of different school staff to deliver the group. Lack of blind raters. No report of IQ, confidence intervals and effect size.

Author (year)	Sample characteristics	Setting	Study Design	Intervention duration & intensity	Outcome Measures	Primary Findings	Limitations
Evans, Sanders & Knight (2014)	*N*=21 (all boys) Diagnosis: ASC Age range: 6-11	CAMHS/ Library, UK	Post-test only design. Clinician-led group sessions.	8 weeks, 60 minutes per session	Group evaluation feedback form	Data indicated participant enjoyment and parent satisfaction with the group.	No child level measured was used pre- or post-intervention. Contamination of treatment by offering parents sessions parallel to the LEGO therapy.
LeGoff (2004)	*N*=47 (34 boys, 13 girls) Diagnosis: ASC, PDD-NOS, AS Age range: 6-16 VIQ: M=65.7	Clinic, US	Repeated measure/waiting list design. Clinician-led individual and group sessions.	24 weeks, 90 minutes per group session, 60 minutes per individual session	Structured playground observations Standardised measures: GARS-SI	Participants made gains in autism specific social interaction during intervention but not during baseline period. Generalisation of social skills to school playground was observed.	The main researcher was running both the individual and group sessions. Lack of blind raters. No report of confidence intervals or effect size.
LeGoff & Sherman (2006)	*LEGO group:* *N* = 60 (49 boys, 11 girls) Age: M = 9.3 VIQ: M= 82.0 *Comparison group:* *N* = 57 (47 boys, 10 girls) Age: M = 10.1 VIQ: M = 83.3 Diagnosis across both groups: ASC, PDD-NOS, AS.	School, US	A 36-month pre- and post-treatment series Clinician-led individual and group sessions.	36 months, weekly sessions, 60 minutes per individual session and 90 minutes per group sessions.	Standardised measures: VABS-SD, GARS-SI	Both groups made significant gains on both autism-specific social interaction and adaptive social functioning, but the participants in the LEGO group made more gains than the non-LEGO group.	Limited information about what the comparison group was offered. Non-randomisation of participants to the groups. No mentioning of confidence intervals and effect size for either group.

(*Table continues next page*)

Author (year)	Sample characteristics	Setting	Study Design	Intervention duration & intensity	Outcome measure	Primary Findings	Limitations/Future directions
MacCormack, Matheson & Hutchinson (2015)	N =17 (17 boys) Diagnosis: ASC (N=12), Cerebral palsy (N =1), TD sibling (N=4) Age range: 3-10	Community-based, Canada	Qualitative design. Paraprofessional-led group sessions.	4 weeks, 60 minutes per session.	Observations, Interviews	Both observation and interviews with mothers of the participants indicated positive social gains.	Only included the viewpoints from the mothers of the participants. No provision of observation-coding scheme of social interactions.
Owens (2008) [a]	N = 9 (7 boys, 2 girls) Diagnosis: A, AS, ASC Age range: 7-10 VIQ = M = 103.2	School, UK	Repeated measure/waiting list design. Teacher-led group sessions.	6 weeks, 60 minutes per session	Standardised measures: GARS-SI, VABS-SD	Social gains were made on teacher reported social adaptive functioning but not on parent-reported autism specific social interaction skills.	Small sample size. Teachers completed the VABS-CD but were not blind to the research hypotheses. No report of confidence intervals and effect sizes.
Owens, Granader, Humphrey & Baron-Cohen (2008)	*LEGO group:* N = 16 (all boys) VIQ: M = 113.9 *Comparison group:* N = 17 (14 boys, 1 girl) VIQ: M = 100 *No intervention group:* N = 16 (all boys) VIQ: M =105.0 Diagnosis across the groups: AS, ASC, A, HFA Age range across the groups: 6-11	School/ Clinics, UK	Randomised block design. Clinician-led group sessions.	18 weeks, 60 minutes per session	Structured playground observations. Standardised measures: GARS-SI, VABS-SD, VABS-CD, Maladaptive behaviour. Parent satisfaction and child enjoyment.	Children in the LEGO group made significantly more gains than the other groups on autism-specific social interaction. Both the LEGO group and the Social Use of Language Programme group made more reduction in maladaptive behaviour than the no intervention group.	The main researcher was running both groups and observed the participants in the playground. No report of confidence intervals.

(Table continues next page)

Author (year)	Sample characteristics	Setting	Study Design	Intervention duration & intensity	Outcome measure	Primary Findings	Limitations/Future directions
Peckett, MacCallum & Knibbs (2016)	Children with ASC $N = 5$ (4 boys, 1 girl) Diagnosis: ASC Age range: 8–12 Siblings $N = 5$ (4 boys, 1 girl) Age range: 6-12 Mothers $N = 5$	CAMHS/ Home, UK	Interpretative Phenomenological Analysis, qualitative design Parent-led group sessions.	6 weeks, 60 minutes per session.	Semi-structured interviews with parents.	Themes such as 'improved family relationships', 'positive impact on the child as an individual' emerged. In addition, mothers spoke about barriers and ambivalence with reference to implementing and the impact of LEGO.	Small sample size. Families made adaptations to the LEGO therapy at home, uncertainty around the exact number and duration of sessions by each family. No child level measured was used pre- or post-intervention.

Note: [a] Unpublished doctoral thesis; A= Autism; ASC = Autism Spectrum Conditions; AS = Asperger's Syndrome; PDD-NOS = Pervasive Developmental Disorder –Not Other Specified. VIQ = Verbal Intelligence Quotient; N = Number of participants; M = Mean; TD = Typically Developing; CAMHS = Child and Adolescent Mental Health Services; GARS-SI = Gilliam Autism Rating Scale – Social Interaction (Gilliam, 1995); VABS-SD = Vineland Adaptive Behaviour Scale – Social Domain (Sparrow, Balla & Cicchetti, 1984); VABS- CD = Vineland Adaptive Behaviour Scale – Communication Domain (Sparrow et al., 1984); US = United States; UK = United Kingdom.

1.11.2.1 Study Characteristics. The autism diagnoses were heterogeneous across the studies and the way that the researchers confirmed them was unclear. Only Owens et al.'s (2008) study used the Autism Diagnostic Interview-Revised (Lord et al., 1994), a well-respected diagnostic tool with high reliability and validity, to confirm the diagnoses. Most studies offered LEGO therapy to primary school aged children only ($N = 8$), with the exception of two studies (LeGoff, 2004; LeGoff & Sherman, 2006) that included both children and adolescents in their inclusion criteria. Only three studies (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008) reported cognitive functioning and they comprised children and adolescents with high functioning. Finally, in more than half of the studies the sample size was considered small ($N < 20$), which is unfortunately common in many of the studies evaluating social skills interventions for children and adolescents with AS or HFA (Rao, Beidel & Murray, 2008). The small sample size makes it difficult to interpret the findings, due to increased type II error and low statistical power, as well as generalise the findings to the wider subgroup population of children and adolescents with HFASC.

1.11.2.2 LEGO facilitators. Most studies were teacher-led or clinician-led by professionals with experience in working with children with ASC and co-facilitated either by university students, teaching assistants or low intensity mental health professionals. However, two studies deviated from this format whereby they were facilitated either by a humanoid robot and a robot assistant (Barakova et al., 2015) or by mothers of children with ASC (Peckett et al., 2016). While both these studies concluded that there is scope to use non-clinician/teacher led facilitators, the researchers also acknowledged difficulties with the administration of LEGO therapy using either a humanoid robot (e.g. limited behavioural repertoire) or mothers of children with ASC (e.g. inexperience of running therapeutic groups) as the lead facilitators. However, the author argues that working in dyads, as both these studies were set up as, takes away from the focus of group-based interventions and learning from peers that requires at least three individuals and ideally not from the same family (Miller et al., 2014).

1.11.2.3 Intervention duration and intensity. All studies delivered the LEGO therapy sessions in a weekly group format, held mainly in schools, clinics, or community-based settings. One study also conducted the group sessions in the home context. The number of group sessions also varied greatly between studies, from four weeks (MacCormack et al., 2015) to eight weeks (Brett, 2013; Evans et al., 2014), or 18 weeks (Owens et al., 2008) to up to three years (LeGoff & Sherman, 2006), with each session lasting approximately 30 minutes to 90 minutes. Interestingly, the first two studies (LeGoff, 2004; LeGoff & Sherman, 2006) published

in this area delivered individual sessions in parallel to the group sessions whereby the lead facilitator was involved in both the individual and group sessions.

1.11.2.4 Study Design. Studies in the review can be divided into quantitative studies and qualitative studies. The quantitative designs varied greatly and included: one post-test only design (Evans et al., 2014), one multiple baseline design (Barakova et al., 2015), three repeated, waiting list design (Andras, 2012; Brett, 2013; LeGoff, 2004; Owens, 2008), one pre-post test series design (LeGoff & Sherman, 2006), and one randomised complete block design (Owens et al., 2008). While the latter two studies employed comparison groups, which are considered an improvement in the research design, only Owens et al.'s (2008) study randomly assigned the participants to the groups. In terms of the qualitative studies, two explored mothers' views of LEGO therapy (MacCormack et al., 2014; Peckett et al., 2016). Only Brett (2013) explored the views of the children who attended the LEGO therapy specifically. Both Brett (2013) and Peckett et al. (2016) described their rationale and choice of either using Thematic Analysis (Braun & Clarke, 2006) or Interpretative Phenomenological Analysis (Smith, Flowers & Larkin, 2009) respectively to satisfactory standards. However, MacCormack et al. (2015) did not provide the readers with such information, which leaves doubt concerning the quality of data provided. Across all the studies, there was also a lack of reference to treatment manuals or treatment fidelity, apart from a couple of studies (Brett, 2013; Owens et al., 2008). As pointed out by Smith et al. (2007), standardisation of social skills groups is not possible without evidence of adherence to treatment manuals.

1.11.2.5 Outcome measures. As shown in Table 1.1, a number of outcome measures were employed by the different studies. Studies have consistently reported in this area that children and adolescents with ASC make greater gains in autism specific social difficulties during the LEGO therapy intervention than during the baseline period (Brett, 2013; LeGoff, 2004), and better than the comparison groups (LeGoff & Sherman, 2006; Owens et al., 2008). While a couple of studies have also reported improvement in social adaptive functioning following LEGO therapy (Brett, 2013; LeGoff & Sherman, 2006), Owens et al. (2008) did not find a difference in adaptive social functioning among children with high functioning ASC attending the LEGO therapy group between pre- and post-intervention. Interestingly, however, the researchers did report that maladaptive behaviour was significantly reduced in children attending the LEGO therapy and the Social Use of Language Programme group (comparison group) but not for the no-intervention group. Overall, observations of children's behaviour also supported generalisation of social skills from the LEGO therapy setting to other settings, in this case the school playground (Andras, 2012; LeGoff, 2004; Owens et al., 2008). However, these observational findings need to be interpreted with caution as the first author, who was not blind

to the research hypotheses, carried out all or some of the observations, which increases risk of detection bias. While qualitative studies have not targeted social skills per se, they still provide richness into this area, and in particular, the positive benefits of LEGO in relation to social skills and family relationships (Brett, 2013; MacCormack et al., 2014; Peckett et al., 2016). Of the quantitative studies discussed so far, none of them reported confidence intervals and only Owens et al. (2008) reported small effect sizes of their findings, which leave comparison between studies difficult.

1.11.2.6 Limitations and future directions. This review has revealed some encouraging and promising results of the effectiveness of LEGO therapy for children and adolescents with ASC. Based on this review, there are also some limitations, including small sample sizes, lack of control of confounding variables (e.g. cognitive functioning) and comparison groups, randomised allocation of participants to groups, no report of confidence intervals and effect sizes, and lack of referrals to treatment manuals. With regards to treatment manuals, Williams White, Koenig and Scahill (2007) reported that they are rarely used to a satisfactory degree in social skills group interventions. That said, the LEGO®-Based treatment manual (LeGoff, Gomez de La Cuesta, Krauss & Baron-Cohen, 2014) was only released recently, which explains the lack of reference to treatment manuals in the previous studies. However, this also makes it difficult to standardise LEGO therapy treatment if manuals are not used or referenced in studies that are conducted post publication of the treatment manual. Relating to this point, Hotton and Coles (2016) suggest that future studies should focus on evaluating the effectiveness of social skills training manuals not only in clinics but also in real-world settings, where things may not always run 'smoothly'.

Furthermore, the research evidence for LEGO therapy for adolescents still remains scarce and studies have not been carried out in the United Kingdom yet, despite the fact that LEGO therapy continues to increase in popularity and has been set up in schools and in the community. In general, studies that have offered a minimum of 12 weeks or longer (e.g. LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008) have provided the strongest evidence in terms of the effectiveness of LEGO therapy. However, this does not mean that short-term LEGO therapy is not effective but that studies so far investigating the effectiveness of short-term LEGO therapy, especially in the Child and Adolescent Mental Health Setting (CAMHS; Evans et al., 2014; Peckett et al., 2016), to promote social skills are considered relatively weak in their designs, including small sample sizes and lack of standardised child-level pre-and post-social outcome measures to assess behavioural change over time. In sum, this review shows that more studies are needed to address some of these gaps in the research literature.

1.12 Rationale for study

    1.12.1 The present study. The issue of children and adolescents with HFASC struggling with profound social difficulties is not new, yet research into the effectiveness of social skills group interventions is limited. Unlike other social skills interventions, LEGO therapy is intrinsically rewarding and is based on a clear theoretical rationale, namely the E-S theory, which emphasises drawing on children's strengths in systemising to teach empathy (Baron-Cohen, 2009b). While the evidence base on LEGO therapy is growing, there are also gaps in the LEGO therapy research literature. The overall objective of the present study is therefore to evaluate the effectiveness of short-term LEGO therapy for older children and adolescents with HFASC within an outpatient, community-based, mental health setting. These findings would feed into the discussions and decision-making whether this approach is a viable cost-effective, evidence-based intervention for children and adolescents with ASC and their families who seek treatment and support via the mental health route. It is hoped that the present study can respond to the clinical needs of CAMHS as well as to contribute to the overall knowledge base concerning psychosocial interventions for this clinical population.

    1.12.2 Aims. The primary aim of this present study is to investigate the effectiveness of short-term LEGO therapy to promote empathy recognition, social competence and adaptive functioning in children and adolescents with HFASC. A second aim of this study is to expand further upon previous research by investigating whether LEGO therapy offers additional gains in adaptation and psychopathology associated with ASC but not necessarily targeted by the group intervention per se. As indicated previously, social skills training may not only improve social competence but possibly anxiety as well. However, this notion has not been tested yet in the area of LEGO therapy. Although still in the early stages, a couple of studies have shown positive outcomes for social skills groups in both social competence and anxiety in adolescents with HFASC (Hillier, Greher, Poto & Dougherty, 2011; Tse, 2007, Strulovitch, Tagalakis, Meng & Fombonne, 2007). The third aim of this study is the incorporation of repertory grid technique to explore psychological changes in the way children and adolescents construe self and others over the course of the present study. Given the numerical systemising nature of this measure, which taps into systemising strength of individuals on the spectrum, repertory grid technique may be a useful assessment measure with children and adolescents with HFASC. Again, previous research has not explored the extent of psychological changes over the course of LEGO therapy or the usefulness of repertory grid technique with this subgroup. In contrast to previous studies in LEGO therapy, a fourth aim of the present study is to overcome some of the difficulties in the existing literature by adhering to a LEGO therapy treatment manual,

ensure that analyses are sufficiently powered to detect medium effect sizes, and report confidence intervals and effect sizes.

1.12.3 Questions. The aim of this thesis is to address the following questions:

1. Is LEGO therapy effective in increasing social competence?

2. Can LEGO therapy help with improving overall adaptive functioning in children and adolescents with HFASC?

3. Does LEGO therapy provide additional gains in comorbid psychopathology?

4. Can sociality (or cognitive empathy) be improved following LEGO therapy?

5. To what extent can LEGO therapy facilitate change in construing?

6. How might changes in construing correlate with those on other outcome measures used in this study over the course of LEGO therapy?

1.12.4 Hypotheses. Using a repeated measure, waiting list control design, the present study expected no change during the eight-week waiting list period. However, behavioural, psychiatric, and psychological changes were predicted following the eight-week LEGO therapy period. In particular, the following one-tailed hypotheses were made, based on the existing research literature, during the pre- and post-LEGO therapy intervention:

- Children and adolescents with HFASC would improve in the areas of autism specific social interaction behaviours.

- In terms of adaptive functioning, it was hypothesised that an increase in social and adaptive behaviour but not communicative behaviour would be detected following LEGO therapy.

- Children and adolescents with HFASC would make greater gains in symptoms of anxiety but not on any other areas of psychopathology between pre- and post-intervention.

- Given that the intervention targets cognitive empathy, it was hypothesised that there would be an improvement of sociality among participants over the course of the LEGO therapy.

- Attendance at LEGO therapy would lead to improvements in self-esteem (e.g. smaller element distance between self and ideal self), a lower degree of tightness in construing, and fewer implicative dilemmas in children and adolescents with HFASC.

- The overall change in construing would be greater during the intervention period than the baseline period.

Chapter 2: Methodology

2.1 Design

Quantitative methodologies were adopted throughout this study. To evaluate the effectiveness of the LEGO therapy, a quasi-experimental, repeated measure, waiting list control design was employed whereby all participants acted as their own controls during an initial eight-week waiting period followed by the eight-week LEGO therapy intervention period. The dependent variables were standardised parent and self-reported measures as well as the repertory grid to assess change in autism specific social behaviour, adaptive functioning, psychopathology and construing. The independent variable was time: time 1 (baseline; week 1), time 2 (pre-intervention; week 8), and time 3 (post-intervention; week 16). This study will refer to the period between time 1 and time 2 as the baseline period and the period between time 2 and time 3 as the intervention (or LEGO therapy) period.

A further aim of this study was to explore how changes in construing might correlate with the outcome measures used to assess change over the course of this study. Therefore, a correlational design was employed to explore the relationships between participants' construing of themselves and other outcome measures over the course of the LEGO therapy.

2.1.1 Ontology and Epistemology. The author of this study adopted a constructivist research paradigm, which is based on a relativist ontology and a subjectivist epistemology (Guba & Lincoln, 1994). Within this ontological perspective, the concept of truth is assumed to be socially negotiated with others. By adapting a so-called relativism foundation, constructivists therefore disagree with a universal, objective truth. Instead, constructivism puts emphasis on a subjectivist epistemology whereby the true meaning of knowledge is considered to be internally constructed. In brief, the author believes that human constructions of experiences are not static and that it is important as a researcher to consider, especially within this research context, that children and young people with ASC might perceive, and likely experience, the world differently from the author.

Methodologically, the present study has applied a constructivist approach in several ways. For example, the author's decision to run group over individual social skills intervention shows how much she valued others in the centre of construction of knowledge and experience related to social communication and social interaction skills. From a constructivist viewpoint, most learning of social communication skills is considered to take place when the individual interacts with others in the environment (Walker & Berthelsen, 2008). Furthermore, the use of

the repertory grid, which is essentially a constructivist assessment tool, allowed the author to capture the multiple realities of the participants and their construing of themselves and others at different time points. In sum, the constructivist research paradigm fitted well in with the research aims and methodology of the study.

2.2 Setting

This study was conducted in collaboration with the CHUMS Mental Health and Emotional Wellbeing Service. The CHUMS Service is a social enterprise and commissioned by the National Health Service to offer support and intervention for children and adolescents, aged 3-19 years, with mild to moderate mental health difficulties and neuro developmental disorders, including ASC. The service has been running psycho-educational groups for service users on the spectrum for many years and this type of intervention is often offered, if appropriate, as first line of treatment.

2.3 Participants

2.3.1 Inclusion/exclusion criteria. Participants were eligible to take part in the research if they had a formal diagnosis of high functioning autism, autism spectrum disorders, autism, or Asperger syndrome by a qualified mental health professional (e.g. clinical psychologist, psychiatrist, or paediatrician) within the National Health Service. In the United Kingdom, these aforementioned terminologies are more frequently used for diagnostic purposes than 'developmental disorder-not otherwise specified' (Mandy et al., 2016). Diagnoses were verified by requesting from the service or parent a documentation of the child or young person's diagnoses, e.g. a copy of a letter from a qualified mental health professional. To further evaluate the accuracy of the diagnosis of the participants, parents completed a demographic form and the Gilliam Autism Rating Scale – Second Edition (GARS-2; Gilliam, 2006).

In addition, children and adolescents were required to be aged 9-18 years, not have Intellectual Disabilities (Full IQ > 70); good command of English, and not currently receiving any other behavioural or social skills group interventions. Children and adolescents on medication or having co-morbid conditions were also eligible for participation. However, children and adolescents with severe mental illness such as psychosis or acute, severe depression were excluded, as LEGO therapy was not considered helpful at this point for them.

2.3.2. Sample size calculation. This study was designed to detect a medium effect, corresponding to a Cohen's *d* of .5, between the no intervention and the intervention period on

relevant outcome measures. A prior power calculation, using the G*Power programme (Version 3.1; Faul, Erdfelder & Buchner, 2007; Faul, Erdfelder, Buchner & Lang, 2009) was conducted to calculate the sample size needed to detect an effect size of this magnitude. To have 80% power to detect a medium effect size ($d = .5$) between the baseline period and the intervention period, assuming a one-tailed alpha of .05, this study needed a total of 27 participants. Figure 2.1 illustrates the prior power analysis from GPower3.

T tests – Means: Difference between two dependent means (matched pairs)		
Analysis:	A priori: Compute required sample size	
Input	Tail (s)	One
	Effect size dz	0.8
	α err prob	0.05
	Power (1-β err prob)	0.8
Output	Noncentrality parameter δ	2.60
	Critical t	1.71
	Df	26
	Total sample size	27
	Actual power	0.81

Figure 2.1: Prior power analysis output from GPower3

2.3.3. Recruitment procedure. Participants were recruited through CHUMS Service and a local child development centre in the United Kingdom. A special clinical team meeting was held at the CHUMS Service on 10th August 2015 whereby the author informed the clinicians about the research study. Recruitment leaflets (see Appendix D) were also left in the waiting room at CHUMS premises as well as e-mailed to parents who were registered with the local child development centre for ASC support. The aim of this research study was explained to parents and their children as an evaluation of an eight-week LEGO therapy group for young people with autism to improve their social skills and to understand the process involved in the development of sociality. Due to the group size, time commitment to assess the participants as well as running the groups, the recruitment of this study took place in three different stages with two weeks interval between the start of each group. The age, developmental needs and availability of the participants were also taken into consideration when allocating participants to the groups. Figure 2.2 illustrates the consort diagram of the entire sample.

```
┌────────────────────────────┐                        ╭──────────────╮
│ Assessed for eligibility   │                        │  Recruitment │
│ (N = 54)                   │                        │    phase     │
└────────────────────────────┘                        ╰──────────────╯
           │
┌────────────────────────────┐                        ╭──────────────╮
│ Did not meet inclusion     │                        │ Screening    │
│ criteria (N = 14)          │                        │ phase        │
│ Declined further           │                        ╰──────────────╯
│ participation (N =5)       │◄─────┤
│ Not able to travel to the  │
│ clinic (N = 1)             │
└────────────────────────────┘
```

Assessed for eligibility
(*N* = 54)

Recruitment phase

Did not meet inclusion criteria
(*N* = 14)
Declined further participation
(*N* =5)
Not able to travel to the clinic
(*N* = 1)

Screening phase

Meeting eligibility criteria for baseline assessment (T1)
(*N* = 34)

Assessment phase

Did not meet inclusion criteria
(*N* =2)
Not suitable for group participation (*N* = 1)
Declined further participation
(*N* = 1)
Did not attend assessment
(*N* = 2)

Allocated to LEGO therapy intervention
(*N* = 28)

Allocation to groups

Group 1 (aged 10-12 years)
(*N* = 10)

Group 2 (aged 13-17 years)
(*N* = 9)

Group 3 (aged 9-13 years)
(*N* = 9)

LEGO therapy groups

Discontinued intervention (*N* = 1)

Health related problems within family

Discontinued intervention (*N* =1)

Other social commitments

Discontinued intervention (*N* =1)

Too far to commute

Exclusion/ Discontinuation

Analysed
(*N* = 9)

Analysed
(*N* = 8)

Analysed
(*N* = 8)

Analysed

Figure 2.2 Consort Flow Diagram

2.4. LEGO therapy

LEGO therapy is a social skills group, based on the LEGO®-based therapy manual developed by LeGoff et al. (2014), and designed primarily for individuals with ASC. Whilst LEGO therapy tends to be long-term (≥18 weeks), the reasons to shorten the LEGO therapy to eight weeks were twofold. Firstly, interventions of ten weeks or longer are considered a luxury rather than standard practice within CAMHS settings. Therefore an eight-week group intervention was not only more realistic but also fitted better in with the service guidelines. Secondly, running a short-term LEGO therapy is expected to be more cost-effective, and hence, more accessible to children and adolescents with ASC who are referred to CAMHS.

Given the scarcity of research evaluating short-term effects of LEGO therapy intervention, advice and guidance was sought throughout this study from Professor Baron-Cohen and Dr Gomez de la Cuesta, who have published research in this area as well as co-written the LEGO®-based therapy manual. The author was also invited by Gomez de la Cuesta to attend a one-day individual workshop and a one-day official and approved LEGO therapy training session by Bricks for Autism (www.bricks-for-autism.co.uk). Following discussion with the research team, several adaptations were made to the LEGO therapy. The group session was extended from 1 hour to 1.5 hours. This decision was based on the evaluation feedback from previous research studies (e.g. Evans et al., 2014). Due to financial constraints, the use of 'LEGO Points', e.g. allowing participants to swap their points into something tangible by the end of the group, was not implemented.

The purpose of the LEGO therapy was for participants to improve their social skills through collaborative play. Participants were building either LEGO sets or freestyle in small groups of two or three with each person being assigned a specific role in the sessions: *the engineer*, *the helper*, and *the builder*. The role of the engineer was to read instructions and describe how to build the set or freestyle to the others. The role of the helper was to sort and find the correct pieces and hand them over to the builder, who then put the pieces together and built the model. Over the course of the session, these roles were switched so that each participant had the opportunity to take the role of engineer, helper, and builder. Through these roles, participants were collaborating and interacting with one another on various LEGO projects. More importantly, group participation helped participants to work on social skills, such as social problem solving, turn taking, joint attention, general communication skills, negotiation, eye contact, listening skills, emotion recognition and responding to name a few, within a structured, naturalistic setting. Each group also set up their own LEGO rules (e.g.

respect each other, build together, use polite words, if you break it you have to fix it or as for help to fix it, clean up your own mess, do not put bricks in your mouth etc.) and were reminded to adhere to these rules by the facilitators and their peers throughout the LEGO therapy.

Each small group of two or three participants were allocated a facilitator. As highlighted by Owens et al. (2008), the role of the facilitator was not to solve the problem for the participants but to acknowledge presence of social related problems to the participants and support them to think of solutions to social problems as well as responding to emotions. Essentially, the facilitators helped the participants to draw on their own strengths to solve and overcome their problems together as a group. Whilst the facilitators were heavily involved in the group process initially, towards the end of the LEGO therapy, fewer interventions were required from the facilitators as participants started working more efficiently together on projects.

The decision was made to start off with set building, from easy to more advanced sets, because this helped to introduce a structure to the LEGO therapy and group work. More advanced LEGO sets (300 +) were often built over two-three sessions. Freestyle building was introduced in the second period (session four to eight) of the LEGO therapy intervention. At this point, participants demonstrated that they could build together and required fewer social inputs from the facilitators. Freestyle was considered more creative and inventive but also greatly challenging and a less structured group activity than set building.

In line with the manual, LEGO certificates were awarded to participants to highlight different levels of skill set that they had achieved in LEGO therapy. At the end of group sessions, a certificate ceremony took place with the whole group whereby participants were awarded for the following LEGO levels: *LEGO Helpers*[11], *LEGO Builders*[12]*, LEGO Creator*[13]*, LEGO Master*[14]*,* and *LEGO Genius*[15]. Figure 2.3 illustrates the certificate for the LEGO Creator.

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[11] LEGO Helper = finding and sorting bricks.
[12] LEGO Builder = building a set of more than 100 pieces.
[13] LEGO Creator = building a freestyle set with peers.
[14] LEGO Master = acting as project manager for the construction of a freestyle project.
[15] LEGO Genius = creating and scripting a LEGO story.

Figure 2.3. Certificate for the LEGO Creator.

2.4.1 Group facilitators and training. The main author acted as the principal facilitator and ran every group session with the help of two co-facilitators provided by the CHUMS Service. This was to ensure a ratio of 3:1 (child-facilitator). A total of six co-facilitators helped out with the LEGO therapy with each of them helping out with one group only. To sustain treatment integrity, all facilitators received LEGO therapy training by the main author. This training session, lasting approximately two hours, was based on materials from the LEGO®-Based therapy manual and workshops. The co-facilitators were provided with on-going training and clinical supervision by the main author throughout LEGO therapy intervention.

2.5 Measures

The main author carried out the administration of the assessment and outcome measures. Table 2.1 summarises the data collection point for the various measures used in this study.

Table 2.1 Data collection procedures

Time	Description	Week	Measures completed by participants	Measures completed by parents
1	Assessment/start of baseline	0	WASI, Repertory grid, SDQ, RCADS	Demographic data, GARS-2, VABS-2, SDQ, RCADS
2	End of baseline/start of LEGO therapy	8	Repertory grid, SDQ, RCADS	GARS-2, VABS-2, SDQ, RCADS
3	End of LEGO therapy	16	Repertory grid, SDQ, RCADS, LEGO evaluation form, CHI-ESQ	GARS-2, VABS-2, SDQ, RCADS, LEGO evaluation form, CHI-ESQ

Note: WASI = Wechsler Abbreviated Scale of Intelligence; SDQ = Strengths and Difficulties Questionnaire; RCADS = the Revised Children's Anxiety and Depression Scale; GARS-2 = Gilliam Autism Rating Scale - Second Edition; VABS-2 = Vineland Adaptive Behaviour Scale – Second Edition; CHI-ESQ = The Experience of Service Questionnaire.

2.5.1 Assessment Measures. The following measures were used as part of the assessment procedure.

2.5.1.1 Demographic data. The parents of the participants completed an initial background questionnaire (see Appendix E), which included information about participants' age, gender, ethnicity, level of education and educational support, mental health history and any additional intervention support. Furthermore, parents provided full details about the various diagnoses of their children, including the place and age of diagnosis, and the name of the clinician who made the diagnosis, and any other developmental or behavioural concerns by any professionals.

2.5.1.2 The Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999). The WASI is a test of intelligence for individuals, aged 6-90 years, and produces standardised age norms for Full Scale IQ, Verbal Comprehension, and Perceptual Reasoning ($M = 100$; SD $= 15$). All four subtests of the WASI were administered to the participants. The WASI is relatively brief to administer, and is a reliable and valid measure for this clinical population and age range (WASI, 1999).

2.5.1.3 The Gilliam Autism Rating Scale- Second Edition (GARS-2; Gilliam, 2006). The GARS-2 is norm-referenced for diagnosing and assessing severity of autism in individuals from the age of 3 years to 22 years old. The 42-item parent-report is based on the

diagnostic symptoms of autism as specified in the DSM-IV-TR (APA, 2000). All three subscales (stereotyped behaviours, communication, and social interaction) were administered to the parents in order to obtain a standard Autism Index (AI) with an average of 100 and a standard deviation of 15. The probability of autism is categorised into 'Unlikely' (AI $\leq$ 69), 'Possibly' (AI = 70-84) and 'Very Likely' (AI $\geq$ 85). Participants needed to have an Autism Index of 70 or above to take part in this study. For further information about scoring GARS-2, please see Table 2.2.

2.5.2 Core and associated features of ASC. The Social Interaction subscale of the GARS-2 (Gilliam, 2006) was used to capture autism specific social behavioural difficulties. The Vineland Adaptive Behaviour Scale- Second Edition (VABS-2) was used to assess adaptive functioning in social behaviours, communication, and maladaptive behaviours (Sparrow, Balla & Cicchetti, 2005). In addition, the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1999; 2001) and the Revised Children's Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Unemoto & Francis, 2000) were completed by the participants and their parents to assess changes over time in psychopathology.

In sum, these instruments were selected for several reasons. Firstly, they are standardised and well-established measures that have been documented in the literature to assess autism severity, adaptive functioning and psychopathology in children and young people with ASC (e.g. Gilliam, 2006; Hallet et al., 2013; Kaat & Lecavalier, 2015; Sparrow et al., 2005). Secondly, previous studies have used the same outcome measures to evaluate the effectiveness of LEGO therapy in autism specific social competence and adaptive functioning (e.g. LeGoff 2004; LeGoff & Sherman, 2006; Owens et al., 2008). Thirdly, both the SDQ and the RCADS are recommended by the CAMHS Outreach Research Consortium (CORC, 2011) to use as routine measures in CAMHS settings. Lastly, all these measures have been published with acceptable psychometric properties for children and young people. No changes were made to any of these measures. Table 2.2 shows a summary of characteristics of the measures used to assess core and associated features of ASC over the course of this study.

Table 2.2 Summary characteristics of the questionnaire measures used in the present study.

Measure	Purpose	Age Rating	Format	Subscales	Scoring	Chronbach's Alpha
VABS-2	To assess childhood adaptive behaviour.	0-90	Parent/caregiver rating form was used. The items on the subscales are rated on a 4-point Likert scale, '0 = Never', '1 = Sometimes or Partially', and '2 = Usually'.	- Communication Domain - Socialisation Domain - Maladaptive Behaviour	Raw scores were converted into age-normed standardised scores for the Communication and Socialisation domains respectively ($M = 100$; $SD = 15$) with a range between 20 and 160. Adaptive level is interpreted as follows: Low = 70 and below Moderately low = 71-85 Adequate = 86-114 Moderately high = 115-129 High = 130 and above The raw maladaptive behaviour was converted into v-scale score ($M = 15$, $SD = 3$). The following adaptive level description was used for the v-scale maladaptive scale score: Low = 9 and below Moderately low = 10-12 Adequate = 13-17 Moderately high = 18-12 High = 21 and above	6 to .8 (Sparrow, Cicchetti & Balla, 2006)

Tables continues next page

Table 2.2 Summary characteristics of the questionnaire measures used in the present study *(Continued)*

Measure	Purpose	Age Rating	Format	Subscales	Scoring	Chronbach's Alpha
GARS-2	Screening instrument for ASC and measures core autistic symptoms.	3-22	Parent-report was administered. The Social interaction subscale consists of 14 items on a 4-point Likert scale: 0 = Never Observed, 1 = Seldom Observed, 2 = Sometimes Observed, and 3 = Frequently Observed.	- Social Interaction Scale	The raw score was converted into a standard score between 1 and 20 with a standard score of 10 indicating an average disturbance in social interaction skills. A higher standard score shows more impairment in social interaction.	.8 to .9 (Gilliam, 2006; Lecavalier, 2005)
SDQ	Behavioural screening for adaption and psychopathology.	3-16	Parent- and self-reports were administered. The SDQ has 25 items on a 3-point Likert scale, "Not True", "Somewhat True", "Certainly True". Self-report norms available from age of 11 and onwards.	- Total problems behaviour - Hyperactivity and Inattention - Emotional symptoms - Conduct problem - Peer problem - Pro-social behaviour	Items within each subscale are summed. Scores from hyperactivity and inattention, emotional symptoms, conduct problems and peer problem are added together to generate a total behaviour problem score. Maximum total problem score was 40. For further information on how to score, please see the SDQ website (www.sdqinfo.com).	Total behaviour = .96 Hyperactivity = .76 Emotional = .66 Conduct = 0.6 Peer-problem = 0.64 Pro-social = .85 (Goodman, 2001)

Table continues next page

Table 2.2 Summary characteristics of the questionnaire measures used in the present study *(Continued)*

Measure	Purpose	Age Rating	Format	Subscales	Scoring	Chronbach's Alpha
RCADS	Behavioural screening of anxiety and depression.	6-18	Parent- and self-reports were administered to participants and their parents. 47-items on the scale was rated on a 4-point Likert scale, 0 = Never, 1 = Sometimes, 2 = Often, 3 = Always.	- Total anxiety - Total depression - Separation anxiety - Generalised anxiety - Social phobia - Panic -Obsessions /compulsions -Depression	Raw scores were converted into T-scores. T score of 70 or above is indicative of meeting the clinical threshold of anxiety and depression respectively. For further information on how to score, please see the RCADS User's guide at: http://www.childfirst.ucla.edu/RCADSGuide20110202.pdf	.78 to .88 (Chorpita, Moffitt & Gray, 2005)

Note: GARS-2 – Gilliam Autism Rating Scale- 2nd edition (Gilliam, 2006); VABS-2 = Vineland Adaptive Behaviour Scale – 2nd edition (Sparrow et al., 2005); SDQ = Strengths and Difficulties Questionnaire (Goodman, 1999, 2001); RCADS = Revised Children's Anxiety and Depression Scale (Chorpita et al., 2000)

2.5.3 Repertory grid technique (Kelly, 1955). In order to understand how participants make sense of themselves and others, the repertory grid was chosen as the method of data collection. Reliability for the repertory grid has also been demonstrated with test-retest reliability and internal consistency being reported within the acceptable to good range (Smith, 2000).

2.5.3.1 Elements. For the purpose of this study, the author and the principal supervisor collaboratively selected the elements, which they believed were most relevant to the aim of this study. The following ten elements were included: 1) *self*, 2) *ideal self*, 3) *self in the future/adult*, 4) *self with friends*, 5) *person I like*, 6) *person I dislike*, 7) *how my family sees me*, 8) *how my friends see me*, 9) *person with autism*, and 10) *person without autism*. Elements seven and eight are related to sociality processes. Each element was written down on a blank card and shown to the participants. For the non-self elements (e.g. person I like), the participants were asked to name someone that they know in person. Alternatively, if this was not possible, the participants were asked to identify someone that best fitted with this role (e.g. cartoon/movie character).

2.5.3.2 Elicitation of constructs. The procedure to elicit constructs was informed by Kelly's (1955) original method. In the first instance, the triad method of elicitation was used in which three element cards were shown to the participant, who was asked, "*Can you tell me some important ways in which two of them are alike but different from the third?*" In order to provide a bipolar construct (emergent-implicit poles), the author asked the participant to state the opposite for each of the construct poles elicited. The two elements that are similar are marked in the emergent pole whereas the dissimilar person goes in the implicit pole. If participants struggled to answer in this way, the dyadic method of elicitation (Salmon, 1976 cited in Winter, 1992) was implemented whereby two instead of three element cards were presented and the participant was asked to state how one element is different from the other element. The triad or dyad methods were repeated, replacing only one element at a time, until nine constructs were reached. For two participants, only eight constructs were elicited. In addition, the author included two bipolar constructs that had direct relevance to the construing of ASC and sociality: 1) *Autistic (Asperger) -Not autistic (not Asperger),* and 2) *Live in own world – Part of the community*.

2.5.3.3 Rating of the repertory grids. Following the elicitation of constructs, participants were asked to rate each element on a seven-point Likert scale on each construct with one representing the emergent pole and seven representing the implicit pole. During the rating procedure, the author presented a Likert scale with the construct poles written on cards and placed at the appropriate ends of the scale to form part of the visual aid for the participants. Appendix F illustrates the repertory grid form used and the constructs elicited for one participant using this method at the assessment stage.

2.5.4 LEGO therapy and service satisfaction evaluation. At the end of the LEGO therapy intervention, both participants and parents were asked to complete evaluation forms in terms of their satisfaction with the service and the LEGO therapy. The Experience of Service Questionnaire (CHI-ESQ; Astride-Stirline, 2002) was employed because this measure was specifically developed to capture the experience of children, young people and their families' experience of mental health services. Additionally, the author developed a specific LEGO therapy evaluation form for participants (see Appendix G) and their parents (see Appendix H), using both open ended questions to identify strengths, challenges, and potential optimisation of the intervention, and Likert-scale questions to rate their satisfaction with regards to the content of the group.

2.6. Procedure

2.6.1 Assessment procedure. For all participants, an initial assessment, lasting approximately 2 hours, was carried out eight weeks prior to the start of the LEGO therapy at the CHUMS premises. At this session, participants were administered the WASI, SDQ, RCADS, and the repertory grid by the author. Parents of the participants completed relevant parent-report measures (GARS-2, VABS-2, SDQ, RCADS) in a separate room. During this session, consent forms were also obtained from the participants and their parents. Following this session, participants were either allocated to a LEGO group or excluded from this study if they were not meeting the criteria for this study.

2.6.2 LEGO therapy intervention. The LEGO therapy sessions took place on a weekly basis at CHUMS clinics. Three separate LEGO therapy groups, provided to 9-10 participants per group, were run on Saturday mornings (Group 1), Saturday afternoons (Group 2) and Monday after school (Group 3) between September and December 2015. Each session was held in the same clinic rooms for 1.5 hours. The LEGO therapy sessions started with a check in, followed by small group buildings, and ended with a group ceremony and final reflections on the group session.

The LEGO therapy intervention had access to three clinic rooms, which were adjacent to one another. The LEGO therapy always started in the largest room out of the three to check in with all the participants before breaking them into smaller groups. Thereafter two small groups stayed in this room together with their facilitators. The second room hosted one small group of two or three participants together with their facilitator. This room was often set aside for participants who struggled with sensory sensitivities to noise, social anxiety, or behavioural difficulties. The third room was used as a break room where refreshments were provided to the participants. Parents of the participants were offered coffee and tea and biscuits in the waiting room. All participants and their parents received a battery of outcome measures, as described in Table 2.1, which was completed at the first and last group session.

2.7 Ethical Considerations

 2.7.1 Ethical Approval. The University of Hertfordshire Ethics Committee with Delegated Authority (ECDA) for Health and Human Sciences granted ethical approval of this study (Protocol Number: LMS/PG/UH/00346; see Appendix I). Initially, the study focused on adolescents only, but in order to increase the sample size, it was decided to include children as well. Final ethical approval with this amendment is shown in Appendix J (Protocol Number: aLMS/PG/UH/99346). As the recruitment, assessment and LEGO therapy were conducted within CHUMS premises; ethical approval was also sought and received from the CHUMS internal ethical review board (see Appendix K)

 2.7.2 Informed Consent. Participants were recruited to this study on a voluntary basis. Approved ECDA information sheets together with consent forms were provided to participants, accordingly to age group of either 9-14 years old (see Appendix L) or 15-18 years old (see Appendix M), and their families (see Appendix N). Participants and their parents were informed that they could withdraw from the study at any time without any explanations or impact on their access to current or future mental health services.

 2.7.3 Managing distress and challenging behaviours. Clear guidelines were put in place at the start of the study, in case participants showed signs of distress or challenging behaviours. The LEGO therapy always started with a check-in, which allowed space for the participants to talk about their week but also for the facilitators to pick up any signs of distress. To reduce further levels of anxiety during group participation, the LEGO therapy remained highly structured and was run in the same clinic rooms with the same three facilitators every week. Participants with sensory difficulties, in particular hearing, were offered to work in an adjacent room with reduced noise levels. If a participant showed signs of becoming distressed, the LEGO therapy intervention was stopped and the main author escorted the participant to another room to calm him or her down. Parents of the participants remained in the waiting room throughout the duration of the group intervention, in case they needed to be contacted easily due to distress or challenging behaviours. Where harm to self or others occurred in the group setting, this information would be shared with the field supervisor, who acted as the designated health professional on behalf of CHUMS.

 2.7.4 Confidentiality. Participants and their families were informed that all data would be kept confidential. Limitations of confidentiality, e.g. in relation to harm to self or others, were also explained at the start of this study to participants and their families. All participant data, associated files and hard copy questionnaires, including any that might identify them, were anonymised and accessed only by the research team. In accordance with the data protection legislation, electronic data were stored on a password-protected computer while hardcopy data were stored in a locked cabinet at the CHUMS

service. Consent forms were stored in the same way. For the purpose of publication, all data will be stored for up to 5 years.

2.8 Data Analysis

For the purpose of this study, the author only included the data for completed Time 1 (baseline), Time 2 (pre-intervention), and Time 3 (post-intervention) measures, as intention to treat analysis was considered too conservative. In the light of the small number across the three groups, all participants were combined to form one group for the purpose of the analyses. When one item was missing for a particular measure, the mean of the total sample was assigned. Means were selected in order to allow comparisons to other studies in this area.

Data was analysed using PASW Statistics Version 21 (SPSS Inc. Chicago, Il, USA, 2012). Changes in autism specific social behaviour, adaptive functioning, psychopathology, and grid measures were assessed in two ways:

Firstly, one way repeated analysis of variance (ANOVA) analyses were employed to compare changes in scores for GARS-social interaction, VABS-social domain, VABS-communication domain, VABS maladaptive behaviours, SDQ, RCADS and grid variables at time 1 (assessment), time 2 (pre-intervention), and time 3 (post-intervention). For all of the ANOVA tests, Mauchly's Test of Spherity was conducted. If the Mauchly's Test of Spherity indicated that the assumption of spherity had been violated for any of the data, then degrees of freedom were corrected using Hyunh-Feldt estimates of spherity. Next, the present study used paired *t*-tests to examine two a priori comparisons: 1) Time 1 *vs.* Time 2, and 2) Time 2 *vs.* Time 3. These analyses were carried out on the condition that the data was normally distributed. The Shapiro-Wilk test along with skewness values were used in order to examine whether the data is normally distributed or not. Several of the dependent variables were identified as not normally distributed (See Appendix N) and data transformation, using log transformation on SPSS, did not rectify this problem. Therefore, it was decided to use non-parametric (Friedman's ANOVA, Wilcoxon Signed Rank test) instead of parametric tests (ANOVA, paired *t*-test) when the distribution of the data was seriously skewed.

Secondly, to counteract for Type II errors due to the small sample size, Pearson's *r* effect size was also calculated manually by the author and reported for each measure in order to compare change in magnitude during the baseline period to that of the intervention period in the LEGO therapy. The following guidelines were used to interpret the effect sizes: small (.1), medium (.3), and large (.5) (Field, 2009). Based on the research literature, one-tailed planned comparison analyses will be carried out where the present study has made directional hypotheses. Where the present study has made non-directional hypotheses, two-tailed significance tests will be presented for those measures. In addition,

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given the exploratory nature of this study to evaluate short-term LEGO therapy and the relatively small sample size as a whole, Bonferroni adjusted p-values to counteract the problem of multiple comparisons were not used. Instead, it was decided to keep the alpha level for statistical significance at .05. Alpha levels from .06 to .1 were interpreted as trends.

The Idiogrid Software Package Version 2.4 (Grice, 2008) was used to analyse the raw repertory grid scores. The following measures were derived from Idiogrid:

Distances between elements. Distances between elements were extracted using the standardised Element Euclidean Distances (Grice, 2006) to indicate the extent to which two elements were similar or different from one another. According to Winter (1992), a distance of 1 is the expected distance value between two elements with any significant dissimilarities or similarities between two elements being indicated as a value over 1.5 or below .5 respectively. The following element distances were analysed: i) *self* and *ideal self*, ii) *self* and *person with ASC*, and iii) *self* and *person without ASC*.

Tightness. The percentage of variance within the construct system accountable by the first component was used to assess rigidity in construing. A high percentage of variance suggests a tight, one-dimensional construct system whereas a low percentage of variance suggests a loose but more complex construct system (Winter, 1992).

Sociality. The percentages of sum of squares for the elements *how my family sees me* and *how my friends see me* were calculated to define the salience of sociality. It was proposed that a high percentage of sum of squares in any of these two elements is indicative of greater sociality.

Psychological changes in construing over time. The general degree of correlation between the grids was used to compare psychological changes in construing during baseline period (time 1 and time 2) and during intervention period (time 2 and time 3). The values range from -1 to 1 with a high correlation being indicative of a small change in construing whereas a low correlation is indicative of a large change in construing.

Implicative dilemmas. An implicative dilemma (Feixas, Saúl & Avila-Espada, 2009) is defined as *"correlation between a discrepant and a congruent construct in a way that the desired change in the former is associated to an undesired change in the latter"* (p. 149). Hence, a discrepant construct is indicative of dissatisfaction with the *self* (undesired pole) compared to the *ideal self* (desired pole). By contrast, a congruent construct is suggestive of agreement between self and ideal self, and therefore, the person in question might not view any need for change. Implicative dilemma analyses were performed to investigate any unexpected correlations between constructs (Winter, 1992). Thus, ratings

of self and ideal self were compared to identify both discrepant and congruent constructs. A discrepant construct was defined as having more than three points difference in ratings between *self* and *ideal Self*. A congruent construct, on the hand, was defined as having less than two points difference in ratings between *self* and *ideal Self*. The present study employed a congruent criterion of .2 to indicate an implicative dilemma.

Correlations between grid variables and questionnaire measures. The associations between grid variables and questionnaire measures were analysed in the following ways. Firstly, Spearman's rho correlations were used to explore associations between grid variables and questionnaire measures at the assessment stage (time 1). Secondly, change scores were calculated for all the dependent variables during the intervention period. Original scores from Time 3 were subtracted from time 2 to represent change scores for the intervention period. Spearman rho correlations were then performed to investigate the relationship between change scores on grid variables and questionnaire measures.

Chapter three: Results

3.1 Chapter Overview

This chapter presents an analysis of the data collected through parent- and self-questionnaires as well as the repertory grid interviews with the participants at three time points: time 1, time 2, and time 3. Participant descriptives will be discussed first; thereafter, the group analyses will be presented in the following order: i) associations between repertory grid and questionnaire measures at time 1, ii) analyses of parent- and self-report questionnaires and repertory grid to evaluate the effectiveness of the LEGO therapy group in facilitating change related to autism specific social behaviours, adaptive functioning, psychopathology, and re-construing, iii) associations between change in repertory grid and questionnaire measures during the LEGO therapy period, and iv) additional analyses related to perception of coping after the group intervention and themes emerging from the evaluation feedback forms.

3.2 Missing Data

Of the 28 children and adolescents who consented to take part in this study, three participants (2 male, 1 female) dropped out during the LEGO therapy intervention phase. One male participant did not attend any group sessions due to health related problems in the family. Another male participant dropped out after the fifth session because he found it too far to commute to the group sessions. The female participant dropped out after the fourth session because she had other social commitments related to her university application that interfered with the subsequent dates of the LEGO-group. These three participants' data were excluded from further analyses. Therefore, 25 out of 28 completed data were available for further analysis.

3.3 Participant characteristics

Table 3.1 shows participant characteristics for those 25 participants who completed the LEGO therapy and whose data was included in the final analyses. The mean Autism Index at the assessment intake was high, suggesting that the probability for the participants to have ASC was 'Very likely' (Gilliam, 2006). A formal diagnosis of ASC was confirmed for all of the participants apart from one female participant. On behalf of the CHUMS Service, it was decided to offer her the LEGO therapy as her main difficulty was related to social communication. At the time of this study, she was considered by her parents and paediatrician to have traits of ASC and was waiting for a definitive ASC diagnostic evaluation. Parent-report on the GARS-2 (Autism Index 70 = 'possibly autism') together with clinical observation confirmed that she was appropriate to attend the LEGO therapy intervention. The majority of participants were White British (92.5%). Participants attended either mainstream school or autism

inclusion within mainstream school, with the exception of two participants who were currently home schooled. Comorbid diagnoses were also commonly reported in our sample, including Attention Deficit Hyperactivity Disorders ($N = 8$), sleep disorders ($N = 5$) and sensory disorders ($N = 4$). There were more boys than girls (5:1) participating in this study, which is consistent with the reported sex bias in ASC (CDC, 2012). As shown in Table 3.1, the groups did not differ on any measures related to autism and intelligence. Attendance was excellent, with the majority of participants attending between 6-8 sessions.

Table 3.1 Participant descriptives at assessment intake and group attendance of participants included in the analyses.

	Total ($N = 25$)	Group 1 ($N = 9$)	Group 2 ($N = 8$)	Group 3 ($N = 8$)	Baseline difference between groups [a]
Age (in years)					
Mean	12.40	11.52	14.71	11.09	-
SD	2.02	1.00	1.35	1.40	-
Gender *(N)*					
Male	20	6	7	7	-
Female	5	3	1	1	-
Diagnosis *(N)*					
ASC	14	5	3	3	-
AS	11	3	5	6	-
HFA	1	1	0	0	-
A	1	0	1	0	-
GARS AQ					
Mean	125.14	128.20	123.56	123.33	$\chi^2 (2, N = 25) = .82, p =$
SD	25.18	30.93	18.77	26.34	.67
Full IQ					
Mean	109.07	107.50	112.00	107.89	$\chi^2 (2, N = 25) = .78, p =$
SD	14.47	15.10	15.67	13.80	.68
Verbal IQ					
Mean	109.64	107.50	112.00	107.88	$\chi^2 (2, N = 25) = .59, p =$
SD	16.41	15.10	15.67	13.80	.74
Performance IQ					
Mean	105.53	105.10	107.67	103.89	$\chi^2 (2, N = 25) = .71, p =$
SD	12.17	13.81	14.32	8.46	.70
Group attendance					
Mean	7.16	7.56	6.75	7.12	$\chi^2 (2, N = 25) = 4.22, p =$
SD	.90	.73	0.71	1.13	.12
%	89.50	94.50	84.38	89.00	

Note: GARS AQ = Gilliam Autism Scale Autism Quotient; ASC = Autism Spectrum Conditions; AS = Asperger Syndrome; HFA = High Functioning Autism; A = Autism; IQ = Intelligence Quotient. [a] = Kruskal Wallis median test between group 1, 2, and 3.

3.4 Associations between repertory grid and questionnaire measures at time 1

Spearman correlations were conducted to assess correlations between repertory grid measures and all the questionnaire outcome measures at time 1 (baseline), two-tailed. Only significant correlations are shown in Table 3.2. Interestingly, only adaption and psychopathology, and not autism specific social competence or adaptive functioning, were correlated with repertory grid measures of distance between elements (*self – person with ASC*), tightness in construing, and implicative dilemmas. Firstly, participants who construed themselves differently from people with ASC showed lower parent-reported conduct problems. Secondly tight construing was associated with greater conduct problems by parent-reports and greater pro-social behaviour by self-reports. Thirdly, the present study found several significant associations between implicative dilemmas and psychopathology, although the direction of the relationship is dependent on the type of psychopathology. More specifically, higher percentages of implicative dilemmas were associated with greater internalising problems (e.g. total anxiety, separation anxiety, and obsessions-compulsions) but fewer externalising problems (e.g. conduct problems).

Table 3.2. Significant Spearman's correlations between repertory grid and questionnaire measures at time 1(baseline)

Measure	Self - Person with ASC distance	Tightness Cpt. I	Implicative dilemma %
SDQ (parent)			
Conduct problems	-0.42*	.47*	-.41*
SDQ (self)			
Conduct problems			-.50*
Pro-social behaviour		.48*	
RCADS (parent)			
Total Anxiety			.40*
Separation anxiety			.47*
Obsessions-Compulsions			.45*

Note: SDQ = Strengths and Difficulties Questionnaire; RCADS = Revised Children's Anxiety and Depression Scale. ASC = Autism Spectrum Conditions; Cpt = variance accounted for by first principal component
*One-tailed $p < .05$.

3.5 Changes during LEGO therapy

      3.5.1 Autism specific social competence. The social interaction subscale of the GARS-2 (Gilliam, 2006) was used to assess change in autism specific social competence over the course of the present study. Table 3.3 shows the descriptives and planned comparison analyses for the social interaction subscale. A repeated ANOVA test showed a trend of a main effect for time, $F(1.15, 28.04) = 3.568$, $p = 0.06$. This finding was followed by a priori comparisons. The first planned comparison indicated no change in mean social interaction score for the participants between time 1 and time 2. By contrast, the second planned comparison showed a significant reduction in mean social interaction score from time 2 to time 3.

      As can be seen in Figure 3.1, on average, participants made a significant improvement in social competence following the LEGO therapy but not over the baseline period. In addition, the difference between scores during the LEGO therapy corresponds to a medium effect size. Hence, these findings are supportive of the main research hypothesis that LEGO therapy intervention, as compared to baseline period, has a positive impact on children and young people's social competence that is specific to autism.
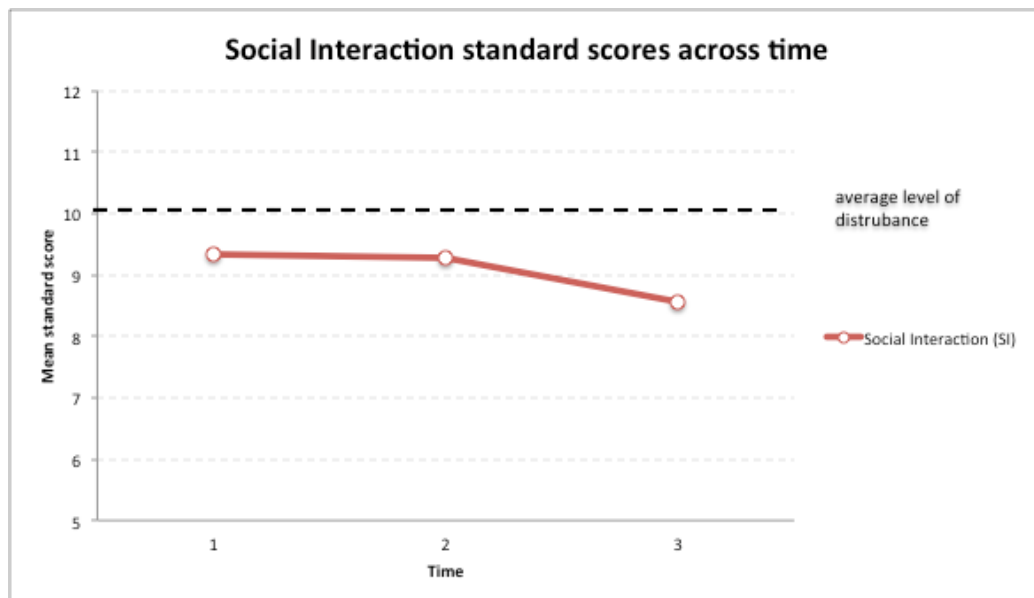
Figure 3.1 Line graph for social interaction scores across time. Lower scores on the social interaction scale indicate fewer symptoms, thus, a decrease of social interaction scores over time suggests an improvement in social interaction.

Table 3.3. Descriptive statistics and planned comparison analyses for the Gilliam Autism Rating Scale -2 and the Vineland Adaptive Behaviour Scale -2 at time 1, time 2, and time 3.

Measure	Time 1 (N = 25) Mean (SD)	Time 2 (N = 25) Mean (SD)	Time 3 (N = 24) Mean (SD)	Change score (T2-T3)	95% CI (T2-T3)	Statistic [a] t/z	2-tail p	ES [b] r	Statistic [c] t/z	1-tail p	ES [d] r
GARS-2											
Social Interaction standard score	9.32 (2.59)	9.28 (2.35)	8.56 (2.92)	- .72	-.0001 to 1.44	$t = .30$	.77	.06	$t = 2.06$	.025*	.39
VABS-2											
Social domain standard score	67.92 (9.54)	67.64 (9.66)	69.24 (9.98)	1.6	-2.83 to -.38	$z = - .74$	.46	.001	$z = - 2.33$	.01*	.33
Communication domain standard score	79.48 (12.29)	79.28 (13.10)	80.12 (12.65)	.84	-1.83 to .18	$z = -.25$	.80[e]	.03	$z = -1.65$	.1[e]	.23
Maladaptive behaviour v-scale score	20.68 (1.99)	20.44 (1.19)	20.16 (1.82)	- .28	- .11 to .67	$t = 1.30$	.20	26	$t = 1.50$	.07	.29
Maladaptive behaviour raw score	26.60 (10.51)	25.40 (9.73)	24.12 (9.32)	- 1.28	- .20 to 2.76	$t = 1.65$	.12	.32	$t = 1.78$	.04*	.34

Note: Time 1 = assessment (baseline); Time 2 = pre-intervention; Time 3 = post- intervention; SD = Standard Deviation; t = paired *t*-test; z = Wilcoxon Signed Rank test; ES = Effect size; r = Pearson's *r* coefficient; GARS-2 = Gilliam Autism Rating Scale- 2; VABS-2 = Vineland Adaptive Behaviour Scale – 2

[a] Paired *t*-test/Wilcoxon Signed Rank test between time 1 and time 2 (baseline period)

[b] Calculation of effect size between time 1 and time 2 on paired t-test/Wilcoxon Signed Rank test

[c] Paired *t*-test/Wilcoxon Signed Rank test between time 2 and time 3 (baseline period)

[d] Calculation of effect size between time 2 and time 3 on paired t-test/Wilcoxon Signed Rank test

[e] Two-tailed hypotheses

* Significant at *p*-level < .05

3.5.2 Adaptive Functioning. The social, communication, and the maladaptive behaviour scales of the VABS-2 (Sparrow et al., 2005) were used to compare change in adaptive functioning during the baseline period to that during the LEGO therapy intervention. Parametric tests were employed for the maladaptive behaviour scale but not for the socialisation and communications scales due to non-normally distributed data.

3.5.2.1 Socialisation Domain. A Friedman's ANOVA test showed that the mean standard score for socialisation varied significantly across the three time points: $\chi^2(2, N = 25) = 7.32$, $p = .03$. This finding was followed up by a priori comparisons. As can be seen in Table 3.3, planned comparisons showed no change in socialisation scores between time 1 and time 2. However, there was a significant increase in socialisation scores from time 2 to time 3.

On average, parents reported statistically significant higher social adaptive functioning following the LEGO therapy whereas no difference was detected in social adaptive functioning during the baseline period. Moreover, the impact of this change on social adaptive functioning during LEGO therapy was moderate. Figure 3.2 below illustrates that the participants' level of social adaptive functioning had not only statistically improved but also clinically, from 'low' to approaching borderline 'moderately low' (Sparrow et al., 2005) within the course of the LEGO therapy.
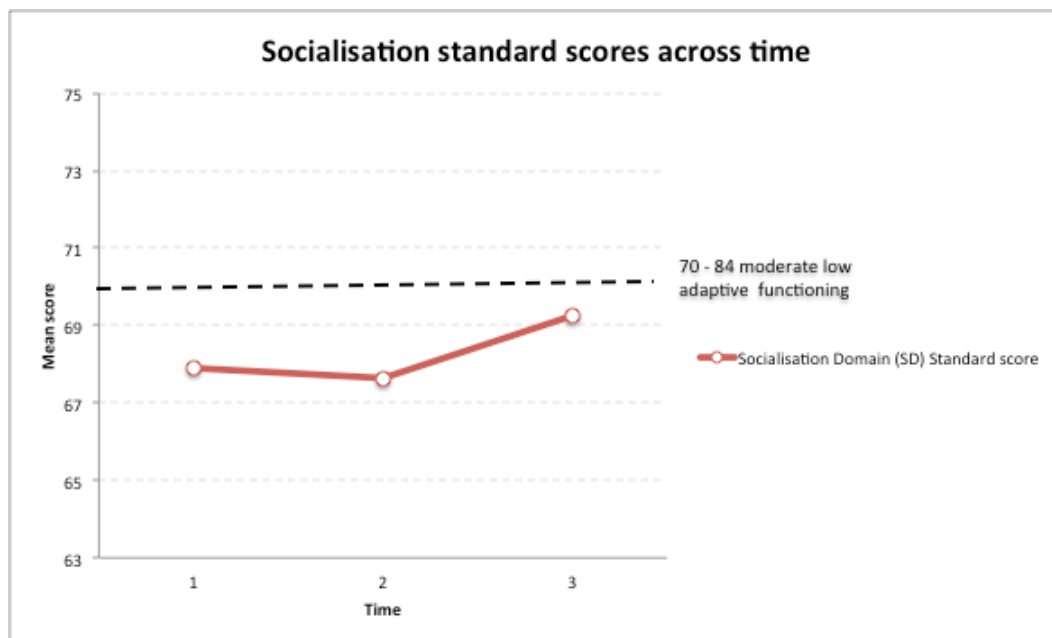
Figure 3.2. Line graph for the socialisation domain across time. Higher scores represent better adaptive functioning.

3.5.2.2 Maladaptive Behaviour. For the purpose of cross study comparison with Owens et al.'s (2008) study, analyses were conducted both for the standard *v-* scale and raw maladaptive behaviour scores. The repeated ANOVA test indicated no differences between the mean standard *v*-scale maladaptive behaviour scores across time, but the result nevertheless showed a statistical trend, $F(1.53, 36.63) = 2.71$, $p = .09$. The first a priori contrast showed no difference in maladaptive behaviour between time 1 and time 2. Although the second a priori contrast revealed a reduction in maladaptive behaviour from time 2 to time 3, this change was not large enough to reach a significant difference. By contrast, analyses for the raw maladaptive behaviour scores revealed a main effect of time, $F(1.41, 33.93) = 3.87$, $p = .04$, as well as a significant reduction in maladaptive behaviour during the intervention period but not during the baseline period.

It was unexpected to find different statistical outcomes in the two sets of analyses for the maladaptive behaviour. Whilst both the standard *v*-scale and the raw scores of the maladaptive behaviour were moving in the same direction as the directional hypotheses between pre- and post-intervention, only the raw scores revealed a statistically significant difference following the LEGO therapy. When exploring the effect sizes for both of these planned comparisons, they both yield medium effect sizes, suggesting that the LEGO therapy had a moderate effect on participants' maladaptive behaviour functioning. Figure 3.3 illustrates the line graph of mean maladaptive behaviour across the time series. As shown in the figure, participants' mean standard *v*-scale scores indicate that they fell just below the cut off point for clinically significant maladaptive behaviour across time (Sparrow et al., 2005).
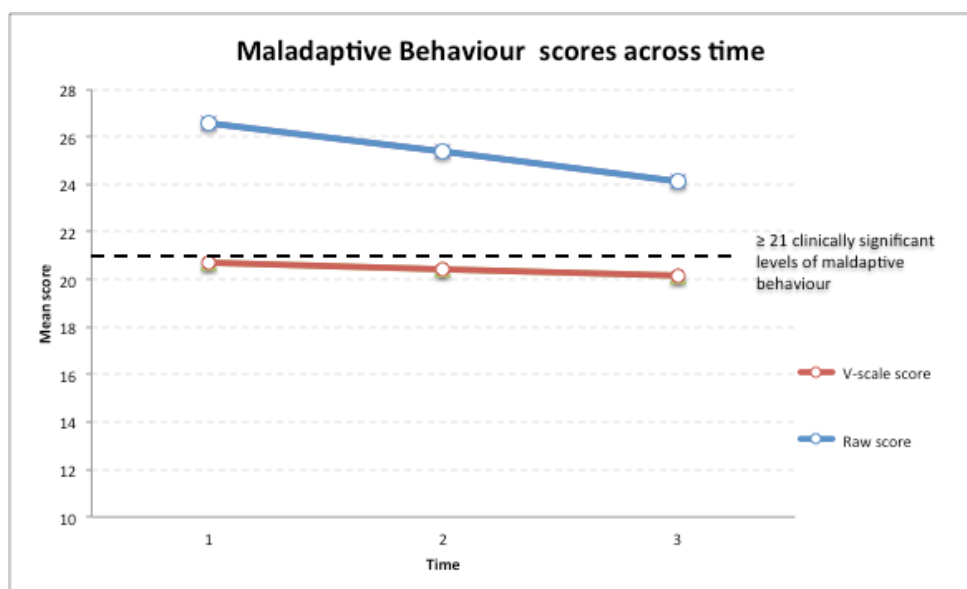
Figure 3.3. Line plot for the v-scale and raw maladaptive behaviour scores across time. Lower scores on both scales indicate fewer symptoms of maladaptive adaptive behaviour.

3.5.2.3 Communication Domain. A Friedman's ANOVA test revealed no significant main effect of time on communication scores (χ^2 (2, $N = 25$) = .24, $p = .84$). Subsequent planned comparisons also showed no difference in communication between time 1 and time 2 (baseline period) or between time 2 and time 3 (intervention period). In brief, the findings support the null hypothesis that there is no change in communication over the course of the present study.

3.5.3 Adaptation and psychopathology. Parent- and self-reported RCADS and SDQ were used to assess change in adaptation and psychopathology over the course of this study. Post-intervention RCADS and SDQ data for one parent went missing in the post. Consequently, only 24 out of 25 completed parent-reports of the SDQ and RCADS at time 3 were available for analyses. In addition, only participants age 11 and above were asked to complete the SDQ ($N = 20$) as this self-report measure is only normed for children age 11 and onwards (Goodman, 1998). Table 3.4 summarises the descriptive statistics and the planned comparisons analyses for these measures.

3.5.3.1 Strengths and Difficulties Questionnaire (SDQ). Shapiro-Wilk tests revealed significant values ($W < .05$) for the total SDQ (parent-report), conduct problems (parent- and self-reports), and kind and helpful (self-report) subscales. Nonetheless, the skewness values for these subscales were only minor or modestly skewed at most (skewness ±1). Hence, it was decided to carry out parametric tests for all of the parent- and self- reported SDQ subscales.

Parent-reported SDQ. No main effect for time emerged on the total problems (F(1.40, 32.28) = 2.63); the conduct problems (F(2, 46) = .80); the peer relationship problems subscales (F(1.65, 38.01) = .28), and pro-social (F(2, 46) = 2.24, $p = .10$), all $ps > .05$. However, there were trends toward main effects for time on the emotional problems (F(1.53, 35.26) = 2.75, $p = .09$) and hyperactivity and inattention (F(2, 46) = 2.57, $p = .09$). As can be seen in Figure 3.4, there were no changes in scores for any of the SDQ parent reported subscales during the baseline period *(ns),* whereas the scores for all the SDQ subscales, apart from the peer problems, somewhat improved during the intervention period with trends for the pro-social behaviour ($p = .08$) and the hyperactivity and inattention subscales ($p = .06$).

Table 3.4 Descriptive statistics and planned comparison analyses for the Strengths and Difficulties Questionnaire and the Revised Children's Anxiety and Depression Scale at time 1, time 2, and time 3.

Measure	Time 1 (N = 25) Mean (SD)	Time 2 (N = 25) Mean (SD)	Time 3 (N = 25) Mean (SD)	$Change^a$ score (T2-T3)	95 CI %^{b} (T2-T3)	Statistics ^{c} t	2-tail p	ES^d r	Statistics ^{e} t	2-tail p	ES^f r
SDQ (Parent)											
Total	20.64 (4.97)	20.72 (6.14)	19.04 (4.50)	-1.63	-.45 to 3.70	-.16	.87	.03	1.62	.12	.32
Conduct problems	2.52 (1.45)	2.64 (1.91)	2.29 (1.81)	- .29	- .24 to .82	- .68	.50	.14	1.13	.27	.23
Emotional difficulties	6.04 (2.03)	6.00 (2.83)	5.17 (2.57)	- .88	- .24 to 1.99	.13	.90	.03	1.62	.12	.32
Hyperactivity/Inattention	6.20 (2.45)	6.32 (2.53)	5.67 (2.37)	- .67	- .02 to 1.36	-.46	.65	.09	2.00	.06	.38
Peer problems	5.88 (1.74)	5.76 (1.64)	5.92 (1.59)	.20	- .84 to .42	.65	.26	.13	-.68	.25	.14
Pro-social behaviour	5.16 (2.43)	5.20 (2.38)	5.71 (2.29)	.50	- 1.07 to .07	-.18	.86	.04	-1.81	.08	.35
SDQ (Child; N = 20)											
Total	18.60 (4.19)	18.35 (3.70)	16.25 (5.26)	- 2.1	.48 to 3.71	.22	.83	.05	2.72	.013*	.53
Conduct problems	3.00 (1.21)	3.05 (1.39)	2.80 (1.82)	- .25	- .25 to 1.55	-.20	.85	.05	.84	.41	.19
Emotional difficulties	5.70 (2.18)	5.55 (2.19)	4.90 (2.25)	-.65	- .37 to .87	.36	.26	.08	1.51	.08	.33
Hyperactivity/Inattention	5.55 (1.85)	5.70 (1.89)	5.00 (1.83)	-.70	-.12 to 1.52	-.36	.72	.08	1.79	.09	.38
Peer problems	4.40 (2.11)	4.05 (2.09)	3.55 (2.04)	-.50	-.16 to 1.14	.66	.26	.15	1.65	.12	.35
Pro-social behaviour	6.40 (2.58)	6.70 (2.39)	6.85 (2.78)	.15	-.91 to .61	-5.2	.61	.77	-.41	.69	.09

(Table continues next page)

Table 3.4 Descriptive statistics and planned comparison analyses for the Strengths and Difficulties Questionnaire and the Revised Children's Anxiety and Depression Scale at time 1, time 2, and time 3 (*Continued*)

Measure	Time 1 (N = 25)	Time 2 (N = 25)	Time 3 (N = 24)	Change[a] score	95 CI %[b]	Statistics[c]		ES[d]	Statistics[e]		ES[f]
	Mean (SD)	Mean (SD)	Mean (SD)	(T2-T3)	(T2-T3)	t	2-tail p	r	t	1-tail p	r
RCADS (Parent)											
Total Anxiety	78.44 (18.52)	77.68 (20.50)	74.58 (20.38)	-3.79	-2.07 to 9.65	.39	.70	.08	1.34	.10	.27
Total Anxiety and Depression	78.72 (18.75)	77.64 (20.94)	75.67 (19.99)	-2.67	-2.99 to 8.32	.62	.54	.13	.98	.17 [g]	.20
Separation Anxiety	79.84 (23.06)	80.80 (24.64)	75.58 (22.30)	-5.13	-.99 to 11.24	-.63	.54	.13	1.73	.05*	.34
Generalised Anxiety	67.68 (16.00)	68.28 (17.76)	67.50 (19.10)	-.96	-3.5 to 5.42	- .48	.64	.10	.44	.33	.09
Panic	81.04 (27.29)	77.52 (30.66)	73.92 (23.78)	-4.96	-3.97 to 13.89	.89	.38	.18	1.15	.13	.23
Social Phobia	69.12 (14.17)	69.44 (15.06)	67.33 (17.26)	-2.54	-3.04 to 8.12	-.12	.90	.02	.94	.18	.07
Obsessions-Compulsions	67.04 (19.66)	65.00 (19.96)	62.88 (21.07)	-2.71	-1.85 to 7.27	z = - 1.09	.28	.15	z = - 1.33	.18	.19
Depression	72.52 (15.92)	69.96 (18.47)	73.42 (17.15)	-.296	-7.80 to 1.88	1.62	.12	.31	-1.27	.22 [g]	.26
RCADS (Child)											
Total Anxiety	56.48 (14.29)	54.88 (15.09)	52.72 (15.15)	-2.16	-1.56 to 5.88	1.40	.17	.27	1.20	.12	.24
Total Anxiety and Depression	56.48 (14.29)	54.96 (14.74)	52.48 (15.34)	-2.48	-1.97 to 6.93	1.52	.14	.30	1.22	.12 [g]	.24
Separation Anxiety	56.68 (14.63)	63.60 (18.81)	61.12 (17.62)	-2.48	-1.97 to 6.93	.09	.93	.02	1.15	.13	.23

(Table continues next page)

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Table 3.4 Descriptive statistics and planned comparison analyses for the Strengths and Difficulties Questionnaire and the Revised Children's Anxiety and Depression Scale at time 1, time 2, and time 3 (*Continued*)

Measure	Time 1 (N = 25)	Time 2 (N = 25)	Time 3 (N = 24)	*Change[a]* score	95 CI %[b]	Statistics [c]		ES [d]	Tt Statistic [e]		ES [f]
	Mean (SD)	Mean (SD)	Mean (SD)	(T2-T3)	(T2-T3)	2-tail t	p	r	1-tail t	p	r
RCADS (Child)											
Generalised Anxiety	52.40 (13.92)	50.92 (14.43)	51.56 (15.24)	.64	-4.30 to 3.02	.79	.44	.16	- .36	.36	.07
Panic	58.68 (14.53)	56.64 (13.90)	53.56 (14.86)	-3.08	-1.49 to 7.65	1.46	.16	.29	1.39	.09	.27
Social Phobia	51.04 (13.11)	50.08 (13.72)	47.40 (13.56)	-2.68	.22 to 5.14	.57	.58	.12	2.25	.02*	.41
Obsessions-Compulsions	52.24 (12.61)	50.48 (10.67)	50.36 (12.26)	-.12	-3.26 to 3.50	.93	.36	.19	.03	.47	.006
Depression	55.84 (12.01)	54.12 (11.99)	51.12 (12.20)	-3	-1.71 to 7.71	1.02	.32	.20	1.32	.20 [g]	.26

Note: Time 1 = assessment intake; Time 2 = pre-intervention; Time 3 = post-intervention; SD = Standard Deviation; ES = effect size; r = Pearson's r; t = paired t-test; z = Wilcoxon Signed Rank test; p = statistical value; SDQ = Strengths and Difficulties Questionnaire; RCADS= Revised Child Anxiety and Depression Scale.

[a] Change score reported for 24 participants between time 2 and time 3.

[b] Confidence interval reported for 24 participants between time 2 and time 3.

[c] Paired t-test/Wilcoxon Signed Rank test between time 1 and time 2 (baseline period)

[d] Calculation of effect size between time 1 and time 2 on paired t-test/Wilcoxon Signed Rank test

[e] t-test/Wilcoxon Signed Rank test between time 2 and time 3 (baseline period)

[f] Calculation of effect size between time 2 and time 3 on paired t-test/Wilcoxon Signed Rank test

[g] Two-tailed hypotheses

* Significant at p-level < .05

On average, parents of the participants rated favourable outcome in the area of adaption and psychopathology, with the exception of peer problems, for their children following LEGO therapy. Nonetheless, these changes were not statistically significant. By contrast, a different picture emerged in terms of practical significance of LEGO therapy on parent reported adaptation and psychopathology. In particular, the two subscales that were suggestive of trends toward improvement in pro-social behaviour and hyperactivity and inattention following LEGO therapy were equivalent to medium effect sizes. An example of this practical importance can be seen for the hyperactivity and inattention subscale whereby participants' mean score on the hyperactivity and inattention subscale was within the "borderline" range before the LEGO therapy intervention. After attending the LEGO therapy, their mean score was within the "normal" range, suggesting that the levels of hyperactivity and inattention for this group of participants were no longer of a clinical concern (Goodman, 1999).
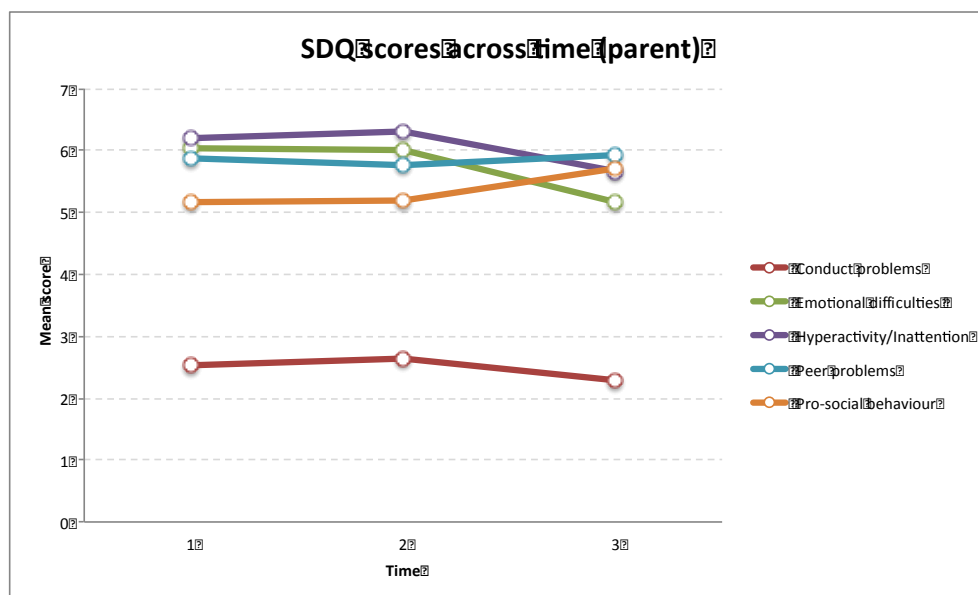
Figure 3.4. Line graph for parent-reported SDQ at Time 1, Time 2, and time 3.

Self-reported SDQ. Repeated ANOVA test indicated no main effects for time on any of the SDQ subscales: conduct problems, $F(2, 38) = .36$; emotional difficulties, $F(2, 38) = 1.78$; hyperactivity and inattention, $F(2, 38) = 1.30$; peer relationship, $F(1.61, 30.61) = 1.71$; and pro-social behaviour, $F(2, 38) = .39$, all ps > .05, apart from a trend towards a main effect for time on the total problem mean subscale ($F(2, 38) = 2.83$, $p = .07$). The first set of planned comparisons found no differences in mean scores for any of the SDQ subscales between time 1 and time 2 (*ns*). Although the second planned comparison indicated gains across all the SDQ subscales, only the total problem subscale and hyperactivity and inattention subscale showed a significant difference and a trend respectively between time 2 and time 3 (see Figure 3.5).

In brief, participants rated on average that their total problem score had significantly reduced following LEGO therapy but not during the baseline period, with the magnitude of this change being indicative of a large effect size. Even though there was only a trend towards an improvement in hyperactivity and inattention after the LEGO therapy, it is important to note that the magnitude of this change corresponds to a moderate effect.
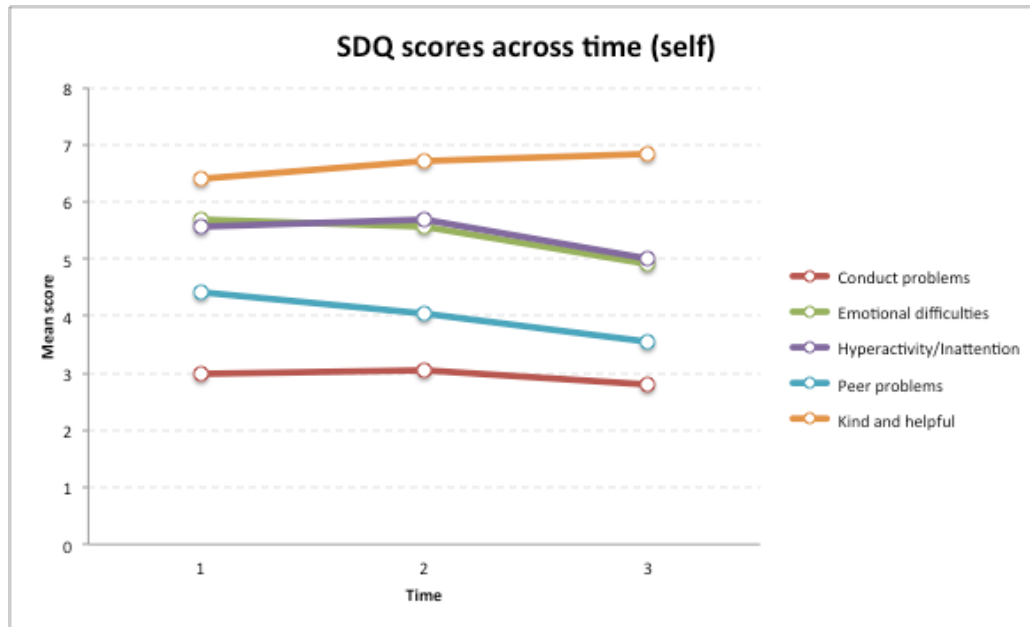
Figure 3.5. Line graph for self-reported SDQ at Time 1, Time 2, and time 3.

Comparisons between parent- and self-reported SDQ. A line graph comparing the total problem scores rated by the parents and the participants respectively is presented in Figure 3.6. As can be seen see in Figure 3.6, parents of the participants rated a higher level of total problem scores across the three time point than the participants themselves, but only the latter revealed a significant change. Although the self-rated score remained within the "borderline" range throughout the LEGO therapy, the mean scores are indicative of a shift from the top end of the borderline range to the low end of the borderline range (Goodman et al., 1998). Both parent and self-report scores were suggestive of improvement in the level of hyperactivity and inattention following LEGO therapy, though non-statistical change, a practical significance of a medium effect was found.
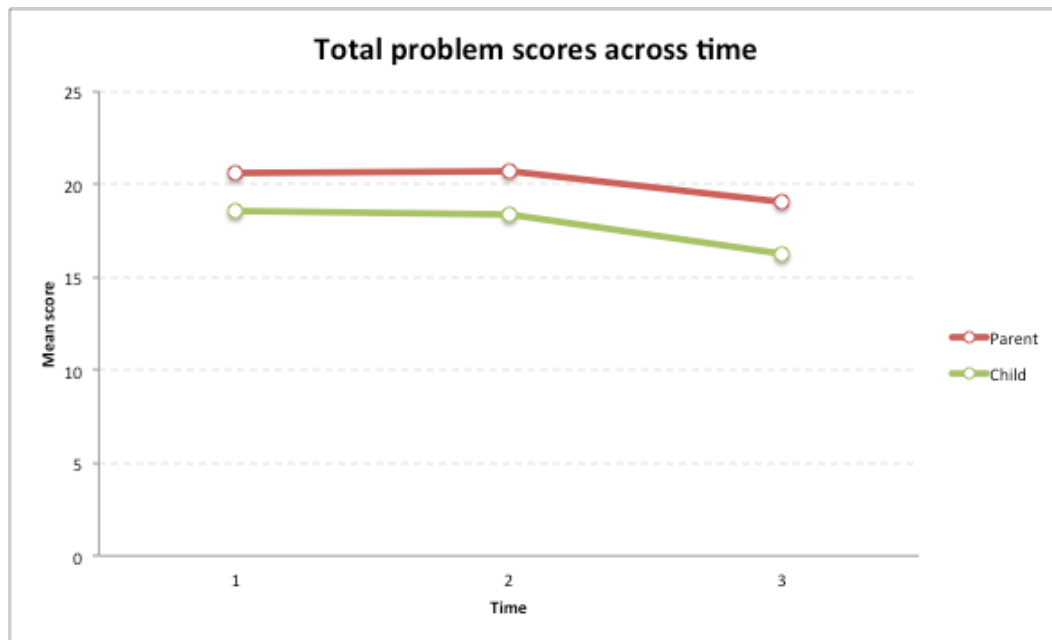
Figure 3.6. Line graph for self- and parent-reported total problem scores on the SDQ across time.

3.5.3.2 Revised Children Anxiety and Depression Scale (RCADS). The present study employed parametric tests for all the parent- and self- report RCADS subscales, apart from the parent-reported obsessions-compulsion subscale due to a serious problem regarding non-normality of distribution. Therefore, non-parametric tests of repeated Friedman's ANOVA and subsequent Wilcoxon Ranked tests were used for the parent-reported obsession-compulsion subscale. Descriptives and planned comparisons analyses for these subscales are shown in Table 3.4.

Parent-reported RCADS. A series of repeated ANOVA tests showed no main effect of time on any of the RCADS subscales: total anxiety (F(1.72, 39.50) = 1.55); total anxiety and depression (F (1.61, 37.09) = 1.04); separation anxiety (F(1.44, 33.01) = 2.44); generalised anxiety (F(1.43, 32.82) = .11); panic (F(2, 46) = 1.61; social phobia (F(2, 46) = .49; and depression (F(2, 46) = 1.09. The Friedman's ANOVA also showed no change in obsessions-compulsions scores over time; χ^2 (2, N = 24) = 1.26, all ps > .05. The first set of planned comparisons revealed no significant differences between scores on any of the RCADS subscales between time 1 and time 2. For the second sets of planned comparisons, there were suggestions of improvements in psychopathology throughout this time period. One exception to this was the depression subscale, which suggested an increase in depressive symptoms between time 2 and time 3. In the end, only the separation anxiety subscale of the RCADS reached a statistically difference between time 2 and time 3, indicating a positive change in separation anxiety following the LEGO therapy. This change in separation anxiety is considered a medium effect size, but was small for the remaining RCADS subscales during LEGO therapy, suggesting that the only statistical and practical importance of LEGO therapy was for the separation anxiety subscale. Figure 3.7 shows the line graphs for the parent-reported RCADS subscales over time.
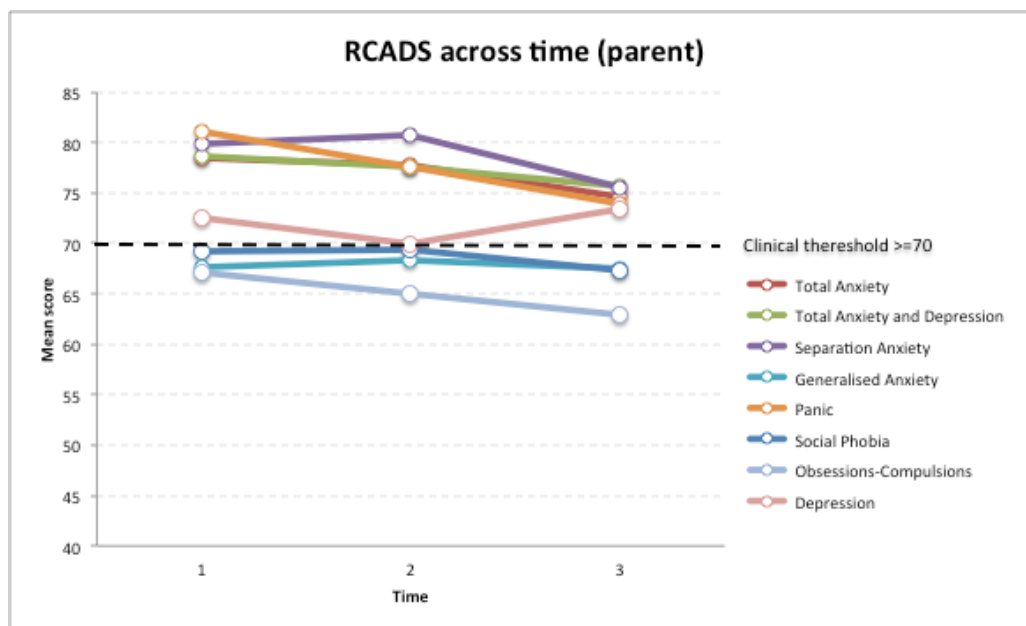
Figure 3.7. Line graph for parent-reported RCADS across time.

Self-reported RCADS. A series of repeated ANOVA tests showed no main effect for time on total anxiety, $F(1.66, 39.90) = 2.61$; separation anxiety, $F(2, 48) = .75$; generalised anxiety $F(1.47, 35.29) = .23$; obsessions and compulsions subscales, $F(2, 48) = .69$, all ps $> .05$. Nonetheless, the results showed a trend towards a significant difference between scores over time on total anxiety and depression, $F(1.15, 36.75) = 2.75$, $p = .09$; panic, $F(1.58, 37.79) = 3.05$, $p = .07$; social phobia, $F(1.71, 41.08) = 2.70$, $p = .09$; and depression ($F(2, 46) = 2.48$, $p = .09$. Planned comparisons were conducted to compare changes in scores during the baseline period and over the course of intervention period. As shown in Table 3.4, the first set of planned comparisons did not reveal any differences in scores for any of the RCADS subscales between time 1 and time 2. Analyses for the second set of planned comparisons suggested that all the subscales of the RCADS, apart from the generalised anxiety subscale, were reducing between time 2 and time 3, but only the social phobia subscale reached statistical significance.

It was surprising and unexpected that participants, on average, rated below the clinical threshold for anxiety and depression symptoms on all the RCADS subscales (see Figure 3.8). According to self-ratings, only the social phobia subscale, and not any other subscales, showed a statistically significant improvement following the LEGO therapy. According to the effect size, this difference in social phobia scores suggested a moderate to high practical significance. Therefore, the a priori research hypotheses of improvement in anxiety following LEGO therapy were confirmed for the social phobia but not for any of the other subscales.
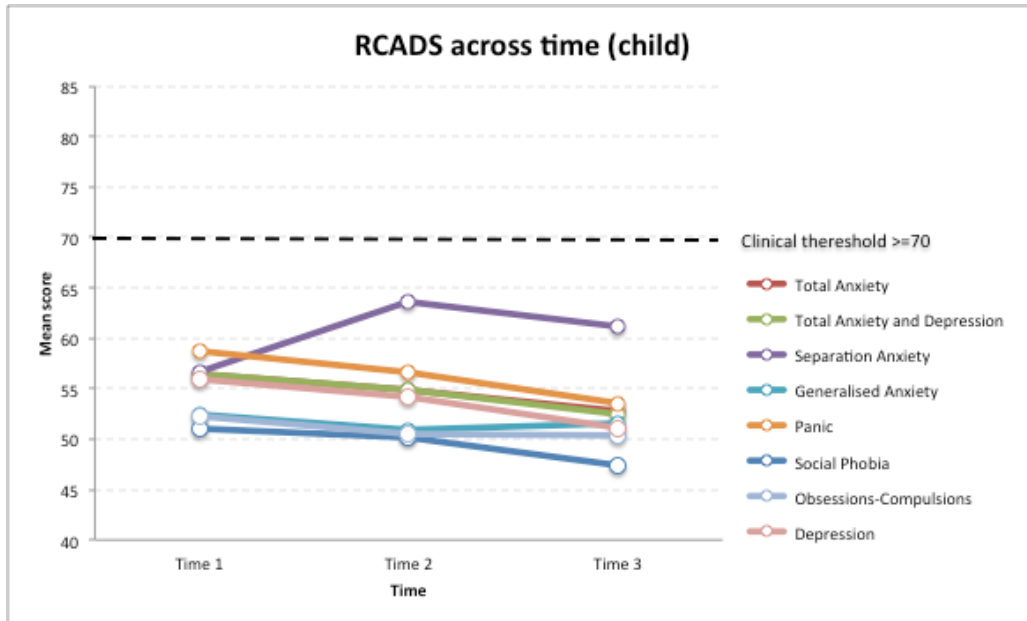
Figure 3.8. Line graph for child-reported RCADS across time.

Comparisons between parent- and self-reported RCADS. Overall, the findings from the analyses highlighted that participants reported a positive change in levels of social phobia whereas parents of the participants reported a positive change in separation anxiety following the LEGO therapy. Another surprising difference is the indication of discrepancy in the proportion of children and adolescents with ASC who met the clinical threshold for anxiety and depression according to parent- and self-reports (see Table 3.5). According to parent ratings, up to two thirds of the participants met the clinical threshold for depression and anxiety diagnoses. Another picture emerged when participants rated their own symptoms of internalising problems whereby between 8 to 36 % of them met the various clinical thresholds on the RCADS subscales.

Table 3.5. Proportion of participants falling above clinical threshold on the RCADS scale according to parent and child reports.

RCADS	Time 1 N (%)	Time 2 N (%)	Time 3 N (%)

Parent report			
Total Anxiety	17 (68.00)	17 (68.00)	12 (50.00)
Total Anxiety and Depression	17 (68.00)	16 (64.00)	12 (50.00)
Separation Anxiety	17 (68.00)	19 (76.00)	14 (58.33)
Generalised Anxiety	13 (52.00)	12 (48.00)	11 (45.83)
Panic	16 (64.00)	13 (52.00)	13 (54.17)
Social Phobia	12 (48.00)	12 (48.00)	11 (45.83)
Obsessions-Compulsions	8 (32.00)	9 (36.00)	6 (25.00)
Depression	13 (52.00)	12 (48.00)	12 (50.00)
Self report			
Total Anxiety	6 (24.00)	5 (20.00)	5 (20.00)
Total Anxiety and Depression	6 (24.00)	5 (20.00)	5 (20.00)
Separation Anxiety	9 (36.00)	9 (36.00)	5 (20.00)
Generalised Anxiety	4 (16.00)	3 (12.00)	4 (16.00)
Panic	6 (24.00)	6 (24.00)	4 (16.00)
Social Phobia	2 (8.00)	4 (16.00)	2 (8.00)
Obsessions-Compulsions	3 (12.00)	2 (8.00)	3 (12.00)
Depression	4 (16.00)	2 (8.00)	3 (12.00)

Note: RCADS = Revised Children's Anxiety & Depression Scale. Time 1 = assessment intake; Time 2 = pre-intervention; Time 3 = post-intervention.

3.5.4 Re-construing. The raw repertory grid data, to assess change in construing, was analysed first using the Idiogrid Software Package Version 2.4 (Grice, 2008), followed by data entry onto the PASW Statistics Version 21 (SPSS Inc, Chicago, Il, USA, 2012) in the same way as the aforementioned outcome measures. From the repertory grids, the following measures were obtained: the distance between elements, tightness, implicative dilemmas, sociality, changes in construing between pairs of grids. Non-parametric tests will be reported for implicative dilemmas and tightness due to problems of skewness in data. For the remaining Idiogrid measures, parametric tests will be employed. Descriptive statistics and planned comparison analyses for Idiogrid variables are shown in Table 3.6 below.

Table 3.6 Descriptive statistics and planned comparison analyses for the Idiogrid measures at time 1, time 2, and time 3

Grid measure	Time 1 (N = 25)	Time 2 (N = 25)	Time 3 (N = 25)	*Mean change score*	*95% CI*	Statistics [e]		ES [f]	Statistics [g]		ES [h]
	Mean (SD)	Mean (SD)	Mean (SD)	*T2 to T3*	*(T2-T3)*	2-tail *t*	*p*	*r*	1-tail *t*	*p*	*r*
Distances between elements [a]											
Self – ideal self	.76 (.30)	0.80 (.35)	.77 (.30)	.04	-.08 to .16	-.54	.59	.10	.66	.25	.13
Self – person with ASC	.80 (.30)	.73 (.35)	.89 (.29)	-.17	-.28 to -.05	.98	.34	.19	-3.00	.006* [i]	.52
Self – person without ASC	1.01 (.31)	.95 (.29)	.95 (32)	.0004	-.08 to .08	1.41	.17	.28	.01	.99 [i]	.002
Tightness [b]	59.26 (14.07)	58.14 (14.02)	53.75 (12.68)	4.39	.28 to 8.50	.50	.62	.11	2.20	.019*	.41
	Mean (SD)	*Mean* (SD)	*Mean* (SD)	Mean change score (T2-T3)	95% CI (T2-T3)	*z*	*p*	*r*	*z*	*p*	*r*
Implicative Dilemma [c]	5.34 (8.48)	5.87 (7.60)	5.68 (8.08)	.19	-2.63 to 3.02	-.82	.41	.12	-.18,	.42	.03
Sociality [d]											
How my family sees me	6.22 (3.60)	6.13 (3.61)	5.74 (3.31)	0.40	-.86 to 1.65	-.66	.51	.12	- .42	.34	.12
How my friends see me	4.67 (3.07)	5.11 (3.68)	5.59 (3.95)	-.47	-2.02 to 1.07	-.31	.76	.04	- .96	.17	.14

Note: ES = Effect size; *r* = Pearson's *r*; t = Paired t-test; z = Wilcoxon Signed Rank test; *p* = significance value; SD = standard deviation; Time 1 = baseline; Time 2 = pre-intervention; Time 3 = post-intervention.
[a] Standardised element Euclidean distance; [b] percentage of variance accounted by the first component in construing; [c] percentage of implicative dilemmas, [d] percentage total sum of squares, [e] Paired t-test/Wilcoxon Signed Rank test between time 1 and time 2 (baseline period); [f] Calculation of effect size between time 1 and time 2 on paired t-test/Wilcoxon Signed Rank test; [g] Paired t-test/Wilcoxon Signed Rank test between time 2 and time 3 (baseline period); [i] Calculation of effect size between time 2 and time 3 on paired t-test/Wilcoxon Signed Rank test [i] two-tailed directional hypotheses.
* Significant at *p*-level < .05

3.5.4.1 Distances between elements. A repeated ANOVA test did not reveal a main effect for time on the standardised Euclidean distance between self and ideal self, $F(2, 48) = .20$, $p = 0.82$. As shown in Table 3.5, the distance between *self* and *ideal self* increased somewhat between time 1 and time 2, followed by a decrease between time 2 and time 3, but these changes did not reach statistical significance. This finding was unexpected and therefore did not support the initial research hypothesis of greater self-esteem after the completion of the LEGO therapy.

In addition, the present study was interested in understanding how similar or dissimilar the participants construe the self to persons with and without ASC over the course of this study. A significant main effect of time was found in the distance between *self* and *person with ASC*, $F(2, 48) = 3.67$, $p = 0.03$ but not between *self* and *person without ASC*, $F(2, 48) = 1.28$, $p = 0.29$. Exploratory planned comparisons revealed no change in the distance between *self* and *person without ASC* between time 1 and time 2 (baseline period) or between time 2 and time 3 (intervention period). By contrast, analyses of planned comparisons indicated that the standardised Euclidean distance between *self* and *person with ASC* had significantly increased from time 2 to time 3, but not between time 1 and time 2, with a large effect size. Figure 3.9 illustrates the line graph of the mean distances between elements over the three time points.
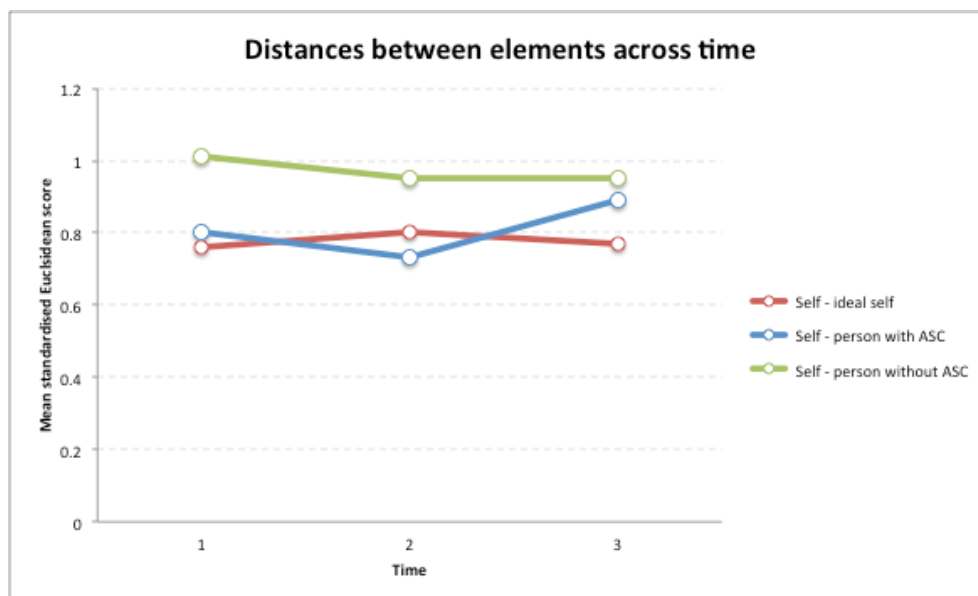
Figure 3.9 Line graph for Euclidean distance between elements across time. Larger distance between elements indicates dissimilarity in construing.

3.5.4.2 Tightness in construing. A repeated ANOVA indicated a main significant effect for time on the mean percentage variance accounted for by the first principal component, $F(2, 48) = 3.43$, $p = 0.04$. As shown in Table 3.6, the first planned comparison revealed that the percentage of variance

accounted by the first component reduced from time 1 to time 2, but this change did not reach statistical significance and the effect size was considered small. By contrast, the second planned comparison suggested that there was a reduction in the percentage of variance accounted for by the first component between time 2 and time 3 with this change being statistically significant.

As expected, the results indicated an overall loosening in participants' construing following the LEGO therapy intervention, which corresponded to a medium effect size. Therefore, the initial research hypothesis of less tightness in participants' construing following the LEGO therapy, but not after the baseline period, was supported. Figure 3.10 illustrates this change in the level of tightness across the time series.
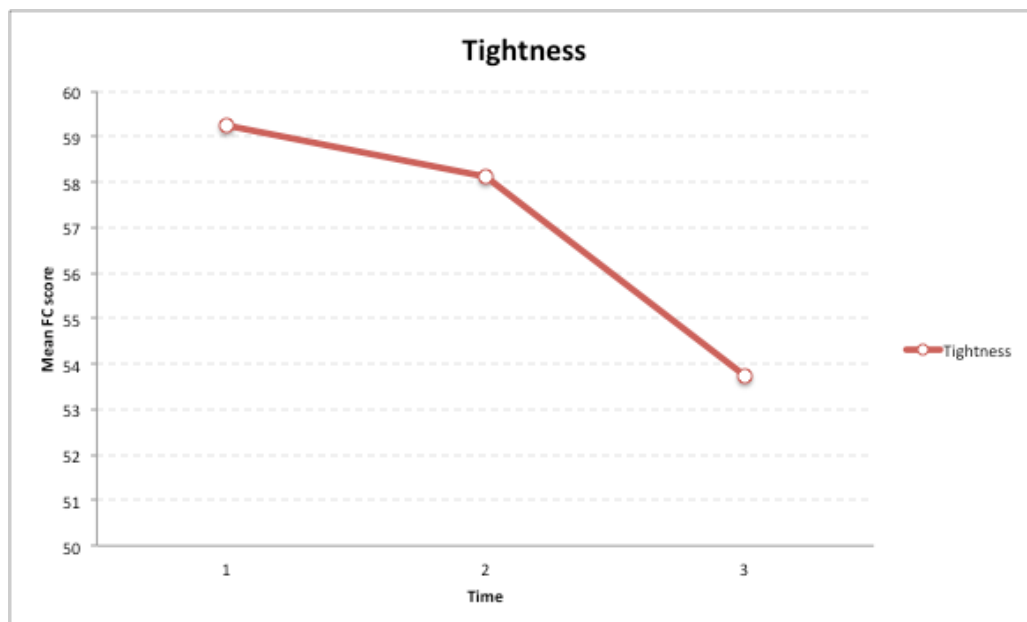
Figure 3.10 Line graph illustrating change in tightness across time. FC = first component accounted for variance in construing. Lower mean percentage of the first component accounted for variance in construing indicates looser construing.

3.5.4.3 Implicative dilemmas. A repeated Friedman's ANOVA indicated that the overall main effect for time was not significant (χ^2 (2, $N = 25$) = 1.49, $p = .48$). The first planned comparison showed no difference in the percentage of implicative dilemmas between time 1 and time 2. Whilst the second planned comparison showed a reduction in the percentage of implicative dilemmas from time 2 to time 3, this did not reach statistical significance either. Therefore, the findings suggest that the LEGO therapy intervention had no impact in resolving any implicative dilemmas for the participants. As such, the directional hypothesis of less implicative dilemma following the LEGO therapy intervention was not supported by the findings.

3.5.4.4 Sociality. Repeated Friedman's ANOVA revealed no significant main effect for time in the extent to which the participants imagined how their family see them (χ^2 (2, $N = 25$) = .56, p = .76) or how their friends see them (χ^2 (2, $N = 25$) = .96, p = .62). As shown in Table 3.6, contrary to the a priori hypothesis, the percentage sum of squares for the element *how my family sees me* reduced from time 1 to time 2 and from time 2 to time 3. Nonetheless, this observed change in sociality fell outside the significance level. With regards to the element *how my friends see me*, participants' ability to imagine how their friends see them changed in the same direction as the a priori hypothesis, that is, sociality increased from time 2 to time 3 but not between time 1 and time 2. Nevertheless, this change in sociality did not reach statistical significance either. In brief, these results indicate that participants' ability to engage in sociality had not improved over the course of the LEGO therapy intervention. The findings of small effect sizes also suggest that the intervention had no impact on sociality.

3.5.4.5 Psychological changes in construing over time. The overall correlation between pairs of grids was larger between time 1 and time 2 grids (M = .62; SD = .18) than between time 2 and time 3 grids (M = .55, SD = .18). A paired *t*-test showed that the difference between pairs of grids was significant (t(24) = 1.68, p = .05, one-tailed, 95% CI (-.01, .15). The effect size of this difference was considered medium (r = .32). In sum, the results are suggestive of a larger change in construing during the LEGO therapy than during the baseline period (see also Figure 3.11). Consequently, these findings are supportive of the research hypothesis that more change in construing would happen during the LEGO therapy intervention than during the baseline period, with a medium effect size.
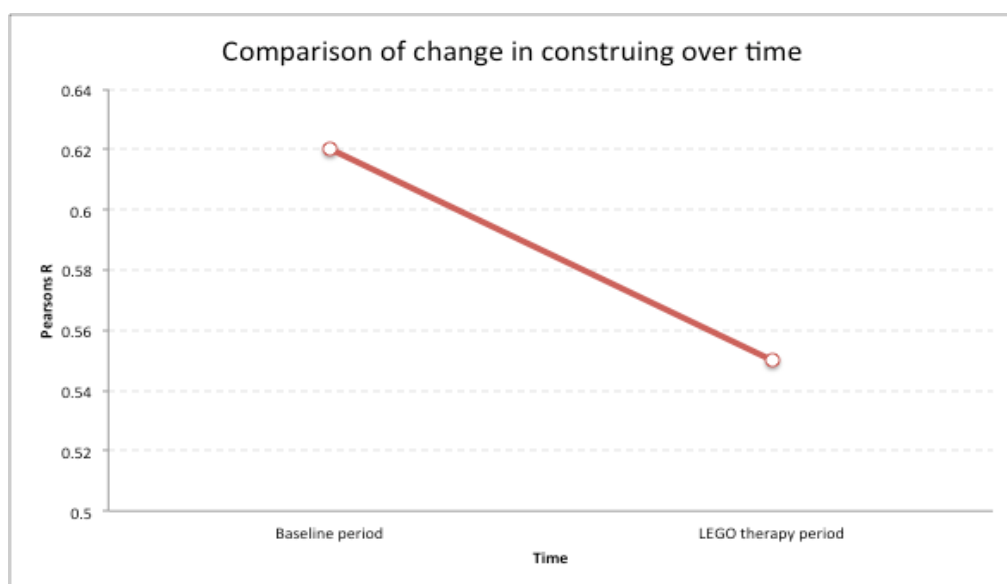
Figure 3.11 Comparison of change in construing during baseline period to that of LEGO therapy period. Low correlation indicates larger change in construing.

3.6 Associations between repertory grid and questionnaire measures during LEGO therapy

In order to explore the relationships of change scores between the repertory grids and questionnaire measures during the LEGO therapy period, Spearman's rho correlations were employed. Table 3.7 displays the significant Spearman correlations between change scores on repertory grid and questionnaire measures. There were only significant correlations between repertory grids and measures related to adaptation and psychopathology but not autism specific social competence or adaptive functioning.

Analyses of correlations suggested that participants who later construed themselves as more different from their ideal self showed an increase in hyperactivity by self-reports and an increase in panic problems by parent-reports. Moreover, participants who came to see themselves as more different from people with ASC showed a reduction in depression according to parent reports. In addition, participants who came to have a higher percentage of implicative dilemmas showed increased symptoms of parent-reported panic problems. Another interesting finding is related to tightness: increased tightness in participants' construing tended to be associated with reduction in internalising problems (e.g. total anxiety, total anxiety and depression, separation anxiety, social phobia, and emotional difficulties) according to parent-reports but increase in panic according to self-reports. Lastly, participants whose separation anxiety increased according to self-reports showed less change in construing.

Table 3.7 Significant Spearman rho correlations of change scores between repertory grids and questionnaire measures during LEGO therapy.

Measure	Self – ideal self distance	Self – person with ASC distance	Pre- and post- grids correlation	Tightness Cpt. I	Implicative Dilemma %
SDQ (parent)					
Emotional difficulties				- .42*	
SDQ (self)					
Hyperactivity/Inattention	.46*				
RCADS (parent)					
Total Anxiety				- .49*	
Total Anxiety and Depression				- .47*	
Separation anxiety				- .55*	
Panic	.41*				.41*
Social phobia				- .44*	
Depression		- .42*			
RCADS (self)					
Separation			.41*		
Panic				.43*	

Note: SDQ = Strengths and Difficulties Questionnaire; RCADS = Revised Child Anxiety and Depression Scale; Cpt. I = variance accounted for by first principal component

* $p < .05$ (two-tailed)

3.7 LEGO therapy evaluation feedback

Nineteen out of twenty five participants completed the evaluation feedback forms (76.0%). For the parents, fifteen out of twenty-five completed the evaluation feedback forms (60.0%). Below is a summary of the main findings.

3.7.1 Coping. As part of the CHI-ESQ questionnaire, participants were asked to rate items related to how they were coping prior to the LEGO therapy ("Before accessing support how were you coping?") as compared to after the LEGO therapy ("How are you coping now?") on a five-point Likert scale (1 = not coping; 2 = not very well, 3 = OK; 4 = quite well, 5 = very well). A paired t-test was conducted to investigate whether there was a change in the way they were coping pre- and post- LEGO therapy. Compared to prior to starting the LEGO therapy group ($M = 3.10$, SD = 1.05), participants felt that they were coping better after having attended the group ($M = 3.63$, SD = .89). This difference was statistically significant, $t(17) = -2.73$, $p = .01$, two-tailed, 95% CI (0.13, .98). The effect size was large ($r = .54$).

Similarly, parents of the participants were also asked how they felt that they and their children were coping prior to ("Before accessing support how were you/your child coping?") as opposed to post- the LEGO therapy group ("How are you both coping now?") on the same five-point Likert scale. The parents reported an increase in coping score from pre-intervention ($M = 2.93$, SD = .88) to post-intervention ($M = 3.53$, SD = .64). A paired t-test revealed a significant difference in coping by the parents over the course of the LEGO therapy, $t(14) = -3.15$, $p = .007$, two-tailed, 95% CI (.19, 1.01). The effect size was large ($r = .64$).

Overall the results from the coping item on the CHI-ESQ suggest that both participants and their parents had noticed a benefit of attending the LEGO therapy in terms of the way they are coping after the group as compared to how they had done previously.

3.7.2 Qualitative themes. The feedback forms also included open-ended questions to give the participants and their parents the opportunity to express what they found helpful or not helpful during the LEGO therapy. The following themes emerged from the data (See Appendix P for a mind map of the themes).

3.7.2.1 Building social bridges through LEGO. Most participants reported that they had enjoyed taking part in the LEGO Club as this gave them an opportunity to share their interest of playing with LEGO whilst building upon their social skills along the way.

"Making new friends and LEGO combined" (participant)

"Playing with LEGO and meeting new people" (participant)

3.7.2.2 Friendships. Although some parents felt that their child had made some friends, other parents felt that the group was too short to allow their children to form friendships.

"My child seemed happy and makes reference to children he sees as friends"(parent)

"Although he enjoyed the experience I don't think he feels he had made a friend. It would take a lot longer for him to feel a friendship with anyone" (parent)

This theme was also shared by some of the participants who felt that the group was too short to form friendships.

"Longer sessions (more weeks and time) preferably 12 weeks. 8 weeks felt too short to bond with people" (participant)

3.7.2.3 Working as a team is really hard work (but can also enjoyable). There was a strong narrative around teamwork, which a lot of the participants found challenging and difficult at times.

"Communication with others were difficult, some people I found more difficult to work with than others" (participant)

However, working in a group also gave the participants a sense of achievement and stood out as one of the highlights of the group sessions. See Appendix Q for illustrations for some of the end products of LEGO building in the smaller groups.

"When all of my group were working together as a team" (participant)

"After completion of the LEGO bionicles, we worked together as a team, all of us"(participant)

3.7.2.4 Being a girl in a boy dominated LEGO Club. Unfortunately, there were only a few girls attending the LEGO therapy group as a whole ($N =5$). The lack of girls in the LEGO therapy was expressed as a limitation for the girls who attended the LEGO therapy, as they felt more difficult to bond with boys than girls, in general.

"I was the only girl. The "treatment" wasn't flexible to my personal needs. I suspect that I was the only borderline case and couldn't understand how (after that) I could be expected (without being told I was) to "bond" with them"(female participant)

In addition to bonding, having other girls in the group created an atmosphere of enjoyment within the group context. Having LEGO sets (e.g. LEGO Friends) that were more tailored towards the female sex was also considered helpful. These findings suggest that LEGO therapy needs to be more tailored towards the needs of the female participants.

"When the group me and the two other girls and we played LEGO friends and making our own things" (female participant)

3.7.2.5 Keep calm and play with LEGO. Participants reported that the LEGO therapy was not only helpful to improve their social skills but also to help them manage their mental health difficulties.

"Attending the Lego Club felt very therapeutic, I left each session feeling more relaxed and calmed than when I first came" (participant)

"His willingness to attend shows he has been less anxious" (parent)

3.7.2.6 Building self-esteem. Several parents also felt that their children have improved their self-esteem over the course of this study.

"It has helped my son gain a little more confidence and helped his social skills" (parent)

"He started off by not wanting to talk much but after a few weeks he started talking more to his peers much more effectively" (parent)

3.7.2.7 Generalisation of social skills to other settings. A few participants mentioned that they were able to transfer the skills that they have learnt in the group to other social settings.

"It has helped me with my social skills. I found it easier to initiate conversations with people after attending the group"(participant)

This generalisation of social communication skills was also noted by the parents of the participants outside of the LEGO therapy group.

"LEGO is a big feature in our family. I have notice my daughter use the skills and terminology she has learnt from the club when playing with her sisters which has resulted in a more positive and enjoyable activity"(Parent)

"This (LEGO therapy) had a huge impact on his confidence and social capabilities. He did really well over Christmas working at Sainsbury's, something we would have never imagined he would have been brave enough to try" (parent)

Chapter four: Discussion

4.1 Chapter Overview

This chapter begins with a summary of the research findings in relation to the research questions. Then a discussion around the relevance of the findings to the theoretical and empirical literature will take place. Following from this, the author will discuss the methodological concerns, strengths and limitations of this study, the clinical implications, and recommendations for further study. Lastly, the thesis will present a summary and final conclusion of this study.

4.2 Summary of Results

A summary of the results relating to the research questions, as stated in the Introduction, is presented below.

4.2.1 Research question 1: Is LEGO®-based therapy effective in increasing social competence?
As expected, the results indicated that the parents of the participants rated a statistically significant, medium size, reduction in autism-specific social difficulties following LEGO®-based therapy but not during the baseline period. Anecdotal evidence from parents also suggested generalisation of social skills outside of the LEGO®-based therapy.

4.2.2 Research question 2: Can LEGO®-based therapy help with improving overall adaptive functioning in children and adolescents with HFASC?
These results are indicative that LEGO®-based therapy targets specific areas of adaptive functioning. In line with the initial research hypotheses, LEGO®-based therapy was found to have a positive impact on social and maladaptive behaviour but not on communicative adaptive behaviour for children and adolescents with ASC. The effect size for the significant results was of moderate size.

4.2.3 Research question 3: Does LEGO®-based therapy provide additional gains in comorbid psychopathology?
The initial hypothesis that the participants would improve in anxiety but no other areas of psychopathology following LEGO®-based therapy was partially supported. The present study only found significant reduction on self-reported social anxiety and on parent-reported separation anxiety but not on any other subscales of the Revised Children's Anxiety and Depression Scale between pre- and post-intervention assessments. Furthermore, a significant change, of large effect size, on the total problem score (conduct problems, hyperactivity and

inattention, peer problems, and emotional problems) of the Strengths and Difficulties Questionnaire was found following LEGO®-based therapy but not during the baseline period.

4.2.4 Research Question 4: Can sociality (or cognitive empathy) be improved following LEGO®-based therapy? Contrary to the initial hypothesis, the results from this study indicated that participants' ability to engage in sociality had not changed during the intervention period. The findings of small effect sizes also suggest that LEGO®-based therapy had no practical impact on sociality.

4.2.5 Research question 5: To what extent can LEGO®-based therapy facilitate change in construing? In line with the hypothesis, the result indicated a statistically significant greater overall change in participants' construing during the LEGO®-based therapy than during the baseline period. In addition, as would have been predicted, less tightness in construing was found following LEGO®-based therapy but not during the baseline period. The magnitude of these changes was moderate. Interestingly and somewhat unexpectedly, participants also construed themselves as significantly more different from people with ASC over the course of the LEGO®-based therapy. The effect size was large. No change in the percentage of implicative dilemmas was found during the baseline period or during the LEGO®-based therapy period.

4.2.6 Research question 6: How might changes in construing correlate with those on other outcome measures used in this study over the course of LEGO®-based therapy? Similarly to the baseline results, there were only significant correlations between change scores on the repertory grid and psychopathology variables. These results suggest that construing is associated with psychopathology but not with social competence or adaptive functioning. There are several relationships between changes in construing and psychopathology worth noting here. Firstly, participants' increased symptoms of psychopathology (hyperactivity, panic) were associated with lower self-esteem, which lends support to the documented relationship between internalising problems and lower self-esteem in children and adolescents with AS (e.g. Farrugia & Hudson, 2006; Russell & Sofronoff, 2005). Secondly, increased tightness in participants' construing tended to be associated with reduction in a number of internalising problems according to parent-reports but increase in panic by self-reports. This finding suggests that tightness in construing may increase or decrease symptoms of internalising problems depending on whether this is viewed from the parent or child perspective. Thirdly, when participants' internalising symptoms reduced during LEGO®-based therapy, there was an increase in construed dissimilarity

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between self and a person with ASC as well as greater overall change in construing. Lastly, there was an indication of a greater degree of positive change in internalising problems when implicative dilemmas reduced during LEGO®-based therapy.

4.2.7 Additional findings. According to the evaluation feedback forms, both participants and their parents reported a statistically significant increase, with a large effect size, in coping from pre- to post-LEGO®-based therapy intervention. Participants identified strengths (e.g. building with LEGO, group building, friendships) as well as weaknesses (e.g. short duration, small number of girls) of attending the LEGO®-based group. This group was well received both by participants and their parents, as indicated by the high attendance rate ($M = 89.5\%$) across the three groups. Taken together, these findings suggest that LEGO®-based therapy is feasible and acceptable as a social skills group based intervention in child and adolescent mental health settings.

4.3 Discussion of main findings

4.3.1 Social competence. The present study provides further support of using LEGO®-based therapy as a therapeutic medium to teach social skills, which has now consistently been reported in this study and in three other studies (LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). In terms of the practical effect of the LEGO®-based therapy on autism-specific social behaviour, the present study found a medium effect size, which is notably larger than the small effect size reported by Owens et al. (2008). Unlike the present study, Owen et al.'s (2008) analyses might have not been sufficiently powered to detect more than a small effect size owing to their sample size.

A number of studies, using structured observations, have demonstrated generalisation of social skills from the LEGO®-based therapy to the school playground (Andras, 2012; LeGoff, 2004; LeGoff & Sherman, 2006; Owens et al., 2008). In addition to the school playground, the qualitative data from this study provide complementary information about generalisation of social skills taught in the LEGO®-based therapy to the home, and even employment contexts. These tentative results of generalisation of social skills following LEGO®-based therapy are indeed encouraging given that there is little evidence of generalisation of social skills taught in social skills training programme (Reichow et al., 2013). One of the reasons for this generalisation of social skills might be the use of highly systemising, intrinsically rewarding materials that children and adolescents with HFASC are motivated to play with outside of the group (Owens et al., 2008). Taken together,

generalisation of LEGO®-based therapy to the school playground has been documented, and formal evaluation of generalisation to the home setting is needed in future studies.

4.3.2 Adaptive functioning. The positive gain in adaptive social functioning during LEGO®-based therapy has been documented by some studies (Brett, 2013; LeGoff & Sherman, 2006) but not all (Owens et al., 2008). Possible reasons for this inconsistency in outcome between studies could be due to methodological differences in sampling characteristics (children *vs.* children and adolescents), setting (clinic *vs.* school), and method of data collection of adaptive social functioning from the Vineland Adaptive Behaviour Scale (e.g. parent/carer form, semi-structured interviews with parent, teacher rating form).

For the purpose of cross study comparison with Owens et al.'s (2008) study, analyses were conducted both for the standard *v*-scale and raw maladaptive behaviour scores. Surprisingly, and somewhat unexpectedly, only the raw scores ($p = .04$) and not the standard *v*-scale ($p = .07$) scores of maladaptive behaviour revealed statistically significant improvement following LEGO®-based therapy. One suspects that this might be largely down to differences in the standard deviation of the scores. The significant result with the raw maladaptive score however is in line with the study conducted by Owens et al. (2008). That said, the *v*-scale score, in the new VABS-2, is considered more useful as it allows comparison to the same age group in the normative sample (Sparrow et al., 2005). But as Cohen said *"the primary product of a research inquiry is one or more measures of effect size, not P values"* (Cohen, 1990, *p*. 1310). Hence, when exploring the effect sizes for both of these planned comparisons, they both yield similar medium effect sizes, suggesting that the LEGO®-based therapy had a moderate effect on participants' maladaptive behaviour functioning. However, as the confidence intervals were rather wide and also included zero, the evidence reported by this study of an improvement of maladaptive behaviour through LEGO®-based therapy must be regarded as tentative. A replication study with a large sample size is required to obtain more precise estimates.

In terms of communicative adaptive functioning, the finding from this study confirms the notion by Owens et al. (2008) that LEGO®-based therapy does not target adaptive communicative behaviour. Participants' adaptive communicative behaviour is more likely to predict outcome on social adaptive behaviour (LeGoff & Sherman, 2006) rather than improve during LEGO®-based therapy.

4.3.3 Anxiety. With reference to the normative data of the Revised Children's Anxiety and Depression Scale, the different types of anxiety were high (32-68%) according to parent-reports but low by self-reports (8-36%). Similarly to the parent-reported figures of anxiety in this study, Simonoff et al. (2008) reported that 71% of their sample of children and adolescents with ASC (N = 112) met the criteria for comorbid psychiatric diagnoses, with social anxiety being the most reported one. These figures from this study and the previous study clearly indicate that anxiety is high among children and adolescents with ASC and HFASC. The finding that the participants and their parents reported improvements in different types of anxiety following LEGO®-based therapy is of interest and new to this area. While the anticipation of leaving home or a significant attachment figure is a feature of separation anxiety (APA, 2013), in children with ASC this might equally mean avoidance of social situations because of their difficulties with empathising instead of not wanting to leave their caregiver's side. The present study proposes that when participants felt less socially anxious in the LEGO®-based therapy they were more able to separate from their parents. In turn, this improvement in social anxiety over the course of the LEGO®-based therapy may have then been interpreted as a reduction in separation anxiety by their parents. The qualitative data from this study also support the notion that symptoms of anxiety have been reduced since attending the LEGO®-based group.

Several reasons are put forward for the reduction in symptoms of anxiety following LEGO®-based therapy. It is possible that the children and adolescents' needs were met through a highly systemised LEGO®-based play together with peers. For typically developing children, friendship has been found as a protective factor against internalising problems (Miller & Ingham, 1976). One can therefore hypothesise that friendship may also have helped to some extent to reduce symptoms of anxiety in children and adolescents with HFASC. Although this would explain the positive change in anxiety symptoms for some of the participants, as indicated by the qualitative data, many of them did not feel that the duration of the group was long enough to develop friendships. In addition, given the bi-directional relationship between social skills and social anxiety (Bellini, 2004), it is likely that the gain in social skills over the course of the LEGO®-based therapy might have reduced the symptoms of social anxiety and vice versa. From a personal construct psychology perspective; the systemising nature of the LEGO®-based therapy may enable participants to anticipate social events, which resulted in lessened anxiety. Taken together, based on the quantitative and the qualitative data, the present study suggests that LEGO®-based therapy can offer some additional improvement in social and separation anxiety for children and adolescents with HFASC. This is consistent with previous research reporting social skills

improvement and additional anxiety reduction in adolescents with ASC using interventions based on the social skills group format (Hillier et al., 2011; Tse et al. (2007).

4.3.4 Sociality The finding of no improvement in sociality, also referred to as cognitive empathy here, is somewhat surprising and inconsistent with the empathising-systemising theory, which suggests that the cognitive component of emotion recognition can be taught to individuals with ASC by using autism friendly, systemising interventions (Baron-Cohen, 2009; Baron-Cohen, Golan & Ashwin, 2009). For example, there is evidence that pre-school children with ASC attending the Transporters DVD intervention make greater gains in emotion comprehension and recognition skills (cognitive empathy) over a four-week period than a clinical control group while performing comparably to a typically developing comparison group (Golan et al., 2010). While both Transporters DVD and LEGO®-based therapy are considered highly systemising interventions, they differ in the format of delivery, which may explain why the former and not the latter facilitated improvement in cognitive empathy. For example, the Transporters DVD intervention requires younger children with ASC to repetitively watch a DVD with faces attached to moving vehicles. Repeating such mechanical systems is highly lawful as it allows predictability of emotions in front of a screen (Golan et al., 2010). It can be argued that in LEGO®-based therapy, although it uses a highly constructional system of LEGO, the group format of the social skills intervention and dealing with 'real' people and social challenges may not be as lawful or predictable (e.g. people might cry when they are sad but also when they are happy). Hence, recognising emotions and mental states of others may be more complex to teach in a naturalistic setting like LEGO®-based therapy where things are not always run as predictably or smoothly as with the Transporters DVD.

Another reason why this study did not find a difference between pre- and post-intervention might be the use of the repertory grid to capture change in sociality. Testing sociality using the repertory grid has not been attempted with individuals on the spectrum previously. It is possible that this measure was not sensitive or specific enough to assess changes in sociality over time within this sample. In the light of this, the results should be interpreted tentatively. Clearly, more research is needed to explore whether sociality, in particular the emotion recognition aspect, can be taught as part of LEGO®-based therapy, and the usefulness of the repertory grid to capture change in sociality over time in ASC.

The discussion so far in the literature and in this study has centred on teaching cognitive empathy using systemising principles. The reason for this is that there has been limited research into understanding affective empathy in ASC, and more importantly, whether this can be taught (Baron-Cohen et al., 2009). While the current study did not show any evidence of participants being more 'clued up' into how their family and friends see them, it is possible that participants made improvement in affective empathy. The author would argue that another key feature of LEGO®-based therapy was to teach participants how to respond to emotions (e.g. 'Amanda looks sad, what could we do to help her?'). From a theoretical perspective, it might be easy to separate *understanding* emotions (cognitive empathy) from *responding* to emotions (affective empathy). In practice, however, it is difficult to disentangle cognitive from affective empathy because some social challenges inevitably require both affect recognition and responding. It would be interesting to see whether advancement in fMRI in the future might enable the affective empathy component to be tested accurately with individuals with ASC (Baron-Cohen, 2009b).

4.3.5. Construing. Of important note, the construct systems of children and adolescents with ASC showed tighter construing prior to LEGO®-based therapy. This suggests more rigid thought processing styles, e.g. concrete thinking and lack of imagination. Consistent with the empathising-systemising theory of autism (Baron-Cohen, 2002), rigidity in thinking style may offer individuals with ASC some prediction of emotions and patterns in an otherwise rather unpredictable social world (Baron-Cohen, 2009b). In addition, it has been suggested that tight construing might act as a coping strategy to counteract any threat of anxiety in new situations (Gould, 2000). Social situations, may lead to the experience of anxiety for children and adolescents with HFASC owing to their difficulties with anticipating social events. Hence, adopting tight construing might help them to cope with anxiety. There was some evidence of this in the correlational analyses of this study, whereby an increase in tightness of construing was associated with reduction in symptoms of total anxiety, social, and separation anxiety during LEGO®-based therapy by parent-reports. As highlighted, there are obvious advantages for adopting tight construing among children and adolescents with HFASC. However, the disadvantage of tight construing is the lessened ability to think of alternatives, which can therefore lead to invalidation (McNair et al., 2015). Looser construing, on the other hand, protects the individual from the risk of invalidation (Winter, 1992). The present study found that LEGO®-based therapy had a moderate effect on loosening participants' construing, suggesting that LEGO®-based therapy may have increased the chances for new knowledge permeating the children and adolescents' construct system and therefore reduced the possibility of invalidation, in particular when it comes to social situations.

Interestingly and somewhat unexpectedly, participants also construed themselves as significantly more different from people with ASC over the course of the LEGO®-based therapy. The effect size was considered large. Tilki (2013) also reported that adults with Asperger's Syndrome construed individuals with Asperger's Syndrome as being more different from themselves than individuals without Asperger's Syndrome. One might hypothesise that as the participants started to gain more social skills and cope better in social situations, they may have started feeling more dissimilar from people with ASC, whom they may continue to construe as being socially deviant. Alternatively, ASC might have been too difficult for participants to construe in the first place, and obscured the results here.

There is good evidence that the element distance between *self* and *ideal self* is a reliable indicator of self-esteem for individuals with psychological difficulties (Randal et al., 2015). Although there was some improvement in self-esteem during the intervention period, this did not reach significance. Children and young people with ASC, especially the higher functioning end of the spectrum, have some awareness of their differences from typically developing peers (Attwood, 2007). This awareness, coupled with the discrepancy in personal construing of how they are (e.g. 'having no friends') and how they want to be ('having lots of friends) in social situations, might impact on their self-esteem. While there was some indication of friendships developing over the course of the group for the participants, it may be that for most of them, friendship is an on-going difficulty and this may reflect the apparent lack of improvement in their self-esteem over the course of LEGO®-based therapy.

However, anecdotal evidence from parents provided an indication of some improvement in children's self-esteem. For example, one parent reported that "*LEGO therapy had a huge impact on his confidence and social capabilities. He did really well over Christmas working at Sainsbury's, something we would have never imagined he would have been brave enough to try*". Given that the research literature tends to highlight disappointing employment outcomes for individuals with ASC (Hendricks, 2010), this finding shows that LEGO®-based therapy, at least for one young person with HFASC, can offer gains in self-esteem and social skills needed to improve his quality of life in the transitioning period from secondary to postsecondary years. As a whole, the evaluation of social skills group based interventions tends to focus mainly on social skills as an outcome measure. In agreement with Beeger et al. (2011), future studies should aim to evaluate whether quality of life is improved by the use of self-esteem measures for example.

4.4 Methodological Considerations. Several aspects of the study warrant discussion. This will focus on the areas of research design, ASC diagnoses, and use of outcome measures.

4.4.1 Design. A no treatment control group design was considered at the initial stage of this study. However, after careful deliberation, it was considered not feasible or appropriate for several reasons. On a practical level, having two groups would require a larger sample size and this was not sensible within the time frame given for this study. On a service and ethical level, assigning participants to a no treatment control group rather than the LEGO®-based therapy intervention raised ethical concerns, especially knowing that children and adolescents with ASC and their families were actively seeking support from the service in relation to core and comorbid difficulties. Moreover, participants and their families might be reluctant to take part in research if they are offered no treatment (Smith et al., 2007). For these reasons, the decision was made to use a repeated measure, waiting list control group design instead of a no treatment control group design.

4.4.2 Sample characteristics. The author recognises that the Autism Diagnostic Interview-Revised (Lord, Rutter & Le Couteur, 1994) and the Autism Diagnostic Observation System (Lord et al., 1989) are commonly used in research to confirm ASC diagnoses. However, this was not feasible in this study due to time and training constraints. Instead, the present study relied on information from parents and mental health services for the confirmation of ASC diagnoses. It is possible that this might have introduced some errors. Apart from one known case, there might have been other cases that might have not been true cases of ASC but instead have attention-deficit hyperactivity disorder or the new diagnosis of social communication disorder. As pointed out by Nguyen and Ronald (2014), "diagnostic substitution" is common in children and young people who require clinical attention. It is worth noting that all of our participants did obtain an Autism Index of 70 or above, indicating either 'possibly' or 'likely' autism, on the Gilliam Autism Rating Scale-2 (Gilliam, 2006), which is considered a well-respected measurement in clinical practice to identify and diagnose ASC in children and young people.

Furthermore, not all participants were referred to the CHUMS Service due to additional mental health problems. Some children were self-referred to the research study (e.g. local autism support service) or referred by another agency (e.g. Paediatrics). Although they are in the minority in the research study ($N = 6$), nonetheless this might not be truly representative of samples of children and adolescents with HFASC referred to the mental health services. Moreover, this might

also have reflected some of the lower psychopathology scores on the Revised Children's Anxiety and Depression Scale (Chorpita et al., 2000) and the Strengths and Difficulties Questionnaire (Goodman, 1999; 2001) respectively.

4.4.3 Outcome measures. While the Gilliam Autism Rating Scale (Gilliam, 2006) and the Vineland Adaptive Behaviour Scale (Sparrow et al., 2005) have been validated on children and adolescents with ASC, the psychometric properties of the remaining outcome measures; the Strengths and Difficulties Questionnaire (Goodman, 1999; 2001), the Revised Children Anxiety's and Depression Scale (Chorpita et al., 2000), and the repertory grid (Kelly, 1955), used in this study have not been validated in the ASC population.

The Revised Children's Anxiety and Depression Scale and the Strengths and Difficulties Questionnaire were considered the most appropriate at the time given that they have been recommended by the CAMHS Outreach Research Consortium (2011) and the service that the author collaborated with already used them as routine pre- and post- measures to capture psychopathology in children and young people. However, the cut off scores for psychopathology on each of the subscales for children and adolescents with ASC are questionable. Given that the current study found poor agreement between self- and parent- report on the Revised Children's Anxiety and Depression Scale, which is consistent with previous studies (Hallet et al., 2013; Kaat & Lecavalier, 2015), some level of caution needs to be maintained when interpreting the findings from the autistic population, with strong conclusions not being drawn from one single measure (personal communication with Chorpita on 18th February 2015).

With regards to the repertory grid, it is difficult to interpret some of the characteristics of construing without normative grid data. Furthermore, some of the grid measures are untested and are therefore subject to debate whether they accurately capture the meaning of the elements and concepts concerned, for example, the element person with ASC and the elements representing sociality (how my family sees me/how my friends see me). As with the Revised Children's Anxiety and Depression Scale and the Strengths and Difficulties Questionnaire, the interpretation of the results for the grid measures needs to be tentative.

4.5 Strengths and limitations of this study. It is important to highlight that no single research on psychosocial interventions in ASC is without its methodological challenges (see Smith et al., 2007). The present study is not without limitations either.

The sample size was relatively small ($N = 25$). Although, the present study had sufficient power to detect clinically significant effects of at least medium size, a larger sample size would have allowed more accurate and refined statistics regarding the effectiveness of LEGO®-based therapy for children and adolescents with HFASC.

With regards to the measurements, there are two limitations. The current study did not include a standard test of advanced theory of mind along with the repertory grid to capture change in sociality processes over the course of the present study. As mentioned by Mazza et al. (2014), the false belief test is a key feature in the evaluation of sociality abilities in individuals with ASC. As such, the present study is not able to address the extent of impairment of sociality in this sample and compare this to normative data. In addition, the present study did not incorporate a direct observation measure of generalisation of social skills to other settings. While this would have added richness to our data, in practice, it was considered not logistically feasible due to time constraints.

Furthermore, there are several sources of bias that may have impacted on the interpretation of the results. Firstly, it is possible that the selection of participants attending the group led to a positive selection bias, as they were more likely to benefit from this type of social skills intervention given their interests in building LEGO in general. It is questionable whether children and adolescents with HFASC who are not as keen on building LEGO would benefit to the same extent as the participants in our sample did. It is therefore likely that our findings are not representative of this subgroup, or of lower functioning subgroups either. Secondly, self- and parent-reports were used to assess change over the course of this study. Given that participants and their parents were not blind to the research aims of the LEGO®-based therapy, the author cannot rule out the effects of treatment expectancy from the participants and their parents, especially as they were not randomly allocated to the LEGO®-based group.

Thirdly, another potential source of bias is related to the characteristics of the co-facilitators. Nonetheless, the co-facilitators were trained to the same level and attended the same training offered by the author. In addition, the author was running all three groups, which hopefully kept the group format and content consistent across the groups. That said, the fact that the author was running the interventions and was not blind to the research hypotheses might have introduced another bias to the interpretation of the results. However, according to both child and parent evaluation feedback, they were in general very satisfied with the LEGO®-based therapy, and there

has been a subsequent demand for more LEGO®-based therapy groups like this to be run in the local area by the collaborating service. In fact, a few of the parents of the children who attended the LEGO®-based therapy decided to start their own parent-led LEGO®-based group in the community for children with ASC following the progress they noticed in their children. This gives some indication that the gains achieved over the course of the LEGO®-based group matched the qualitative data about the group being well received and respected by the participants and their parents.

Despite the above limitations, this study also had several strengths. The study managed to recruit participants with IQs being equivalent to the high functioning end of the spectrum. This is advantageous as previous studies suggest that IQ might be a confounding variable in autism research studies. This study followed the LEGO®-based therapy treatment manual. Lopata, Thomeer, Volker, Nida and Lee (2008) reported that improvement in social skills and behaviour was found when a treatment manual was used to guide the social skills intervention. The rationale of this study was based on clear theoretical frameworks, guiding both the choice of intervention and assessment tool. There was also a large volume of data collected to evaluate and capture the behavioural, psychiatric, and psychological changes in the participants during the course of LEGO®-based therapy and this information was collected by using different sources (parent, participants) and employing an autism-friendly, systemising assessment tool (repertory grid technique) as well as standardised questionnaires. The present study attempted to provide a complete report of statistical analyses, including confidence intervals and effect sizes, which have not been reported in previous studies. In addition, the group effect was controlled by randomly allocating participants to the small groups in each therapy session. Lastly, this study is considered to have high ecological validity. The groups were facilitated in a naturalistic, community based, mental health setting and the participants represent children and adolescents with ASC who would be typically seen in child and adolescent mental health services.

4.6 Implications of findings

4.6.1 Clinical Implications. There is a great deal of social skills group interventions, but only a few of them are guided by a theoretical framework. The current study was based on the empathising-systemising theory (Baron-Cohen, 2002), suggesting that individuals with ASC show preserved or superior systemising skills but impaired empathising ability. Conceptualising weaknesses in the social domain but relative strengths in the non-social domain using this theoretical framework is still in the infancy but highlights several clinical implications.

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As individuals on the spectrum are attracted to systems, this may be a way to promote cognitive empathy. The current study's lack of significant findings relating to sociality (cognitive empathy) suggests that emotion recognition cannot be taught over the course of this study. It may be that the group was too short, but a more likely reason is perhaps the use of the repertory grid to capture change in sociality, which may have not been sensitive or specific enough. Despite no change in cognitive empathy, using the attractions of constructional systems of LEGO coupled with a highly systemised content of LEGO®-based therapy facilitated improvement in autism specific social competence (e.g. aloofness, unaffectionate, eye contact) following LEGO®-based therapy. In addition to the improvement in social competence, the present study reported gains in adaptive functioning, anxiety and total problem behaviour, and construing. These findings are indeed promising as they suggest that even short-term LEGO®-based therapy can be beneficial. More importantly, these findings do support that using the principles of the emphasising-systemising theory can facilitate behavioural, psychiatric, and psychological changes for children and adolescents with HFASC.

Clinical impressions suggested that the participants were intrinsically motivated to attend the LEGO®-based therapy, as indicated by the high attendance and low dropout rate across the groups. One of the main reasons why LEGO®-based therapy was popular among children and adolescents with HFASC was the use of LEGO, a highly systemised and predictable toy, which is very familiar to them even outside of the LEGO®-based therapy setting, and not to say appealing to their autistic mind (Baron-Cohen, 2009b). This has also clear implications for learning, suggesting that a key to motivate learning and promote behavioural change in children is to use the child's own strengths and interests in systems, with LEGO being only one of many systems (Owens et al., 2008). Another important contribution of this finding is the notion that group-based social skills intervention that focuses on systemising may be an alternative to other evidence based interventions that draw heavily on learning theory to systematically shape behaviours such as Applied Behaviour Analysis (Baer, Wolf & Risley, 1968). On an ethical level, interventions that are based on the foundation of being intrinsically rewarding may be more ethically sound and autism friendly than those interventions guided by external reinforcers (Baron-Cohen, 2009a). While the study adds to the growing research evidence about the effectiveness of LEGO®-based therapy for children and adolescents with HFASC, this does not mean that systemising interventions may be beneficial to everyone on the spectrum owing to the heterogeneity.

Apart from LEGO®-based therapy, the present study also used the repertory grid, which the author proposes is another appealing system, centred on a mathematical system in this case. The current study has demonstrated the feasibility of administering this assessment technique with children and adolescents with HFASC. Consistent with past research (Hare et al., 1999), most children and young people with ASC in the present study also found this assessment technique intrinsically motivating to complete. Hence, the application of repertory grid technique in clinical practice may be a useful assessment and clinical tool with children and young people with high functioning ASC in order to gain an insight into how they make sense of themselves and others with and without ASC. Perhaps part of clinical work with them is to help them loosen their construing to avoid further invalidation (Winter, 1992) and the experience of anxiety.

As neither total problem behaviours nor anxiety are targeted by LEGO®-based therapy, these findings have important clinical implications, suggesting that social skills groups could potentially address both core social and comorbid psychopathology difficulties in children and adolescents with HFASC (Bellini, 2004; Ratcliffe et al., 2015). The current clinical recommendation for treatment of anxiety in children and young people with ASC is either individual or group based Cognitive Behavioural Therapy (National Institute for Clinical Excellence, 2013). Given the heterogeneity in ASC, not every child or young person with ASC will respond to Cognitive Behavioural Therapy. The result from the present study is indicative that LEGO®-based therapy may be offered as an alternative to Cognitive Behavioural Therapy to manage symptoms of anxiety amongst children and adolescents with HFASC, especially if their anxiety is related to social or separation anxiety.

4.6.2 Service implication. The National Institute for Clinical Excellence guidelines (2013) advocate full access to mental health services for children and adolescents with ASC. The quantitative findings from the present study add richness to this area and support the use of LEGO®-based therapy as an alternative or addition to the current treatment approaches offered within CAMHS to address core social behavioural difficulties and comorbid psychopathology for children and adolescents with high functioning ASC. Given that the group was modest in cost, relatively easy to set up and facilitated by mental health professionals within a mental health setting, the author proposes that this is a viable cost-effective, evidence-based intervention for children and adolescents with ASC and their families who seek treatment and support via the mental health route.

4.6.3 Implications for Clinical Psychologists. Clinical psychologists are expected to be 'scientist-practitioners' (Division of Clinical Psychology, 2010). A key feature of this is that of research evidence to inform clinical practice, but likewise, to use the experience from clinical practice to conduct research. This sounds very attractive in theory but in practice the clinical practice takes priority, which generally leaves the research part unfortunately on the sideline. It is important to recognise that Clinical Psychologists are in a strong position to carry out research to help advance health and social care. This study demonstrates that it was possible for a trainee Clinical Psychologist and qualified Clinical Psychologists to carry out 'real' research in clinical settings. The author hopes that this study will inspire and encourage current or future Clinical Psychologists to bridge the gap between research, theory and practice, whether this means specific interventions such as the LEGO®-based therapy or other psychosocial interventions that will help to promote the wellbeing, functioning and quality of life for children and young people with or without ASC.

4.7 Recommendations for future research

An important theme that emerged from the evaluation feedback was the experience of being a girl in a boy dominated LEGO club. The girls in this study felt that they might have enjoyed the group more if there were others girls in the group whom they could have bonded with on a social level. This finding is in line with the notion by Kasari et al. (2011) that girls connect better with girls and the same pattern for the male counterparts. Our limited number of five female participants did not allow meaningful exploration of gender difference in LEGO®-based therapy. It might be important for future research to look into the qualitative exploration of girls' experience of attending LEGO®-based therapy in more detail and to incorporate a larger number of girls in the groups in order to compare social improvements by gender in LEGO®-based therapy.

Although the Revised Children's Anxiety and Depression Scale and the Strengths and Difficulties Questionnaire were acceptable for the purpose of this study, future research should use validated anxiety measures to assess levels of anxiety among children and adolescents with ASC. It was brought to the attention of the author that a new, adapted version of the Revised Children's Anxiety and Depression Scale for children and adolescent with ASC specifically was released, namely the Anxiety Scale for Children with Autism Spectrum Disorder (Rodgers, Wigham, McConachie, Freeston, Honey & Parr, 2016), following the completion of this study. With hindsight, the Anxiety Scale for Children with Autism Spectrum Disorders might have been more appropriate but was unfortunately not available at the time this study was conducted. However,

using this measure, which is validated on children and adolescents with ASC, might be able to shed light into whether LEGO®-based therapy can promote reduction in symptoms of anxiety.

This study only reported change during baseline and intervention periods. It would be helpful to carry out follow-up assessments of whether gains from LEGO®-based therapy are maintained in the long-term, which is a weakness in this area as a whole. Only one study so far has considered the long-term impact of LEGO®-based therapy for children and adolescents with HFASC (LeGoff & Sherman, 2006). There is potential scope for the CHUMS Service to collect follow-up data for the LEGO®-based therapy on the Revised Child Anxiety and Depression Scale and Strengths and Difficulties Questionnaire separately within the near future.

There are now a growing number of studies, including this study, showing the effectiveness of LEGO®-based therapy for children and adolescents with ASC. Future studies should now involve larger randomised controlled trials, which have still not been conducted in this area. Another interesting possibility would be to look into whether LEGO®-based therapy can benefit other conditions in children, such as social anxiety or social communication disorders.

Lastly, while this study adopted the theoretical framework of the empathizing-systemising theory, it is still difficult to know whether this was the active ingredient of LEGO®-based therapy that contributed to the positive gains seen in children and adolescents with HFASC. Currently, we are still unclear about the active set of mechanisms underlying the positive findings of LEGO®-based therapy. Thus, the present study suggests further research in this area to examine the active mechanisms of change in LEGO®-based therapy.

4.8 Final summary and conclusion

This is, to the best of the author's knowledge, the first study to investigate the effectiveness of LEGO®-based therapy with older children and adolescents with HFASC within a mental health setting in the United Kingdom. The findings from the current study are indeed encouraging as they suggest that gains are possible even if the therapy is delivered as a short intervention of eight weeks within a naturalistic outpatient mental health setting. New to this area was the inclusion of psychiatric outcome measures as well as the use of repertory grid technique to capture change in construing over the course of the LEGO®-based therapy. Despite the methodological limitations, the present study indicated statistically significant findings across autism specific social behaviours, adaptive functioning, psychopathology, and construing. The effect size for the

significant results was of moderate to large size. In the light of the initial findings, the present study offers support for using the empathising-systemising theory to promote learning and behavioural change in an intrinsically motivating and autism-friendly way. After all, learning should be fun, motivating, and inspiring. Our findings suggest that LEGO®-based therapy is a viable cost-effective, evidence-based intervention for children and adolescents with ASC and their families within the child and adolescent mental health services.

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Appendices

Appendix A: DSM-V diagnostic criteria for Autism Spectrum Conditions

Appendix B: Kelly's (1955) 11 corollaries

Appendix C: Literature review search strategy

Appendix D: Recruitment letter

Appendix E: Interview Schedule

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Appendix G: LEGO therapy evaluation feedback form - participants

Appendix H: LEGO therapy evaluation feedback form - parents

Appendix I: Ethical approval - University of Hertfordshire

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Appendix A: DSM-V Criteria of Autism Spectrum Conditions (APA, 2013).

Social Communication & Social Interaction	Restricted, repetitive behaviour, interests, activities

Persistent deficits in social communication and social interaction across multiple contexts, as manifested by all three of the following, currently or by history:
   1. Deficits in social-emotional reciprocity, ranging, for example, from abnormal social approach and failure of normal back-and-forth conversation; to reduced sharing of interests, emotions, or affect; to failure to initiate or respond to social interactions.
	Restricted, repetitive patterns of behaviour, interests, or activities, as manifested by at least two of the following, currently or by history:
	   1. Stereotyped or repetitive motor movements, use of objects, or speech (e.g. simple motor stereotypes, lining up toys or flipping objects, echolalia, idiosyncratic phrases).
	   2. Insistence on sameness, inflexible adherence to routines, or ritualised patterns or verbal nonverbal behaviour

2. Deficits in nonverbal communicative behaviours used for social interaction, ranging, for example, from poorly integrated verbal and non-verbal communication; to abnormalities in eye contact and body language or deficits in understanding and use of gestures; to a total lack of facial expressions and nonverbal communication.	(e.g. extreme distress at small changes, difficulties with transitions, rigid thinking patterns, greeting rituals, need to make same route or eat same food every day).
3. Deficits in developing, maintaining, and understanding relationships, ranging, for example, from difficulties adjusting behaviour to suit various social contexts; to difficulties in sharing imaginative play or in making friends; to absence of interests in peers.	3. Highly restricted, fixated interests that are abnormal in intensity or focus (e.g. strong attachment to or preoccupation with unusual objects, excessively circumscribed or perseverative interest).
	4. Hyper- or hyporeactivity to sensory input or unusual interests in sensory aspects of the environment (e.g. apparent indifference to pain/temperature, adverse response to specific sounds or textures, excessive smelling or touching of objects, visual fascination with lights or movement).

Appendix B: Brief introduction to Kelly's 11 corollaries. This information is extracted from Winter & Viney (2005), p. 366-367.

Construction corollary

'A person's anticipates events by construing their replications' (Kelly, 1955, p.50). We search for repeated themes in our experiences of our world, identifying similarities and differences between events.

Individuality corollary

'Persons differ from each other in their constructions of events' (Kelly, 1955, p.55) No two people are very likely to construe an event in exactly the same way.

Organization corollary

'Each person characteristically evolves, for his convenience in anticipating events, a construction system embracing ordinal relationships between constructs' (Kelly, 1955, p.56). Constructs may be viewed as 'transparent patterns or templates' that the person 'creates and then attempts to fit over the realities of which the world is composed' (Kelly, 1955. p. 8-9). They are organized in a hierarchical system in which some are superordinate to others.

Dichotomy corollary

'A person chooses for himself that alternative in a dichotomized construct through which he anticipates the greater possibility for the extension and definition of his system' (Kelly, 1955, p.64). Our choices are essentially elaborative rather than hedonistic, being directed towards maximizing our capacity to anticipate our world rather than maximizing our level of pleasure.

Range corollary

'A construct is convenient for the anticipation of a finite range of events only' (Kelly, 1955, p.68). Each construct has a focus of convenience, the area of its maximum usefulness, and a range of convenience, an area in which it can still be applied but less well.

Experience corollary

'A person's construction system varies as he successively construes the replication of events' (Kelly, 1955, p.72). Our predictions of events may be validated or invalidated, and this will generally results in either the strengthening or the modification of the constructions concerned.

Modulation corollary

'The variation in a person's construction system is limited by the permeability of the constructs within whose ranges of convenience the variants lie' (Kelly, 1955, p.77). A permeable construct is one that may be readily applied to new elements of the person's experience: 'good-bad-, for example, is likely to be more permeable construct for most people than is 'Theravada Buddhist-Zen Buddhist'.

Fragmentation corollary

'A person may successively employ a variety of construction subsystems which are inferentially incompatible with each other' (Kelly, 1955, p. 83). Construct systems do not have to be entirely logically organized, and inconsistent subsystems may be tolerated if the person's superordinate constructs are sufficiently permeable to subsume these.

Commonality corollary

'To the extent that one person employs a construction of experience which is similar to that employed by another, his processes are psychologically similar to those of the other person' (Kelly, 1955, p.90). Especially within a particular culture group, there may be similarities within aspects of people's construing and therefore of their 'behaviour'.

Sociality corollary

'To the extent that one person construes the construction process of another, he may play a role in a social process involving the other person' (Kelly, 1955, p.95). The essence of social relationships, including the therapeutic relationships, is the attempt to see the world through the other person's eyes.

Appendix C: Systematic Literature Review on LEGO therapy

Rationale for the systematic literature review

The primary rationale for this systematic literature review was to critically evaluating the current evidence-base for LEGO therapy for children and adolescents with Autism Spectrum Conditions, high functioning Autism Spectrum Conditions, and High Functioning Autism or Asperger's syndrome.

Search Strategies

When first developing this research study, the author was in contact with Dr Gomez de La Cuesta (co-author of the LEGO-Based® Therapy Manual) who highlighted some relevant empirical papers ($N = 4$) within this area. In addition to these papers, the author also conducted a systematic literature

review. The following databases were searched on 4th April 2016: *Education Research Complete, Google Scholar, PubMed, PsychArticles, and Web of Science*. The review was limited to published empirical studies and unpublished dissertations from 2004 and onwards. Only studies containing participants with children and adolescents with Autism Spectrum Conditions (aged 6-18 years) were included. Pre-school children and adults with Autism Spectrum Conditions or children with social related conditions but not on the autism spectrum were excluded from this review. In addition, studies that only described LEGO therapy but did not deliver LEGO therapy to children and/or adolescents with Autism Spectrum Conditions were also excluded. Results were also limited to articles published in English in peer reviewed journals/unpublished doctoral dissertations. In addition to Table 1 below illustrates the search engines and terms used for this thesis.

Table 1. Key search terms	
AND	**OR**
LEGO therapy	LEGO play
	LEGO Club
	LEGO play therapy
	Systemising play
Peer interaction	Social Interaction
	Social skills
	Social competence
	Social Development
Autism Spectrum Disorders	Asperger Syndrome
	High Functioning Autism
	Autism Spectrum Conditions
	Autism
	Pervasive Developmental Disorders – Not Other Specified

Figure 1 below illustrates the CONSORT flow diagram regarding the inclusion and exclusion criteria of articles at each stage of the systematic literature review.

```
┌─────────────────────────────────────┐
│ 783 articles identified through     │
│ database searching:                 │
│ Education Research Complete (n = 4)  │
│ Google Scholar (n = 767)            │
│ PubMed (n = 6)                      │
│ PsychArticles (n = 1)               │
│ Web of Science (n = 5)              │
└─────────────────────────────────────┘
              │
              │────────────────────────────────►  ┌──────────────────────┐
              │                                    │ Duplicates n = 121   │
              ▼                                    └──────────────────────┘
┌──────────────────────┐          ┌──────────────────────────────────────┐
│ Titles screened, n = │─────────►│ Excluded following title screen,     │
│ 662                  │          │ n = 618 (did not include information │
└──────────────────────┘          │ about LEGO therapy, not with         │
              │                   │ individuals on the spectrum, not     │
              │                   │ social skills interventions)         │
              ▼                   └──────────────────────────────────────┘
┌──────────────────────┐          ┌──────────────────────────────────────┐
│ Abstracts screened,  │─────────►│ Excluded following abstract screen,  │
│ n = 44               │          │ n = 18 (not published in a peer-     │
└──────────────────────┘          │ reviewed journal, not able to access │
              │                   │ full article, not with individuals   │
              │                   │ on the spectrum, not group based     │
              │                   │ social skills interventions, not in  │
              │                   │ English)                             │
              ▼                   └──────────────────────────────────────┘
┌──────────────────────┐          ┌──────────────────────────────────────┐
│ 26 articles full-text│─────────►│ Excluded following full text screen  │
│ assessed for         │          │ n = 19 (not social skills or peer    │
│ eligibility          │          │ intervention, not empirical research,│
└──────────────────────┘          │ reviews, not social skills based     │
              │                   │ group, duplicate of study, too young)│
              ▼                   └──────────────────────────────────────┘
┌──────────────────────┐          ┌──────────────────────────────────────┐
│ Hand searching of    │─────────►│ Excluded due to duplication, n = 2   │
│ key author (n = 1).  │          └──────────────────────────────────────┘
│ Contacting key author│
│ resulted in four     │
│ research papers.     │
└──────────────────────┘
              │
              ▼
┌──────────────────────┐
│ Papers fulfilling    │
│ entry criteria:      │
│ Published papers,    │
│ n = 8                │
│ Unpublished doctoral │
│ dissertations,       │
│ n = 2                │
└──────────────────────┘
```

Figure 1. CONSORT flow diagram

LEGO Club

Evidence Based Social Skills Club for Lego Fans (age 10-18 years)

This study offers an opportunity for young people to engage with peers and improve their social interactions (e.g. turn taking, problem solving, sharing) through fun collaborative Lego building. Groups are for young people with Autism Spectrum Disorders, High Functioning Autism, Asperger Syndrome, and Autism.

For more information, please contact CHUMS, Child Bereavement, Trauma and Emotional Wellbeing Service (telephone 01525863924) or Camilla Nguyen (telephone 074 00909130, e-mail c.nguyen2@herts.ac.uk).

This study has received ethical approval from the University of Hertfordshire, the Health and Human Sciences ECDA (protocol number: LMS/PG/UH/00346) and CHUMS, Child Bereavement & Trauma Service.

Saturdays (8 sessions)
19th September – 14th November (no session on 31st October)
Start time to be confirmed
Location: CHUMS

Appendix E: Assessment schedule

Lego-Based Therapy for Intake Assessment

Interviewer: _____

Date of Interview: _____

Identifying Information

Name:_____

DOB:_____

Chronological Age: _____

Gender: Male ☐   Female ☐

Ethnicity: _____

Parent(s)/Guardian(s): _____

Address:

_____

_____

Phone: _____

Email: _____

School:_____

Educational support: _____

Developmental Information

Actual or Estimated Full Scale IQ:_____   VIQ: _____   PIQ: _____

Adaptive Functioning:

        Language: _____ Above age level
                                          _____ Age level
                                          _____ Mild delay
                                          _____ Moderate delay
                                          _____ Severe delay

        Communication: _____ Above age level
                                          _____ Age level

```
                                    _____ Mild delay
                                    _____ Moderate delay
                                    _____ Severe delay


Social Development:                 _____ Above age level
                                    _____ Age level
                                    _____ Mild delay
                                    _____ Moderate delay
                                    _____ Severe delay


Fine Motor:                         _____ Above age level
                                    _____ Age level
                                    _____ Mild delay
                                    _____ Moderate delay
                                    _____ Severe delay


Gross Motor:                        _____ Above age level
                                    _____ Age level
                                    _____ Mild delay
                                    _____ Moderate delay
                                    _____ Severe delay


Self-Help:                          _____ Above age level
                                    _____ Age level
                                    _____ Mild delay
                                    _____ Moderate delay
                                    _____ Severe delay
```

Diagnosis:_____

Age of
diagnosis:_____

Place of
diagnosis:_____

Name and profession of clinician who made the diagnosis: _____

_____

Previous or Current
Treatment/Intervention:_____

Medications: _____

Social Development

Friendships: _____

_____

Peer Preferences: _____

_____

Play Activities: _____

_____

Autistic Features

Stigmatizing or Stereotyped Behaviours: _____

_____

Obsessive Interests: _____

_____

Interfering/Disruptive Behaviours: _____

Casual/Setting Events for Interfering Behaviours: _____

_____

Casual/Setting Events for Prosocial Behaviours: _____

_____

Appendix F: Repertory grid example

Emergent Pole 1	Self	Ideal Self – How I would like to be	Self in the future/adult	Self with friends	A person I like – Belle	A person I dislike – Amber	How my family sees me	How my friends see me	A person with autism - Matthew	A person without autism – Allistair	Contrast Pole 7
Funny	2	1	3	2	2	6	4	4	2	3	Annoying
Active	2	1	2	3	2	7	3	3	4	3	Lazy
Enthusiastic	1	1	1	1	2	7	2	1	2	3	Not enthusiastic
Psychopathic	7	7	7	6	7	1	6	6	6	7	Sane
Crazy	5	6	5	4	6	1	6	5	5	5	Very happy
Abusive	7	7	7	7	7	2	6	6	6	6	Kind
Caring	1	1	1	2	1	7	2	2	3	2	Not very nice
Less arrogant	2	1	2	2	1	7	3	2	2	2	More arrogant
Helpful	1	1	1	2	1	7	3	2	2	3	Aggravating
Autistic	4	7	5	3	4	2	3	2	5	2	Not Autistic
Live in own world	3	6	5	4	6	3	2	4	3	4	Part of the community/society

Appendix G: LEGO therapy evaluation feedback form - participants

Lego group participant evaluation form

Your age _____   Date _____

Which group did you attend? (please tick one of the choices below)

☐ Saturday AM   ☐ Saturday PM   ☐ Monday PM

1. What were the best things about the Lego Club?

2. What did you find most challenging or difficult about Lego Club?

3. Highlight any moments that stood out as being particularly good.

4. What would make the Lego Club better?

5. How much fun was it to attend the Lego Club?

1	2	3	4	5
Awful	Not very good	Good	Really Good	Brilliant

6. Would you recommend the Lego Club to someone with autism/ASD/Asperger's?

Please tick the relevant box:

Yes	No	Don't know

Please give this back to Camilla before you leave. Thank you!

Lego group parent evaluation form

Date _____

Which group did your child attend? (please tick one of the choices below)

| | Saturday AM | | Saturday PM | | Monday PM |

How satisfied or dissatisfied were you with the Lego Club?

1	2	3	4	5
Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Very satisfied

Please rate the following statements:

1. There is a need for more of these groups in child and adolescent mental health settings

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

Comments

2. I would recommend the Lego Club to other parents

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

<div style="border:1px solid blue">

Comments

</div>

3. My child made a friend whilst attending the Lego club

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

<div style="border:1px solid blue">

Comments

</div>

3. I have noticed a change in my child from attending the Lego club

1	2	3	4	5
Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree

<div style="border:1px solid blue">

Comments

</div>

<div style="border:1px solid blue">

Any other comments…

</div>

Please give this to Camilla before you leave. Thank you!

Appendix I: Ethical approval

UNIVERSITY OF HERTFORDSHIRE
HEALTH & HUMAN SCIENCES

ETHICS APPROVAL NOTIFICATION

TO   Camila Nguyen

CC   David Winter

FROM   Dr Richard Southern, Health and Human Sciences ECDA Chairman

DATE   24/03/2015

Protocol number: **LMS/PG/UH/00346**

Title of study: Sociality in Autism:can LEGO® - Based Therapy Increase Social Skills for Adolescents with ASC.

Your application for ethical approval has been accepted and approved by the ECDA for your school.

This approval is valid:

From: 24/03/2015

To: 01/06/2016

Please note:

Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1. Should you amend any aspect of your research, or wish to apply for an extension to your study, you will need your supervisor's approval and must complete and submit form EC2. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1 may need to be completed prior to the study being undertaken.

Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately. Failure to report adverse circumstance/s would be considered misconduct.

Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Students must include this Approval Notification with their submission.

Appendix J: Amended ethical approval

UNIVERSITY OF HERTFORDSHIRE
HEALTH AND HUMAN SCIENCES

ETHICS APPROVAL NOTIFICATION

TO	Camilla Nguyen
CC	Professor David Winter
FROM	Dr Richard Southern, Health and Human Sciences ECDA Chairman
DATE	7/3/16

Protocol number: aLMS/PG/UH/00346

Title of study: Sociality in Autism: can LEGO®-Based Therapy Increase Social Skills for Children and Adolescents with ASC

Your application to modify the existing protocol as detailed below has been accepted and approved by the ECDA for your School.

Modification:

Change of title to that noted above;

Widening of age criteria for participants to include 9-16 year olds;

Recruitment of participants for the CHUMS Emotional Wellbeing and Emotional Service;

Inclusion of SDQ and RCADS at 4 months follow-up.

This approval is valid:

From: 7/3/16

To: 1/6/16

Please note:

Any conditions relating to the original protocol approval remain and must be complied with.

Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1 or as detailed in the EC2 request. Should you amend any further aspect of your research, or wish to apply for an extension to your study, you will need your supervisor's approval and must complete and submit a further EC2 request. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1 may need to be completed prior to the study being undertaken.

Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be

Appendix K: CHUMS Internal Ethics Approval

Camilla Nguyen

Dear Camilla,

Re: Lego Therapy Project

This letter provides written confirmation that CHUMS has agreed to provide premises for the Lego Therapy research project, subject to ethics clearance.

Please do not hesitate to contact me should you have any questions or concerns.

Yours sincerely

Dr Hannah Baron
Clinical Psychologist

Appendix L: Information sheet and consent form (9-14 years old)

Information sheet for young person (9-14 years)

Title of Study:
Lego Club with young people with autism: building people and communication skills through the use of Lego
This leaflet tells you about the research study and why you have been chosen for this study.

Introduction
My name is Camilla Nguyen and I am a Clinical Psychologist in training at the University of Hertfordshire. I am interested in understanding the development of people and communication skills in autism, especially through LEGO play.

Why running LEGO Club?
The idea behind LEGO Club is to use your own interest in LEGO to help you with things you might struggle with such as following social rules, using names, and problem solving.

Why me?
You live in an area, which has been chosen to take part in this study. Your CHUMS service is sending the leaflet to young people who are 10 years and above with autism to take part in a LEGO Club.

Do I have to take part in this study?
If you don't want to be in this study, you don't have to. Remember, being in this study is up to you and no one will be upset if you don't want to take part or even if you change your mind later and want to stop.

What do I have to do?
In the first session, I will be inviting you and your family to come along so that you can complete some short question sheets about yourself. I will also test your mental ability, skills and behavior in using Lego. I also need you to think about yourself in different situations and how other people might see you. This will take between 1.5 to 2 hours.
Following the assessment, there will be some wait before the LEGO Club begins. The LEGO Club will then run for 8 weeks and last around 1.5 hours each time. The Club will take place in a local church, clinic or school. You will have the chance to play with other young people with autism and work as a team to complete set of Lego models. You will have some free time afterwards to play with the Lego if you want to.

I will also ask you to complete some short question sheets and ask you again to think about yourself in different situations and also think about how other people might see you. I will arrange a place for us to meet, for example in the clinic, hospital, or home etc. This will last approximately 1 hour.

Are there any possible benefits if I participate?
You may benefit from attending the LEGO Club by gaining people and communication skills and making new friends in the group.

Are there any possible risks or discomforts that I can expect from this study?

Children and young people who have been to the LEGO club in the past have said that they enjoyed taking part so we are not expecting any discomforts for you when coming to the LEGO Club.

What will happen to the information I give?
The written information will be kept safe in a cupboard and all computers will have a password. I will not tell anyone what you say in the interview or what you did in the LEGO Club. But, if you tell me that you or someone else is being hurt I might need to tell someone else.

What will happen to the results of the research study?
At the end of the project, I will write up the findings in a report. Your name will be kept secret in the write up or any publication.

Who can I contact if I have any questions?
If you would like further information or would like to discuss any details personally, please get in touch with me, Camilla Nguyen, and I will do my best to answer your questions (tel: 074 00909130; e-mail c.nguyen2@herts.ac.uk).

Thank you very much for reading this information and giving consideration to taking part in this study.

SIGNATURE OF STUDY PARTICIPANT

I understand the study described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____
Name of Participant

_____   _____
Signature of Participant   Date

SIGNATURE OF PERSON OBTAINING ASSENT (to be completed by Camilla Nguyen**)**

In my judgment the participant is voluntarily and knowingly agreeing to participate in this research study.

_____   _____
Name of Person Obtaining Assent   Contact Number

_____   _____
Signature of Person Obtaining Assent   Date

Appendix M: Information sheet and consent form (15-18 years old)

Information Sheet for Young Person (aged 15-18)

Title of Study:
Lego Club with young people with autism: building social skills through the use of Lego

Introduction
My name is Camilla Nguyen and I am a Trainee Clinical Psychologist at the University of Hertfordshire. I am asking you to take part in a study because I am interested in understanding how young people with autism develop social skills. You were selected as a possible participant to attend the LEGO Club because you have a diagnosis of autism and are between 10-18 years old. More importantly, you have a special interest in playing with Lego.

What is the aim of the research?
The aim of the research is to encourage young people with autism to develop a range of social skills that they might struggle in day-to-day situations such as taking turns, following rules, using names, and problem solving.

Do I have to take part in this study?
Please talk this over with your parents before you decide whether or not to participate. We will ask your parents to give their permission for you to take part in this study. But even if your parents say "yes" you can still decide not to do this.
If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to participate or even if you change your mind later and want to stop.

What will happen to me if I take part?
If you volunteer to participate in this study, you and your parent will be invited to an initial assessment session. During the session, I will assess your intelligence, skills and behaviour in using Lego. I will also ask you to think about yourself in different situations and also think about how other people might see you. The session will last between 1.5 to 2 hours.

Following the assessment, there will be an 8-weeks wait before you can attend the LEGO Club. The LEGO Club will run for 8 weeks and lasting 1.5 hours each session. This will take place in a clinic, local church or school. During the LEGO Club, you will have the opportunity to interact with other young people with autism and work as a team to complete set of Lego models. By the end of each session, you will also be given time to play freely with Lego models you have built.

In the fourth and last week of the LEGO Club, I will also ask you to complete some questionnaires and ask you again to think about yourself in different situations and also think about how other people might see you. I will arrange a place for us to meet, for example in the clinic, hospital, or home etc. This will last approximately 1 hour.

Are there any possible benefits if I participate?
You may benefit from attending the LEGO Club by social skills and making new friends in the group.

Are there any possible risks or discomforts that I can expect from this study?

It is unlikely that you will feel suffer from pain or anxiety by attending the LEGO Club. The LEGO Club will be structured, which means that it will be easy for you to follow and to know what to expect. If you find it difficult to be in the group then there will be a member of staff you can talk to. You can also choose to stop or leave the group whenever you want to.

Will I receive any payment if I participate in this study?
You will receive no payment for your participation.

What will happen to the information I give?
The written information will be kept safe in a cupboard and all computers will have a password. I will not tell anyone what you say in the interview or what you did in the LEGO Club. But, if you tell me that you or someone else is being hurt I might to tell someone else. Before I do so, I will talk to you about it.

What will happen to the results of the research study?
At the end of the project, I will write up the findings in a report. Your name will remain unnamed in the write up or any publication. If you would like a copy of the findings please let me know and I will send these to you.

What happens next?
If you say 'yes' and want to take part in this study, I will arrange a day and time to see you and your parent.

Who can I contact if I have any questions?
If you would like further information or would like to discuss any details personally, please get in touch with me, Camilla Nguyen, and I will do my best to answer your questions (tel: 074 00909130; e-mail c.nguyen2@herts.ac.uk).

Thank you very much for reading this information and giving consideration to taking part in this study.

Informed Consent Form for Young Person (15-18 years)

Name of principal researcher: Camilla Nguyen, Trainee Clinical Psychologist

Contact details of principal researcher:

E-mail: c.nguyen2@herts.ac.uk
Telephone: 074 00909130
Post: c/o Doctorate in Clinical Psychology, F262 Wright Building, College Lane
Campus, Hatfield, AL10 9AB

Title of Study:
Lego Club with young people with autism: building people and communication skills
through the use of Lego

1 I have had the details of the study explained to me and willingly consent to take
part in this study. My questions have been answered to my satisfaction and I
understand that I may ask further questions at any time.

2   I understand that my name will remain unidentified and that all the information
given will be used for this study only.

3 I understand that I may withdraw my approval for the study at any time without
giving any reason and to refuse to answer particular questions.

4 I understand that all information given will be kept private. All data will be identified
by a code, with personal details kept in a locked file or secure computer with access
only by the researcher (Camilla Nguyen).

5 I understand how the results of the study will be used. Results will be written up for
a thesis and written up in journals.

Name (participant):   _____

Signature: _____

Date: _____

Name (researcher) :   _CAMILLA NGUYEN_____

Signature: _____

Date: _____

There should be two signed copies, one for the participant, one retained by the researcher for records.

Appendix N: Information sheet and consent form (parents)

INFORMATION SHEET FOR PARENT/GUARDIAN

Title of Study:
Sociality in autism: can LEGO®-based therapy increase social skills for adolescents with autism?

Name of researchers:
Camilla Nguyen, University of Hertfordshire, Hatfield. E-mail: c.nguyen2@herts.ac.uk
Postal address: Doctor of Clinical Psychology Training Course, University of Hertfordshire, Hatfield, Herts, AL10 9AB.
Professor David Winter, University of Hertfordshire, Hatfield. E-mail: d.winter@herts.ac.uk
Professor Simon Baron-Cohen, University of Cambridge & Autism Research Centre, Cambridge. E-mail: sb205@cam.ac.uk

Introduction
You are being invited to take part in a research study. Before you decide whether to do so, it is important that you understand the research that is being done and what your involvement will include. Please take the time to read the following information carefully and discuss it with others if you wish. Do not hesitate to ask us anything that is not clear or for any further information you would like to help you make your decision. Please do take your time to decide whether or not you wish to take part. Thank you for reading this.

Aims of this study
My name is Camilla Nguyen and I am a second year Trainee Clinical Psychologist at the University of Hertfordshire. I am looking for children, aged 10-18, who have been diagnosed with autism and their families to take part in this research project. I am interested in understanding the development of social competence in young people with autism. The aim of this study is to investigate the effectiveness of a short-term LEGO®-based therapy group for young people with autism as well as the process involved in the development of social skills. You and your child's participation would be very much appreciated to address this knowledge gap.

Do I have to take part?
It is completely up to you and your child whether or not you decide to take part in this study. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. Agreeing to join the study does not mean that you have to complete it. You are free to withdraw at any stage without giving a reason. A decision to withdraw at any time, or a decision not to take part at all, will not affect the rest of the treatment/care that you receive.

What will happen to me if I take part?
You and your child will be invited to an initial assessment in which I will provide you with some further information about the group and collect some details about your child that will help with the planning and treatment of the intervention. During the assessment, I will ask you to complete questionnaires related to your child's autism symptoms severity, co-morbid symptoms, adaptive behaviour and social skills. I will also need to assess your child's intellectual ability, skills and behaviour in using Lego. The assessment will last approximately 1,5 to 2 hours.
Following the assessment, if your child meet the criteria for taking part in this study, s/he will be put down on a waiting list, approximately 8 weeks, before s/he attends the LEGO therapy group. The group will run for 8 weeks, lasting 1.5 hours each

session. At the beginning and end of the waiting and intervention periods, you will be asked to complete questionnaires. Around the same time, I will also interview your child whereby s/he will be asked to think about him/herself in different situations and also think about how others perceive them. This will be used to evaluate any changes in social skills development over the course of LEGO therapy.

What are the possible benefits of taking part?
LEGO therapy draws upon your child's own interests to facilitate social skills learning within a group setting. Clinical research has shown that children and adolescents with ASD have made significant improvement in social competence after attending the group.

What are the possible disadvantages of taking part?
It is possible that your child might become distressed if s/he finds the LEGO task or structure of the group difficult. Your child will be offered regular breaks and the session will be stopped if s/he shows signs of becoming distressed. A member of the clinic staff will be in the room during LEGO therapy and they will be able to comfort your child if necessary.

How will my taking part in this study be kept confidential?
Your child might leave the study at any point, if s/he wishes. A code will be attached to the data so it remains totally anonymous. You and your child have the right to withdraw your data from the project at any point. Their involvement in the study will remain confidential except in the highly unlikely event that the researcher has a serious concern regarding a child protection issue.

What will happen to the results of the research study?
The findings of the study will be written up in a report. Your child will not be identifiable in the write up or any publication, which might ensue. If you would like a copy of the findings please let me know and I will send these to you.

Who has reviewed this study?
This study has received ethical approval from the University of Hertfordshire, the Health and Human Sciences ECDA (protocol number: LMS/PG/UH/00346) and CHUMS, Child Bereavement & Trauma Service.

Who can I contact if I have any questions?
If you would like further information or would like to discuss any details personally, please get in touch with me, Camilla Nguyen, and I will do my best to answer your questions (tel: 074 00909130; e-mail c.nguyen2@herts.ac.uk).

Although we hope it is not the case, if you have any complaints or concerns about any aspect of the way you have been approached or treated during the course of this study, please write to the University Secretary and Registrar.

Thank you very much for reading this information and giving consideration to taking part in this study.

Informed Consent Form for Parents

Name of principal researcher: Camilla Nguyen, Trainee Clinical Psychologist

Contact details of principal researcher:

E-mail: c.nguyen2@herts.ac.uk
Telephone: 074 00909130
Post: c/o Doctorate in Clinical Psychology, F262 Wright Building, College Lane Campus, Hatfield, AL10 9AB

Psychology Ethics Committee protocol no: LMS/PG/UH/00346

Participant identification code: _____**(**to be completed by the researcher)

To be completed by parents/carers

I, the undersigned *[please give your name here, in BLOCK CAPITALS]*

_____

of *[please give contact details here, sufficient to enable the investigator to get in touch with you, such as email address]*

_____

hereby freely give approval for *[please give name of participant here, in BLOCK CAPITALS]*

_____

to take part in the study entitled:

<u>Sociality in autism: can LEGO®-based therapy increase social skills for adolescents with autism?</u>

1   I confirm that I have been given a Participant Information Sheet (a copy of which is attached to this form) giving particulars of the study, including its aim(s), methods and design, the names and contact details of key people and, as appropriate, the risks and potential benefits. I have been given details of his/her involvement in the study.

2   I have been assured that he/she may withdraw from the study, and that I may withdraw my permission for him/her to continue to be involved in the study, at any time without disadvantage to him/her or to myself, or having to give a reason.

3 I understand that relevant sections of my child's medical file will be checked by the trainee clinical psychologist who informed me about the study to see whether he/she meets the criteria for a diagnosis of autism. I give permission to Camilla Nguyen, trainee clinical psychologist, to check this information.

4 I have been told how information relating to him/her (data obtained in the course of the study, and data provided by me, or by him/her, about him/herself) will be handled: how it will be kept secure, who will have access to it, and how it will or may be used.

5 I agree that the results of this study can be submitted for publication in a psychological journal.

6 I declare that I am an appropriate person to give consent on his/her behalf, and that I am aware of my responsibility for protecting his/her interests.

Signature of person giving consent

_____ Date _____

Relationship to participant

_____

Signature of (principal) investigator

_____Date _____

Name of (principal) investigaror *[in BLOCK CAPITALS please]*

_____CAMILLA NGUYEN _____

When completed, one copy for the participant, one for the research file, one original to be kept in case notes.

Appendix 0: Descriptive Data

Measure	M(SD)	Skewness	W
GARS-2			

Social Interaction T1	9.32 (2.59)	0.29	.89*
Social Interaction T2	9.28 (2.35)	-1.45	.89*
Social Interaction T3	8.56 (2.92)	9.28	.92
VABS-2			
Social Domain T1	67.92 (9.54)	1.44	.85*
Social Domain T2	67.64 (9.66)	1.59	.89*
Social Domain T3	69.24 (9.98)	1.57	.91*
Communication Domain T1	79.48 (12.29)	1.44	.85*
Communication Domain T2	79.28 (13.10)	1.69	.84*
Communication Domain T3	80.12 (12.65)	1.06	.82*
Maladaptive behaviour *v*-scale score T1	20.68 (1.99)	-0.24	.95
Maladaptive behaviour *v*-scale score T2	20.44 (1.19)	-0.07	.96
Maladaptive behaviour *v*-scale score T3	20.16 (1.82)	0.42	.94
Maladaptive behaviour raw score T1	26.60 (10.51)	0.47	.97
Maladaptive behaviour raw score T2	25.40 (9.73)	0.38	.97
Maladaptive behaviour raw score T3	24.12 (9.32)	0.44	.95
RCADS (Parent)			
Total Anxiety T1	78.44 (18.52)	0.97	.97
Total Anxiety T2	77.68 (20.50)	0.96	.98
Total Anxiety T3	74.58 (20.38)	0.32	.96
Total Anxiety and Depression T1	78.72 (18.75)	0.98	.97
Total Anxiety and Depression T2	77.64 (20.94)	0.94	.97
Total Anxiety and Depression T3	75.67 (19.99)	0.41	.95
Separation Anxiety T1	79.84 (23.06)	0.96	.96
Separation Anxiety T2	80.80 (24.64)	0.95	.95
Separation Anxiety T3	75.58 (22.30)	0.61	.96
Generalised Anxiety T1	67.68 (16.00)	0.97	.94
Generalised Anxiety T2	68.28 (17.76)	0.96	.95
Generalised Anxiety T3	67.50 (19.10)	0.05	.96
Panic T1	81.04 (27.29)	0.97	.95
Panic T2	77.52 (30.66)	0.95	.91*
Panic T3	73.92 (23.78)	0.45	.93
Social Phobia T1	69.12 (14.17)	0.95	.98
Social Phobia T2	69.44 (15.06)	.91*	.94
Social Phobia T3	67.33 (17.26)	-0.06	.96
Obsessions and Compulsions T1	67.04 (19.66)	0.96	.90*
Obsessions and Compulsions T2	65.00 (19.96)	0.93	.84*
Obsessions and Compulsions T3	62.88 (21.07)	1.95	.83*
Depression T1	72.52 (15.92)	0.95	.94
Depression T2	69.96 (18.47)	0.98	.91*
Depression T3	73.42 (17.15)	0.44	.93
RCADS (Child)			
Total Anxiety T1	56.48 (14.29)	0.05	.94
Total Anxiety T2	54.88 (15.09)	0.18	.95
Total Anxiety T3	52.72 (15.15)	0.38	.95
Total Anxiety and Depression T1	56.48 (14.29)	0.08	.94
Total Anxiety and Depression T2	54.96 (14.74)	0.16	.95
Total Anxiety and Depression T3	52.48 (15.34)	0.48	.92*
Separation Anxiety T1	56.68 (14.63)	0.05	.96
Separation Anxiety T2	63.60 (18.81)	0.27	.94
Separation Anxiety T3	61.12 (17.62)	0.75	.92
Generalised Anxiety T1	52.40 (13.92)	0.66	.94
Generalised Anxiety T2	50.92 (14.43)	0.41	.97
Generalised Anxiety T3	51.56 (15.24)	0.55	.96
Panic T1	58.68 (14.53)	0.52	.92
Panic T2	56.64 (13.90)	0.76	.88*

Panic T3	53.56 (14.86)	0.79	.87*
Social Phobia T1	51.04 (13.11)	-0.08	.97
Social Phobia T2	50.08 (13.72)	0.34	.96
Social Phobia T3	47.40 (13.56)	0.40	.96
Obsessions and Compulsions T1	52.24 (12.61)	1.27	.88*
Obsessions and Compulsions T2	50.48 (10.67)	0.27	.93
Obsessions and Compulsions T3	50.36 (12.26)	0.63	.92*
Depression T1	55.84 (12.01)	0.48	.96
Depression T2	54.12 (11.99)	0.31	.98
Depression T3	51.12 (12.20)	1.11	.92*
SDQ (Parent)			
Overall Stress T1	20.64 (4.97)	-0.44	.96
Overall Stress T2	20.72 (6.14)	-0.72	.91*
Overall Stress T3	19.04 (4.50)	-0.25	.95
Emotional Distress T1	2.52 (1.45)	0.20	.93
Emotional Distress T2	2.64 (1.91)	-0.62	.93
Emotional Distress T3	2.29 (1.81)	0.02	.98
Behavioural Difficulties T1	6.04 (2.03)	0.94	.89*
Behavioural Difficulties T2	6.00 (2.83)	0.60	.93
Behavioural Difficulties T3	5.17 (2.57)	0.78	.90*
Hyperactivity and Attention T1	6.20 (2.45)	-0.38	.94
Hyperactivity and Attention T2	6.32 (2.53)	0.10	.93
Hyperactivity and Attention T3	5.67 (2.37)	-0.25	.94
Peer Relationship Problems T1	5.88 (1.74)	-0.16	.97
Peer Relationship Problems T2	5.76 (1.64)	-0.14	.96
Peer Relationship Problems T3	5.92 (1.59)	-0.07	.94
Prosocial Behaviour T1	5.16 (2.43)	0.10	.96
Prosocial Behaviour T2	5.20 (2.38)	0.09	.96
Prosocial Behaviour T3	5.71 (2.29)	-0.03	.96
SDQ (Child)			
Overall Stress T1	18.60 (4.19)	-0.35	.96
Overall Stress T2	18.35 (3.70)	-0.77	.93
Overall Stress T3	16.25 (5.26)	0.13	.98
Emotional Distress T1	3.00 (1.21)	-0.93	.93
Emotional Distress T2	3.05 (1.39)	-0.33	.92
Emotional Distress T3	2.80 (1.82)	-0.48	.95
Behavioural Difficulties T1	5.70 (2.18)	-0.39	.88*
Behavioural Difficulties T2	5.55 (2.19)	0.55	.92
Behavioural Difficulties T3	4.90 (2.25)	0.73	.86*
Hyperactivity and Attention T1	5.55 (1.85)	-0.42	.92
Hyperactivity and Attention T2	5.70 (1.89)	-0.09	.95
Hyperactivity and Attention T3	5.00 (1.83)	0.34	.94
Peer Relationship Problems T1	4.40 (2.11)	-0.55	.93
Peer Relationship Problems T2	4.05 (2.09)	-0.30	.95
Peer Relationship Problems T3	3.55 (2.04)	0.19	.95
Prosocial Behaviour T1	6.40 (2.58)	-0.64	.88*
Prosocial Behaviour T2	6.70 (2.39)	-0.97	.92
Prosocial Behaviour T3	6.85 (2.78)	-0.58	.91
Element Distance			
Self – Ideal Self T1	.76(.30)	-0.50	.96
Self – Ideal Self T2	0.80(.35)	-0.43	.95
Self – Ideal Self T3	0.80(.35)	-0.27	.96
Self – Person with ASC T1	0.80(.35)	0.11	.94
Self – Person with ASC T2	0.80(.35)	-0.21	.98
Self – Person with ASC T3	0.80(.35)	0.58	.94
Self – Person without ASC T1	1.01(.31)	-0.13	.97
Self – Person without ASC T2	.95(.29)	-0.15	.97

	.95 (32)	0.23	.98
Tightness			
Tightness T1	59.26 (14.07)	0.37	.98
Tightness T2	58.14 (14.02)	0.63	.97
Tightness T3	58.14 (14.02)	0.96	.92
Implicative Dilemmas			
Percentage variance T1	58.14 (14.02)	1.69	.69*
Percentage variance T2	5.87 (7.60)	1.83	.76*
Percentage variance T3	5.68 (8.08)	1.64	.73*
Sociality			
How my family sees me			
Percentage of variance T1	4.67 (3.07)	0.80	.93
Percentage of variance T2	4.67 (3.07)	1.35	.87*
Percentage of variance T3	5.74 (3.31)	1.27	.90*
How my friends see me			
Percentage of variance T1	4.67 (3.07)	0.92	.88*
Percentage of variance T2	5.11 (3.68)	1.40	.86*
Percentage of variance T3	5.59 (3.95)	1.75	.83*

Note. * = significance at p = .05; M = mean; SD = standard deviation; W = Shapiro Wilk test; GARS-2 = Gilliam Autism Rating Scale-2 (Gilliam, 2006); VABS-2 = Vineland Adaptive Behaviour Scale (Sparrow et al., 2005); RCADS = Revised Children's Anxiety and Depression Scale (Chorpita et al., 2000); SDQ = Strengths and Difficulties Questionnaire (Goodman, 1999).

Self – Person without ASC T3

Appendix P: Mind map of themes
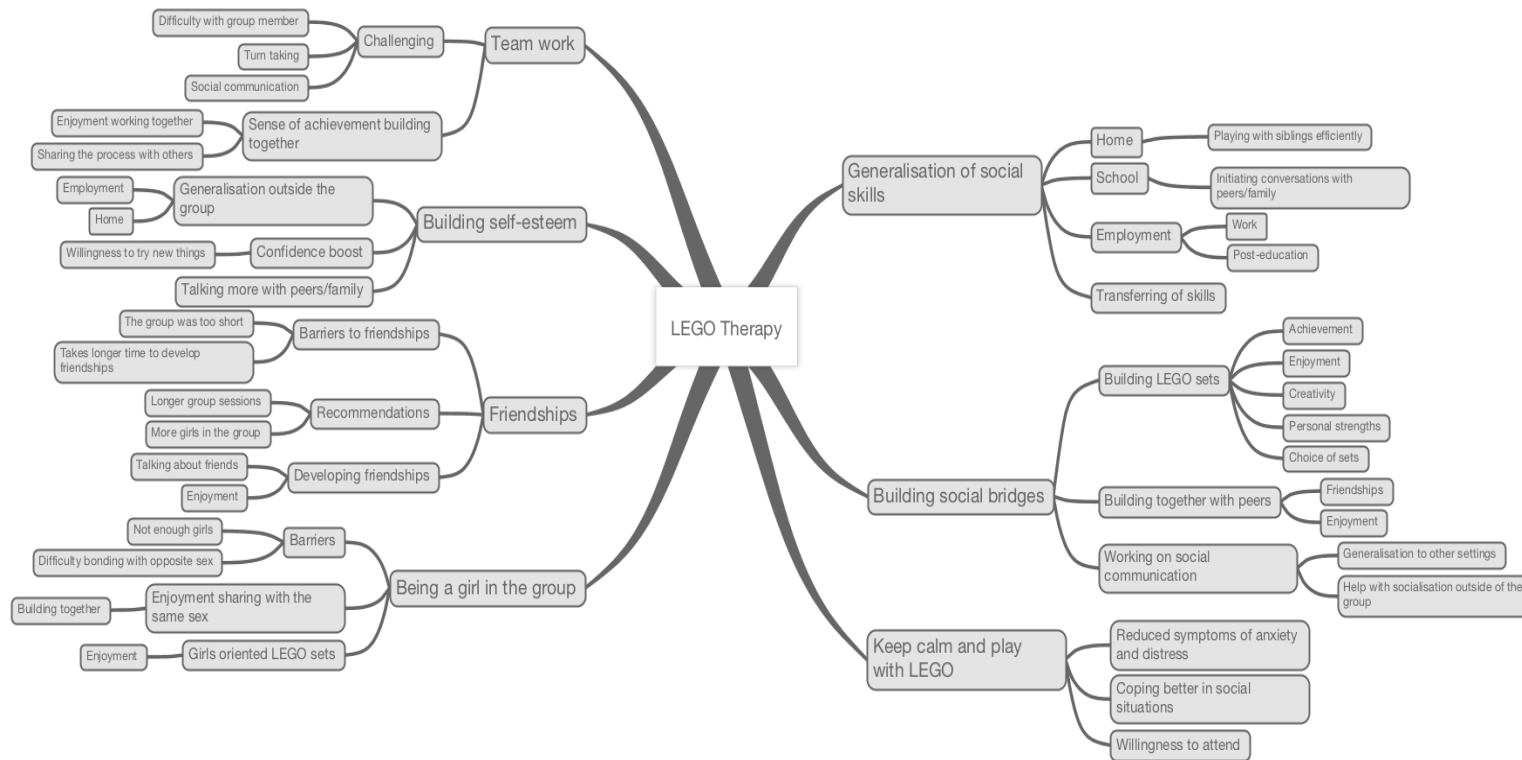
Appendix Q: Illustration of free style LEGO building in the LEGO therapy - games theme (top picture) and robot bionicle theme (bottom picture)