

**CHILD-CAREGIVER PLAY AND ATTACHMENT IN PRE-
SCHOOL AUTISM:
A LONGITUDINAL INVESTIGATION**

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Child-caregiver play and attachment in pre-school autism: A longitudinal investigation.

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ABSTRACT

Background: Play impairments in autism are intrinsic to its definition but there is continuing debate about whether they are specific to symbolic play or found across all play behaviours. In typically developing children, play development is strongly linked to other aspects of development, to the quality of caregiving behaviour and attachment relationships; however, these associations are less well characterised in autism. Three previous empirical studies have found links between play and attachment quality in autism similar to those in typical development. Additionally, a number of recent studies have investigated patterns of child attachment in autism, finding a range of attachment styles, which argue against primary attachment difficulties in the disorder.

Rationale: This study aimed to i) make a detailed study of the early development of play in autism; ii) explore for the first time the role of caregiver play; iii) extend the small literature on the relationship between child play and child attachment. **Method:** 49 children aged two and five years diagnosed with core autism were group-matched with 45 neurotypical children on gender and non-verbal development. Detailed structured video-coding of both child and caregiver play in a naturalistic setting was made at baseline (T1), after seven months (T2), and after 13 months (T3), using Noldus Observer. Child attachment behaviour was assessed using the Brief Attachment Screening Questionnaire at T1 and T3. **Results:** Children with autism showed similar patterns of play change over time to controls but at a delayed rate; with more simple exploratory play and reduced advanced functional play at all three timepoints and reduced symbolic play development identified by T3. Group differences were also found in caregiver play. Quality and complexity of child and caregiver play were largely associated. Emergence of more advanced forms of child play in both groups was predicted by level of previous child play; and also level of caregiver play, but only if it was developmentally appropriate. Children with autism showed similar responses to caregiver behaviour as typical children, despite their core social impairments. By contrast, simple play reduced over time in both groups irrespective of the nature of caregiver play. There were group differences in child attachment behaviours at T1 and T3. However, attachment quality showed no relationship to child play development. **Conclusions:** The play of children with autism was generally delayed compared to controls, with no evidence of a specific delay in symbolic play. In both autism and typical development, emergence of more complex forms of play was predicted by developmentally sensitive caregiver play, consistent with the Vygotskian theory of a 'zone of proximal development'. Developmental reduction in simple play however was independent of caregiver, consistent with Piagetian theory of children as 'lone scientists' in this context. Child attachment and play quality were not specifically related.

DECLARATION

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CHAPTER 1. INTRODUCTION

1.1 WHAT IS AUTISM?

Autism is a severe neurodevelopmental disorder manifesting in the behavioural expression of a triad of impairments in social interaction, communication, and restricted and repetitive behaviours (RRBs) and routines (Wing, 1981; Howlin, 1997). These symptoms were first recognised by Kanner (1943) in his descriptions of autism and still represent the key diagnostic criteria of the disorder (Diagnostic and Statistical Manual of Mental Disorders [DSM-IV]; American Psychological Association; [APA], 2000).

Social interaction and communication problems, along with impairments in social imaginative abilities, are often clustered together. Social interaction deficits represent the 'hallmark' feature of autism (Rutter, 1996) and early signs include failure to make eye contact (Dawson, Osterling, Meltzoff and Kuhl, 2000) and responding to one's name (Osterling and Dawson, 1994). Deficits manifest in impaired social relationships, problems establishing friendships (Bauminger and Shulman, 2003) and maintaining the dyadic flow of interactions (Leekham and Ramsden, 2006). In addition, impaired expression and interpretation of emotions further complicate social behaviours (Hobson, 1986; Hobson, Lee and Hobson, 2009). Social imaginative deficits contribute to the autistic child's inability to predict other intentions and interpret behaviours (Tager-Flusberg, 1993).

The deficits in communicative abilities present a complex picture, spanning both verbal (Wing, 1981) and non-verbal modalities (Mundy, Sigman, Ungerer and Sherman, 1986). Many children present delayed or limited speech (Eisenmeyer *et al*, 1996; 1998). The dyadic qualities of conversation are often compromised (Rutter and Schopler, 1987) and children may possess a literal understanding of language (Happe, 1993). Echolalia is often present with children echoing or mirroring the speech of others (Fay, 1969; Roberts, 1989).

The restricted and repetitive behaviours (RRBs) element of the triad is generally viewed as separate from social and communicative impairments (Lewis and Bodfish, 1998). Behaviours such as sensory sensitivity, preoccupations, intense interests and repetitive motoric actions are evident

early on in the development of the disorder (Turner, 1999). As the disorder progresses, intense interests and routines often develop further whilst more sensory behaviours are assumed to reduce (Turner, 1999).

Autism is represented on a spectrum of varying degrees of severity (Wing, 1981). Each child presents a unique profile of symptoms and the disorder is characterised by extreme heterogeneity (Happe, Ronald and Plomin, 2006). Autism spectrum disorder (ASD) comprises the core disorder in a category of impairments termed pervasive developmental disorders (PDD; APA, 2000). The autism spectrum is comprised of autism, Asperger's syndrome and pervasive developmental disorder not otherwise specified (PDD-NOS). Autism represents the most severe of the spectrum conditions, with individuals displaying complex and severe symptoms. In addition to autism symptomatology, up to 80% of children with autism also have accompanying learning disabilities (Fombonne, 1999).

1.2 PREVALENCE, DIAGNOSIS, CO-MORBIDITIES AND CAUSES

Prevalence estimates previously placed diagnoses of core autism at 1 in 400 (Fombonne, Simmons, Ford, Meltzer & Goodman, 2001). However, estimates vary between sources; with reports ranging from 0.7 cases per 10,000 live births and to 21.1. In the UK, over half a million people have a diagnosis of ASD and it is widely accepted that the prevalence rate of children with core autism is 0.4% and 1% for wider spectrum conditions (Baird *et al*, 2006).

Autism is generally diagnosed in the pre-school period, between two and four years of age. ASD represents one of the most common developmental disorders (Le Couteur, Haden, Hammal and McConachie, 2008; Chakrabarti and Fombonne, 2001). 4.8 boys to 1 girl are diagnosed with autism (Wing, 1981); however, once diagnosed, girls often demonstrate more severe presentations of the condition (Lord, Schopler and Revicki, 1982). Autism is classified as a lifelong condition with symptoms changing but continuing into adulthood (Howlin, Goode, Hutton and Rutter, 2004). Symptoms generally improve with age but co-morbidities increase.

Children and adults with autism demonstrate vast co-morbidity (Leyfer *et al*, 2006). Estimates place 20 to 30% of children experiencing epileptic seizures

by adulthood (Gabis, Pomeroy and Andriola, 2005; Canitano, 2007). Other co-morbidities include Fragile X syndrome (Bailey *et al*, 1993), attention deficit disorder (Goldstein and Schwebach, 2004) and Tuberous Sclerosis (Smalley, 1998). In adolescence and adulthood, anxiety and depression are commonly shown (Bellini, 2004; Gillott and Standen, 2007).

The impact of a child with autism has a profound effect on family life, causing immense distress and burden. Autism is a costly condition, with families reporting a great deal of economic strain (Knapp, Romeo and Beecham, 2009). However, whilst the impact of autism is clear, the exact cause or causes of autism are still largely unknown and no one factor has emerged as dominant. There are no differences in expression between social economic (Larsson *et al*, 2004) or ethnic groups (Ritvo *et al*, 1971) and parental factors - such as a perceived lack of warmth - have long been disproved (Cox, Rutter, Newman and Bartak, 1975). Therefore, a combination of factors is likely to contribute to the development of autism.

Autism is a highly heritable condition; however, no single gene has been identified. It is likely that a number of candidate genes play a role due to the complex and heterogenic nature of autism (e.g. Ashley-Koch *et al*, 1999). A number of chromosomes are likely to be implicated and the role of mutations (e.g. Durand *et al*, 2006), linkage (e.g. Alarcón *et al*, 2008) and copy-number variants (e.g. Sebat *et al*, 2007) has been debated in recent years.

Family studies indicate a strong genetic predisposition or an inherited tendency to develop autism (Bailey *et al*, 1995). Monozygotic twin studies suggest up to a 90% concordance rate, whereas dizygotic studies implicate a wider disposition to language disorders or autism spectrum conditions (Bailey *et al*, 1995; Folstein and Rutter, 1997). Infant siblings of children of autism also have a higher likelihood of being diagnosed with an ASD (Zwaigenbaum *et al*, 2005).

Prospective and retrospective longitudinal studies indicate disruptions from as early as six months and symptoms clearly displayed at 14 months (Landa and Garrett-Mayer, 2006) therefore early detection and intervention are vital for the

long-term success of children with autism. Language abilities are generally viewed as both central to diagnosis and as a predictor of long term success (Toth, Munson, Meltzoff and Dawson, 2006) and therefore widely targeted through intervention.

Due to the heterogeneous nature of autism and the diversity of symptoms, researchers have suggested that there can be no single cause or treatment for the condition (Happe et al, 2006). What is important for families, clinicians and researchers is to understand how the symptoms of autism manifest in development and how the presence of autism disrupts typical trajectories.

1.3. THE ROLE OF PLAY AND THE CAREGIVER-CHILD RELATIONSHIP IN AUTISM

The triad of impairments observed within ASD are evident in a wide range of functioning. This thesis explores the impact of a diagnosis of core autism on two key developmental phenomenon - play and the caregiver-child relationship. In addition to exploring how autism may impair children in their play behaviours and attachment bond, the study examines how these constructs relate to one another and if this relationship differs to that evident in typical development.

Play is viewed as a universal phenomenon evident in all cultures (Haight, Wang, Fung, Williams and Muntz, 1999). Due to its links to development, the impact of play in the early years is irrefutable (Ginsberg, 2007). Children with autism are known to display impairments in play, and these are viewed as a core diagnostic marker of the disorder (e.g. Jarrold, Boucher and Smith, 1993). Previously it was assumed that children with autism experience a specific impairment in the expression of symbolic play (Baron-Cohen, 1987), however there is much debate as to whether the impairment is more generalised; influencing play development as a whole (e.g. Williams, Reddy and Costall, 2001; Jarrold, Bocuher and Smith, 1996).

In typical development, play influences, and is in turn influenced by, other areas of development such as language and social abilities (Meins, 1997). Play is also influenced by those around the child and the interpersonal relationships they hold (Slade, 1987a). The caregiver-child attachment

relationship has been shown to influence early development, including cognition, language and play (Matas, Arend and Srouffe, 1978). It is assumed sensitive caregivers will promote more advanced play behaviours whilst creating a secure attachment relationship which in turn will support play development even when external to the relationship (Slade 1987 a and b).

The attachment relationship in autism has been debated for many years, with early descriptions of the disorder suggesting a failure to form a secure attachment was a core symptom. Despite this symptom not forming part of recent diagnostics, secure attachments are thought to be underrepresented in samples of children with autism or represented in different ways concordant with the child's ability to interact dyadically (e.g. Shaprio, Sherman, Calamiri and Koch, 1987). What is evident is that both play and the attachment relationship are likely to influence development in autism and be influenced by the presence of autism.

This thesis sought to establish how play behaviours differ to typical development in a sample of children with core autism. In addition, possible differences in attachment and what predicts these differences were explored. Recent studies have indicated that attachment and play in autism may be linked extending the relationship found in the neurotypical literature (Naber *et al*, 2008; Marcu, Oppenheim, Koren-Karie, Dolev and Yirmiya, 2009); however the relationship between these two factors has not been explored over time.

The role of caregivers during play was explored in depth for the first time in a sample of children with autism. In typical development caregivers play and structuring of the play environment is assumed to have a profound impact on child play and subsequent development. This thesis sought to clarify whether the caregiver remains as influential in the play development of children with autism, despite the social impairments evident in this sample, or whether caregiver play is modified by the presence of autism symptoms.

The following three chapters outline the literature surrounding play, attachment and the relationship between the constructs before outlining the research hypotheses developed, the sample utilised and the methods developed.

CHAPTER 2: PLAY: PERSPECTIVES, DEVELOPMENT AND AUTISM

Play is a developmental phenomenon that has attracted interest from researchers and clinicians for many years due to its strategic developmental progression and its links to development and developmental disorders. This chapter introduces the construct of play; describing its development and theories of its importance. Links to development are then explored before reviewing the impairments experienced by children with autism.

2.1. TOWARDS A DEFINITION OF PLAY

The definition of play has plagued researchers and theorists with difficulties for many decades. For the purpose of this thesis, play is defined as;

“Freely chosen; personally directed, intrinsically motivated behaviour that actively engages the child...Play can be fun or serious. Through play children explore social, material and imaginary worlds and their relationship with them, elaborating all the while a flexible range of responses to the challenges they encounter.”

(National Playing Fields Association, 2000, pp.6)

Play is viewed as a universal phenomenon observed in all cultures, ethnic groups and socio-economic strata (Wolfberg, 1999) and it is widely assumed to directly influence development in other areas.

2.1.1. The nature and function of play

The above definition references the social, physical and pleasurable aspects of play. The benefits of play have been extensively studied over the past century with social, cognitive and social-constructivist researchers developing theories as to why children play. Whilst a full exploration of the functions and benefits of play is beyond the scope of this thesis, this section will briefly explore its function before leading to an outline of influential psychological theories of play.

Classical approaches of play focused on the physical and instinctive aspects of these behaviours, viewing it as a release of surplus energy (Spencer, 1855)

and a form of relaxation (Lazarus, 1883). However contemporary theorists have explored the links between play and everyday competence, social, emotional, cognitive and language development (Rast, 1986; Casby, 2003). Play is viewed as a context where children acquire the foundation for many complex developmental tasks, such as communication, emotional regulation and rule learning. Without play these abilities are assumed to be hindered; as such the primary national curriculum is heavily reliant on learning through play.

Vygotsky emphasised the significance of play as the leading activity in the early childhood years stating:

“Play contains in a concentrated form, as in the focus of a magnifying glass, all developmental tendencies”

(Vygotsky, 1978, pp.74).

Vygotsky argued that it was within the context of play where children learn about and develop language. Children also develop fine and gross motor skills through object exploration and engage in visual-spatial activities. Thus the significance of play cannot be underestimated in both typically and atypically developing populations, whilst simultaneously offering a ‘window’ to study developmental variables within a naturalistic context. A hypothesised interplay between play and development overtime has been proposed and forms the framework for modern theories of play.

2.2 APPROACHES TO PLAY DEVELOPMENT

Modern theories of play have resulted in a profound impact on early years education; viewing play as a vehicle for nurturing development across a variety of domains. Subsequently, based on the theories presented within this section, numerous play schemes and training programmes have been developed to encourage learning through play. Within the primary curriculum, play features heavily, with learning placed in a fun and engaging context.

Social and cognitive-developmental researchers have explored the associations between play and various aspects of development, with these hypothesised relationships forming the basis of the modern theories of play development. Three theories are outlined in this section - Parten’s social

theory, Piaget's constructivist theory and Vygotsky's socio-constructivist theory. Whilst there are many more theories framing the relationship between play and development, these three theories (in particular Vygotsky and Piaget) have been the most influential to date.

Parten (1932, 1933) separated play behaviours into different categories based on a social continuum increasing in complexity of engagement. Parten theorised that all forms of play begin in the form of an onlooker; children then attempt to engage with others through parallel play before engaging in group play with other children, firstly in an associative role then collaboratively. Parten's theory highlights the strategic development of play, with dissociable levels indentifying how play over time builds in complexity.

However, whilst it is clear that play develops in social complexity, Parten's theory ignores the association between play and other areas of development with play developing both in terms of content and themes as well as in social complexity. It is apparent to the everyday observer that the play of toddlers differs greatly from the play of pre-schoolers, therefore it is likely to relate concurrently and over time to development in different domains. Subsequent theories have focused on the relationship between play and cognitive development rather than simply social attributes.

Piaget's (1962) constructivist theory placed play on a continuum of increasing cognitive complexity, with each stage requiring mastery before the next stage is reached. Piaget described play development in clear dissociable stages each relating to a specific developmental task leading to cognitive advancement. Piaget's theory of play is largely based on his stages of cognitive development (Inhelder and Piaget, 1958), with play at each stage mirroring development. Piaget viewed play as a forum for exploration, experimentation and the development and refinement of skills, referred to as 'schemas.'

Piaget's theory of play development is divided into four distinct stages. The first stage, sensorimotor, develops from birth to two years with play focused on interaction with the environment and developing basic skills. The second stage, pre-operational, develops between two and seven years. The child is

unable to think abstractly and requires concrete objects to play, but play is more complex and based on scenarios. After this children enter the concrete operational stage between seven and eleven years, where they are able to conceptualise ideas and develop logical processes using abstract thinking. Finally children develop formal operations between eleven and fifteen, whereby they think and behave like adults and reason conceptually.

Piaget's theory of play and cognitive development has remained influential, especially within the educational curriculum with the onus on logical and conceptual growth. Piaget's research also highlights the importance of learning through activity rather than instruction. However, the theory is not without its critics and is widely viewed as underestimating the abilities of children. For example, symbolic play behaviours are generally observed before the age of seven and often as young as two. The assumption that play becomes redundant following the development of abstract thought has been questioned. The transitions proposed have been debated with development not always characterised by quantitative but qualitative differences.

Piaget's theory ignores the social nature of play, focusing solely on cognitive advancement, and fails to recognise the importance of play as a precursor and mediator in the formation of social relationships. Play often occurs within a social context and, whilst objects have no intentions, play partners hold play an irrefutable role in the developmental process. Whilst Piaget viewed children as 'lone scientists', socio-constructivist theorists propose an interaction with the environment, providing a more integrated theory of play development.

Vygotsky (1977, 1978) began to bridge the gap between social and cognitive theories, focusing on the development of play within a social context. His socio-constructivist theory places play at the forefront in a variety of developmental tasks, hypothesising as well as cognitive benefits recognised by Piaget, through play children learn about the rules of society, cultural expectations and their role in the wider environment. Abstract and reasoning skills are developed during play and are assumed to be important in language and writing development.

Vygotsky explored the influence of other players on the child's experience. The notion of a 'Zone of Proximal Development' (ZPD) represents the difference between what a child is currently achieving and their potential, and is accomplished through the guidance of an 'expert other'. It is this 'expert other' who provides the link between potential and current functioning through scaffolding and support and without the 'expert other' further progression would be limited.

Vygotsky's theory of play has been widely implemented within educational settings. Teachers will encourage children to reach their potential and this is often achieved by scaffolding and playing the role of the 'expert other.' However, it could be argued Vygotsky's theory underestimates the capabilities of children by themselves.

Theories of play offer a framework from which to study play development; its links to wider development and its consequences in developmental disorders. Piaget and Vygotsky's theories, in particular, provide conceptual ideas that can be explored in everyday life and implemented within the national curriculum and play schemes. They also provide a theoretical base from which to compare findings in atypical populations and conceptualise play behaviours.

2.3. TYPES AND STAGES OF PLAY

A widely accepted continuum of play has been proposed in recent years, encompassing the theoretical conceptualisations discussed in section 2.2 and empirical observations. In its simplest form, four categories of play complexity are proposed; sensorimotor, relational, functional and symbolic. However, researchers have expanded these into as many as twelve (Belsky and Most, 1981) or condensed development into two or three categories (Libby et al, 1998). Play is assumed to progress from its simplest manipulative form to symbolising abilities, free from reality and concrete definitions. Play content is also assumed to deepen with age, with themes and acts becoming increasingly complex.

The first stage of play, sensorimotor (termed here *simple exploratory play*) is characterised by the exploration and manipulation of objects, with no other apparent goal than the extraction of visual and tactile information. In relational

play (termed here *cause and effect*) the child combines objects or actions to extract information or create an effect. Examples include pushing buttons on a pop-up toy or combining Lego bricks. Following this, functional play develops, where everyday skills and roles can be mastered. In this current study, functional play is defined as the appropriate use of objects - including miniature objects, such as toy cars. Both this present study and Williams et al (2001) divided functional play, exploring simple and elaborate/advanced forms to seek clarification of the association with development and impairments shown in autism. Symbolic play represents the final, most advanced stage of play development, with the use of imaginary objects or substituted items. Symbolic play usually develops within the second year of life and is hypothesised to be the most cognitively advanced of the play stages; its links to development are widely shown (Piaget, 1962; Rubin, 1980).

However, there is little consensus as to what behaviours constitute symbolic and functional play (Vig, 2007), with a lack of consistency between researchers making cross study comparison difficult. Symbolic play (as defined here) involves imaginary 'objects, properties or people' - such as a doll having a voice - or object substitutions - for example using bricks to represent people at a tea party. However, functional activities - such as drinking from a toy cup - are often regarded by researchers as symbolic play (Baron-Cohen, 1987; Ungerer and Sigman, 1981). It is argued here that, despite attributing an absent property, behaviours such as 'drinking' from a toy cup or pushing a toy car are functionally appropriate for the object, despite the objects being a smaller scale. Conversely, putting a toy cup on a teddy's head as a hat represents symbolic play as the child is assigning a new function to the object. Naming of objects is also often included in definitions of functional play, however it is questionable whether this represents understanding the use of an object. The issue of definition is also a contentious issue in the field of autism and will be discussed throughout this thesis.

Despite inconsistencies, the different stages of play allow researchers to quantify play behaviours whilst retaining an index of complexity/quality. It also enables researchers to specify links to development and impairments in disorders such as autism.

2.4. PLAY AS PART OF DEVELOPMENT

Play has attracted vast attention within research due to its apparent associations with contemporaneous and longitudinal development (Piaget, 1962; Vygotsky, 1978; Casby, 2003). Viewed as the child's main activity during early years (Reilly, 1974), play is seen as a successful way to engage children in learning:

“Play offers a practical vehicle to enlist a child’s attention, to practice specific motor and functional skills and promote sensory processing, perceptual abilities and cognitive development. It also serves to support social, emotional and language development”

(Rast, 1986, pp.30)

Play offers vital opportunities to practice skills and experiment in a safe context (Boucher, 1999) as well as providing a naturalistic context to observe language, cognitive and social abilities.

Developments in play often occur simultaneously with development in other areas and when delays are shown in language, these are frequently mirrored in play behaviours (Meins, 1997). Development (especially that of language) and play are seen by many researchers as intrinsically linked with a reciprocal relationship existing throughout childhood. Play is equally dependent on developmental abilities with a reciprocal relationship is proposed (Lewis, 2003). Play has been seen as an index of cognitive maturation (McCune-Nicolich, 1981) associating with performance on a variety of measures of cognition (e.g. Lyytinen, Laasko, Poikkeus and Rita, 1999; Zigler, Finn-Stevenson and Hall, 2002). However, it is unclear whether this association exists simply by chance, is mediated by independent variables, or if a reciprocal relationship pervades throughout development.

Irrespective of socio-economic status, cultural and linguistic background, play is beneficial in a variety of domains (Elkind, 2007; Zigler and Bishop-Josef, 2006), and provides children opportunities to learn and engage with others. Viewed as the primary way children first learn about the world, play can also be used to promote developmental progress.

Whilst play behaviours increase in complexity with age, chronological age fails to discriminate play complexity. Belsky and Most (1981) found that play was only moderately predicted by age despite associating with cognitive measures. Play therefore reflects much more than chronological age; perhaps representing a more specific ability such as developmental capacity.

Language is one area of development that is theorised to be highly correlated to play, if not stemming from the same underlying ability (Piaget, 1962). Piaget first highlighted the co-occurrence of symbolic play and language in development with early examples of symbolic play often followed by a surge in language development (Meins, 1997). When children start combining words in speech, they have been observed combining play actions; first word acquisition is assumed to occur at the same time functional play begins to emerge (McCune-Nicholich, 1982).

Symbolic play has been viewed as a necessary precursor for language development in both typical development and developmentally delayed samples (Charman *et al*, 2000). However, early research is plagued by methodological and definition issues compromising the ability to draw firm conclusions. Language usually develops around the age of one, whereas symbolic play is rarely shown before the age of two. Therefore, due to definition issues, functional play rather than symbolic play maybe important early on in development. With maturation, the association may switch to symbolic play and as such it is important to recognise that a dynamic relationship may pervade and this may change with cognitive progression.

Ungerer and Sigman (1984) explored the association between play and language at 13 and 22 months. Functional play at 13 months related concurrently to language, however at 22 months this association had changed to symbolic play. Functional play at 13 months correlated with both expressive and receptive language at 22 months indicating that certain play behaviours maybe pre-requisites for later language systems.

However, caution must be adopted when drawing conclusions from Ungerer and Sigman's (1984) research. Firstly, their definition of symbolic play encompasses what has been classified as functional play (Williams *et al*,

2001). Whilst the definition did include object substitutions, it is unclear what percentage of behaviours consisted of this form of play. Secondly, the predictive value of play was assessed using correlations between time one and time two variables. Whilst correlations indicate associations, they do not test the predictive abilities of variables. In addition, at 13 months symbolic play would be virtually absent and, therefore, no assumptions can be made about the influence this form of play has on language development at such an early age. Finally, no other variables - such as non-verbal development or age - were controlled in the analysis and these factors may mediate or alter the relationship between play and language. Earlier language was not partialled out of the analysis and other studies have found initial language abilities to be a mediating factor (Stone and Yoder, 2001).

Tamis-LeMonda and Bornstein (1990) explored the associations between language production and comprehension, play and attention. The authors proposed two theories: firstly, these constructs are related in development, or secondly, they are all supported by an external/mediating factor. Whilst language production did not relate to play, language comprehension did. Play also related to the child's attention span. Tamis-LeMonda and Bornstein's study highlights the apparent specificity of the association between play and language. However, as the study only tested cross sectional associations, it is unclear whether play would predict language development or whether this relationship changes over time.

In a sample of deaf and hearing infants, Spencer and Meadow-Orlans (1996) assessed the contribution of language and maternal responsiveness to play behaviours between 9 and 18 months. Language associated with representational play (functional and symbolic), but this association was not obligatory for its development, indicating that play was not reliant on language. It is unclear whether the association found was accounted for by functional or symbolic behaviours, or a combination of both, as these were grouped into the category of representational play. Whilst conclusions cannot be drawn regarding the specificity of the relationship between play and language, the study highlights the importance of definitions and the inclusion of functional play behaviours.

In two studies, Lyytinen and colleagues (1999 and 2001) explored the concurrent and predictive relationships between play and language in typically developing children. Lyytinen et al (1999) looked at symbolic play using the Symbolic Play Test (Lowe and Costello, 1976) and language abilities were assessed using examiner-issued and parental report measures. Vocabulary production, derived from parental report, correlated with symbolic play. Verbal comprehension, assessed through the examiner-issued measure, also associated with symbolic play. This result compliments the findings of Tamis-LeMonda and Bornstein (1994) who found specific but changing associations with symbolic play. At 13 months language comprehension but not production was related to play, whereas at 20 months only semantic diversity associated with symbolic play.

Lyytinen et al (1999) found, that when dividing symbolic behaviours into individual categories, only other-directed pretence correlated with language comprehension and production, thus highlighting the importance of definitions in research. The relationship between play and language appears to be dynamic; changing within a short timeframe. The disparity in the associations between parent and researcher rated measures and play presents an interesting finding as it would be assumed that, whilst parents may over-estimate language abilities, the measures would tap into the same underlying abilities and relate in the same way to play behaviours.

Lyytinen *et al* (2001) assessed the same sample longitudinally using the same play and language measures to explore the skills that predict language and cognition at two years. Play, vocabulary and maternal education at 14 months predicted later vocabulary production. Play was the strongest independent predictor measured at 14 months. However, at 18 months no variable made a unique contribution to language and cognition at two years. This finding again highlights the dynamic nature of the association between play and language.

Charman et al (2000) explored joint attention, imitation and symbolic play as precursors for both theory of mind and language development. Given the proposed progression from functional to symbolic play, there was an expected trend towards significance in the relationship between functional and symbolic

play; indicating a close developmental association between these forms of play. Whilst symbolic play correlated with both expressive and receptive language, only the association with expressive language held after controlling for IQ. This research again demonstrates the specificity of the relationship between play and language and the inter-connectivity with other variables.

Lewis, Boucher, Lupton and Watson (2000) further attempted to clarify the relationship between play and language. Replicating the research of Doswell, Lewis, Boucher and Sylva (1994) - who found that, irrespective of chronological age, symbolic play related to expressive and receptive language as well as grammatical ability - Lewis et al found strong relationships between play and language. However, age also correlated with all measures indicating the relationship may be mediated by chronological age despite the previous finding that play itself is not well explained by age (Belsky & Most, 1981).

Whilst play and language are undoubtedly closely linked in development, the exact relationship is far from clarified. This study will address how play relates to language concurrently and over time, and how play might be predicted by or dependent on language abilities.

Play behaviours have also been linked to social development and play is viewed as a context to learn about social situations and develop shared meaning (Wolfberg, 1999). Play allows children to develop skills vital for successful social interactions, such as turn taking and social referencing. The associations between play and social abilities may have implications for children with autism and maybe different due to the social impairments experienced in the population.

Many studies have linked symbolic play and theory of mind in development. Youngblade and Dunn (1995) found that children who engaged in more sophisticated play possessed a better understanding of others' false beliefs and emotions. Astington and Jenkins (1995) also found that performance on false belief tasks was positively related to role play production. In addition, children who scored higher on measures of fantasy play had more advanced representational ability in theory of mind tasks (Taylor and Carlson, 1997).

Play has been linked to other areas requiring representational skills. Symbolising is seen as an essential foundation for literacy and numeracy (Zigler et al, 2002). Simple manipulation and building play has been shown to relate to logic formation and spatial abilities (Ginsburg, Inoue and Kyoung-Hye, 1999; Ginsburg *et al*, 2006), indicating an encompassing influence.

It is evident from the above research that play and development, whether social, spatial or language, represents a complex series of associations not easily disentangled by other factors. It remains unclear whether language, play and cognition represent different systems or one unified system; therefore when one system fails are delays and problems apparent in other systems, or are these modules spared? In the case of autism, where play and language are known to suffer impairments and are viewed diagnostic markers, understanding play development and how it relates to other domains is vital for interventions and clinical practice.

2.5. THE CHARACTER OF PLAY IN AUTISM: DELAY OR DEVIANCE?

Play impairments in autism have been observed for over 30 years. Deficits in the production of symbolic play are seen as a core diagnostic marker in the disorder (APA, 2000). However, it is unclear whether the impairment is specific to symbolising abilities (e.g. Baron-Cohen, 1987), a deficit in production under certain conditions (e.g. Jarrold et al, 1996), or play as a whole is affected (e.g. Libby, Powell, Messer and Jordan, 1998). It is also unknown whether play in autism is delayed or is different to that displayed by children without autism. Play in autism represents an area of interest for researchers due to its links to development, its relevance in diagnosis and its role in treatment and as such exploration of the area can inform clinical practice and our understanding of the condition.

Wing and colleagues (Wing and Gould, 1979; Wing, Gould, Yates and Brierley, 1977) explored the presence of symbolic play (termed 'pretend play') in children with autism. The results indicated a striking absence of symbolic play and, when demonstrated, behaviours were repetitive and stereotyped. Although widely influential on subsequent theory and practice, Wing et al's study is open to criticism. It is assumed that symbolic play usually does not

emerge until the second year of life and, as no neurotypical control group was available, it is impossible to predict that symbolic play would be present at such a young age. It is also debatable that the children would have received a full diagnosis of autism by this age - with diagnosis occurring around two years - therefore children may present autism-like symptoms but not go on to receive a full diagnosis.

Matched studies began to produce results indicative of a more complex play impairment than first suggested. Ungerer and Sigman (1981) found that compared to non-verbally matched controls, children with autism demonstrated less diverse and fewer symbolic acts overall but not a total absence of symbolic play. The study also found that when play was elicited rather than spontaneous, children with autism displayed more symbolic behaviours indicating that measurement may play a crucial role.

Mundy and colleagues (1987) found that, compared to non-verbally matched controls, children with autism demonstrated less diversity in their play. However, this was not specific to symbolic play and reduced diversity was evident in functional play. This was further supported by Stone, Lemanek, Fishel, Fernandez and Altemeir (1990) who conducted a comprehensive analysis of the time children with autism spent engaged in free play, the toys they used and the complexity of their play. Overall children with autism spent less time playing and their play was characterised by immature behaviours. They demonstrated fewer functional acts than controls, however, the absence of symbolic play was not a useful 'marker' as many of the children in other diagnostic groups failed to show these behaviours. The impairment shown in functional play was discriminative and served as a better diagnostic indicator.

Baron-Cohen (1987) disputed this in his study using children matched on non-verbal and verbal development and children with Down's syndrome. Baron-Cohen criticised early studies' inclusion of behaviours that are functionally appropriate to the object (e.g. brushing a dolls hair) in the category of symbolic play, therefore over estimating the incidence of these behaviours in children with autism, and modified his definition accordingly. Children with autism reached ceiling on assessments of functional play but differences emerged in

symbolic play; children with autism produced significantly fewer acts, more ambiguous play and less time engaged in symbolic play overall.

This finding has been further supported by Atlas and Blumberg-Lapidus (1987) and Charman *et al* (1997). Symbolic impairments persisted when play was structured by the examiner, providing evidence for an overriding symbolising deficit independent on measurement condition. Bigham (2008) extended Baron-Cohen's findings to the comprehension as well the production of symbolic play. Mirroring the results on performance, children with autism could comprehend functional play acts; however symbolic play comprehension was impaired, indicative of a specific impairment in this form of play.

However, Baron-Cohen (1987) and other studies have included naming of toys the definition of functional play as well as actual play behaviours. It is debatable whether naming objects constitutes a functional definition and the inclusion of these behaviours may explain a large percentage of the functional play acts in children with autism.

Baron-Cohen's (1987) research sparked a debate surrounding the measurement of symbolic play. Lewis and Boucher (1988) and Jarrold *et al* (1996) suggest that the play of children with autism is largely dependent on the measurement condition. In structured conditions both Lewis and Boucher (1988) and Jarrold *et al* (1996) found that children with autism performed relative to language matched controls and differences only emerged in the spontaneous condition, with children with autism producing fewer symbolic play acts. Functional play was also impaired in the spontaneous condition when using purer definition of functional play that excluded naming.

More recently, Williams and colleagues (2001) suggested many studies fail to find functional impairments as a result of the coding schemes utilised. Williams *et al* argued that a single category of functional play created a lack of precision and sub-typing is required to further define the nature of any functional play impairments. Williams *et al* (2001) developed a coding scheme based on previous research but dissociated simple and elaborate functional play to explore the specificity of any functional play impairments found. Williams *et al*

conducted a detailed and comprehensive coding of functional play duration, frequency, diversity and integration.

No differences emerged in the total amount of time the children spent engaged in overall functional play or the number of play acts they produced, however, when a more fine grained analysis was conducted, differences began to emerge on indices of quality. Children with autism spent less time producing new functional acts and engaged in elaborate functional play. When functional play was demonstrated it was more likely to consist of simple, less diverse acts with objects. Further research into more complex functional play behaviours, therefore, maybe crucial for understanding how play is truly affected in autism.

More elementary forms have often been ignored in autism research; however Libby et al (1998) questioned the specificity of the advanced play impairment in autism. The authors hypothesised that the presence of rigid and stereotyped behaviours may influence play resulting in more elementary behaviours. Overtime children with autism showed no reduction in sensorimotor and functional play, with exploratory behaviours and sensorimotor play remaining constant compared to continuing low levels of symbolic play. When symbolic play was shown it was in its simplest form, object substitutions, requiring concrete props to facilitate play.

Honey, Leekham, Turner and McConachie (2007) also found that children with autism were delayed in both symbolic and non-symbolic play providing further support for a continuum wide impairment or delay. When functional play was demonstrated, it was less frequent, diverse, integrated and elaborate, than in typically developing controls. van Berckelaer-Onnes (2003) reported deviance in play in children subsequently diagnosed with autism. These impairments were reported by parents of children who later went on to receive a diagnosis of autism and were shown from the 1st year of life. Play was described as unvaried and limited to specific objects with exploratory play pervading early development. When play behaviours were combined, these combinations were often repetitive and stereotyped. Functional play was described as routinised and similar to 'rote' learnt sequences.

If play is believed to develop sequentially in the way proposed by Piaget (1962) and other theorists, the results gained by Libby et al (1998), Honey et al (2007) and van Berckelaer-Onnes (2003) suggest that children with autism fail to progress through the complexity levels and get 'stuck' in more elementary forms. This has significant consequences since, if play relates to development at each stage of development, then children with autism will be hindered as they will not get the opportunities to practice and enhance cognitive, emotional and social skills.

Further support for impairments throughout the play spectrum has been found by Rutherford, Young, Hepburn and Rogers (2007) who explored the emergence of play behaviours across two time points in children. Children with autism displayed less symbolic play in both structured and spontaneous conditions. Interestingly, children with autism also demonstrated less sensorimotor play at T1 and spent more time not actively engaged in play behaviours thereby suggesting an impairment/delay in even basic forms of play. At time one the deficit spanned all forms of play and conditions, however, by time two the impairment was specific to symbolic play.

Adopting a qualitative approach, Wolfberg (1999) conducted in-depth case studies with three children with autism. Repetitive play was more common, including routinely inspecting objects or repeating play schemes over and over. Functional play was infrequently observed and, when functional or symbolic play was shown, acts were inflexible and uncreative. Wolfberg concluded that "spontaneous, flexible, imaginative and social qualities commonly associated with play are characteristically absent" (pp. 38). Whilst Wolfberg's sample was small and generalisations difficult, it provides more in-depth evidence for a more generalised impairment.

Despite the complex picture presented, the play impairment in autism is likely to vary with each child presenting a unique profile of strengths and weaknesses in accordance with the heterogeneity of the disorder. No one argument pervades and there is evidence of a symbolising specific deficit as well as a more generalised impairment. Therefore, it seems likely that both delay and deviance characterise the disorder. It is evident that measurement

conditions, definitions of play and control groups all influence the results gained. However, despite the uncertainty surrounding play strengths and weakness in autism, play is still assumed to be as important, if not more so, to developmental success (Casby, 2003). What is clear is that play in autism is “not easily disentangled from the social, cognitive and affective aspects of the disorder” (Wolfberg, 1999, pp.2).

There are a number of unresolved issues that pervade the literature. Firstly, definition and measurement inconsistencies and confounds make generalisation and cross study comparisons difficult. Early evidence is plagued with small sample sizes, no control groups and weak statistical methodology. The studies presented here have all been used to inform this current thesis and provide a starting point to further clarify the specificity of the play impairment in autism.

2.6. THE RELATIONSHIP BETWEEN PLAY AND DEVELOPMENT IN AUTISM

As described in section 2.4, play has been shown to associate with development in a variety of domains. These relationships have been replicated in other samples, for example children with Down’s syndrome (O’Toole and Chiat, 2006) and language disorders (Casby and Della Corte, 1987). As play development is delayed and/or impaired in children with autism, studying its links to development presents an interesting question: does play in autism still associate with development despite the delays/deviance experienced, or does play fail to relate to development or relate in a different way?

Play has been recognised as a useful context to study development in children with autism due to difficulties issuing standardised assessments in this sample (Williams, 2003). Researchers have subsequently explored the possible links with social, language and cognitive development as well as autism symptomatology.

Charman (1997) reviewed the literature surrounding both joint attention and symbolic play in autism posing the question: did these impairments lead to the deficits experienced in mentalising tasks, or are they symptomatic of a more basic cognitive impairment in autism? Prospective screening studies, utilising

'high-risk' groups of infant siblings of children with autism, suggested that the evidence surrounding the association between both joint attention and symbolic play in the prediction of autism is unclear. Charman (1997) highlights the lack of research exploring functional play in autism. Despite impairments being found in studies looking at both symbolic and functional abilities (e.g. Stone et al. 1990; Jarrold et al, 1996), little is known about the predictive value of functional play in autism or its relation to cognitive development. Functional play may be more informative in prospective studies utilising young samples as they are more likely to demonstrate these behaviours at a very young age.

Baron-Cohen, Allen and Gillberg (1992) found that infant siblings of children with autism who failed both joint attention and symbolic play tasks at 18 months were more likely to develop autism. However, Swettenham (1996) found that when siblings presented just symbolic play impairments they were no more likely to go on to receive a diagnosis; leading Baron-Cohen *et al* (1996) to conclude that children need to fail at both tasks at 18 months to be at risk. However, symbolic play in its purist definition is rarely shown before the age of two and, therefore, many children may fail this task at 18 months regardless of the group they fall into.

Rutherford et al (2007) explored the emergence of play in children with autism, developmental disorders, and typically developing children matched on mental age. The study looked at play development in a two year longitudinal study. At time one, diagnosis accounted for spontaneous and structured symbolic play. Sensorimotor play was predicted by a combination of diagnosis and spatial reversal tasks performance, suggesting a visual-spatial/cognitive element to this form of play and linking development to play progression rather than visa versa. Change in spontaneous symbolic play at time two was predicted by both joint attention and diagnosis; however, the percentage of variance explained was relatively low indicating that other factors may play a role. Scaffolded symbolic play at time two was solely predicted by diagnosis indicating the importance of diagnostic symptoms rather than development in this form of play.

Longitudinal studies such as Rutherford et al (2007) allow developmental theories to be explored through the emergence of abilities overtime in relation to other variables. Rutherford et al (2007) recognised the absence of longitudinal research in play in autism, highlighting the need to study development longitudinally rather than testing children once.

Stanley and Konstantareas (2007) explored the links between symbolic play and autism symptomatology. In addition, they sought to clarify how play is related to other areas of functioning known to correlate with play in typical development. Stanley and Konstantareas (2007) studied children with a diagnosis of autism spectrum disorder aged between two and nine years of age. Chronological age, autism symptoms, non-verbal development, language and social development accounted for over half of the variance in symbolic play. However, autism symptoms alone were not a significant individual predictor unlike the findings of Rutherford et al (2007). Chronological age correlated with symbolic play, a finding that contradicts typically developing literature (Belsky and Most, 1981). However, when more than two other variables were included this association was no longer significant.

Expressive language and non-verbal development were both individually predictive, mirroring results found in typical development (Charman et al, 2000). In addition, social development was significant when non-verbal development was controlled for, but only in those with minimal learning disabilities. Stanley and Konstantareas (2007) highlight the inter-connectivity of developmental constructs in the measurement of play behaviours; however, due to the lack of a control sample and the age range of children used, it is difficult to draw firm conclusions from the results gained.

Messier, Ferland and Majnemer (2008) recognised the usefulness of play for both assessment and treatment in children with intellectual disabilities, including children with autism. Results revealed a mean global play age of the sample of 28 months. No correlation was found with IQ scores. The sample was split into severe and moderate intellectual disabilities. The severely impaired group spent significantly more time exploring objects, a result the

authors suggest is indicative of the child's inability to engage and maintain interest in play.

However the sample used by Messier et al (2008) were extremely mixed and only 17 of the 27 scored on the IQ test, presenting a very small sample when further analysis was performed. It is also unclear on what aspects of IQ the children failed or succeeded on, therefore the results found may be dependent on the verbal aspects of the IQ test, rather than non-verbal items.

As is in the typically developing field, research has explored the links between play and language in autism. Given that the acquisition of language is a key determiner of long-term success in autism (Liss *et al*, 2001), understanding its precursory skills and associating variables is pivotal. If symbolic play is an indicator of language readiness, research can provide not only insight into the diagnostic features of autism, but a gateway to study how these impairments interact and manifest behaviourally.

Mundy et al (1987) looked at the concurrent relationship between functional and symbolic play and language in children with autism finding that only symbolic play correlated with language; suggesting a specific association with symbolising abilities. However Warreyn, Roeyers and De Groote (2005) found that in children with autism or a language disorder, language abilities associated with all forms of play; negatively with more elementary forms and positively with advanced behaviours therefore questioning the assumed specificity to symbolic play behaviours.

Stone and Yoder (2001) explored the predictors of expressive language growth in four year olds with a diagnosis of either autism or PDD-NOS. Stone and Yoder found that whilst play and imitation were highly correlated with one another, play did not correlate with joint attention. Object play associated with expressive language at follow up, however this lost its significance when language at time one was controlled for; suggesting that language itself may represent an area which may associate with other factors, but is ultimately predicted by earlier language or pre-requisite language skills. The importance of language, in both the assessment and development of children with autism, is an area which requires clarification and language abilities may mediate

associations, even when assessments only require non-verbal understanding, highlighting the significance of language in autism.

Not all studies have found an association between play and language in autism. Sigman and Ruskin (1999) failed to replicate the relationship between play and language; functional and symbolic play were not significant predictors of language over time. Similarly, Lewis and Boucher (1988) found that language positively related to play complexity, however, when chronological age was partialled out, the significance was lost highlighting the importance of possible covariates in the developmental relationships.

As language acquisition is crucial in autism diagnosis and success, understanding the factors which may predict or facilitate is vital for a thorough understanding of autism as a disorder. Toth et al (2006) looked specifically at the role joint attention, imitation and toy play, all factors thought to predict language development. Joint attention and imitation were the strongest contributors to language at two years. However, different combinations of variables predicted growth in language using a trajectory analysis. Immediate imitation and toy play were both related to communicative ability at two years, whereas delayed imitation and toy play predicted the rate of acquisition over two years.

It is unclear however from Toth et al's findings whether toy play or imitation alone predicted growth, or whether it is the unique combination of these variables accounting for the growth trajectories. Whilst toy play did relate to growth in language, no concurrent relationships were found. Toy play as measured by Toth et al was a poorly defined concept, coupling both symbolic and functional behaviours as one category, therefore it is unclear whether the relationship to growth is maintained by symbolic or functional abilities.

Honey et al (2007) looked at what factors predict play in a sample of children with autism and typically developing controls. Expressive and receptive language plus RRBs (measured through parental report) accounted for a third of the variance in symbolic play. In the autism group alone, expressive language and RRBs accounted for the same percentage. The results suggest that, across the two samples, the association between play and other

variables, specifically language, varies. In typical development, expressive language was a strong individual predictor, whereas in the autism group this is coupled with RRBs. This was the first study of its kind to explore the association between RRBs and play in a concrete way. Other researchers have reported increased expression of repetitive play, but Honey et al (2007) extended this observation to look at the association between two diagnostic markers.

Play in autism has also been shown to relate to social abilities, in particular performance on theory of mind tasks. Both symbolic play and theory of mind are known to be impaired in children with autism (Baron-Cohen, 1987, 1989) therefore understanding how these constructs relate in atypical development will benefit intervention and our knowledge of the disorder. Play is seen as an opportunity to develop social skills, therefore may represent an area to focus interventions for children with autism. Manning and Wainwright (2009) suggest that play is an inherently social behaviour and the social impairments experienced are likely to contribute to the play impairments shown. Results indicated that play predicted social functioning, independent of diagnosis, suggesting that play behaviours could serve as a marker for social development.

What is evident from the research outlined, is that no one variable predicts play and play does not consistently relate to one factor. A complex, dynamic and integrated relationship is likely to exist; with other factors influencing development and play. Attempts have been made to explain the play impairments in autism and their associations with development, however the association, especially between play and language, is far from resolved and the interplay between different diagnostic markers of the condition unclear. This study will attempt to clarify the association with language, autism symptomatology and other developmental factors.

Theoretical conceptualisations have been proposed to explain the play impairment in autism theoretically. These theories are outlined in the following section to help conceptualise the findings presented in this chapter in a theoretical framework.

2.7. EXPLAINING THE PLAY IMPAIRMENT IN AUTISM

Four main theories have been proposed to explain the cause of the deficits experienced by children with autism, each focusing on a different aspect of the impairment. The metarepresentational, generativity, weak central coherence and social-developmental theories are all discussed in the following section. In addition, the theories presented in section 2.2 are discussed in relation to play in autism.

The metarepresentational theory focuses on the hypothesised domain specific deficit in symbolic play. It is hypothesised that these deficits arise out of the theory of mind difficulties demonstrated by children with autism. Numerous studies have shown that children with autism are unable to demonstrate this ability and are impaired on tasks requiring false belief (e.g. Baron-Cohen, 1987). Theory of mind (ToM) requires the child to detach a representation from a seemingly fixed characteristic. It is assumed this impairment will impact on the ability to interact socially and form abstract representations; required for many developmental tasks, such as symbolic play.

Baron-Cohen (1987) theorised that symbolic play impairments are caused by an underlying deficit in mentalising abilities. As previously discussed children with autism have been shown to be capable of producing functional play in spontaneous conditions, but struggled with symbolic acts. Baron-Cohen (1987) suggested that this selective impairment in symbolic play was caused by an over-riding impairment in mentalising abilities; with children with autism experiencing difficulties in holding two conflicting representations in mind at the same time. Steele and colleagues (2003) suggest the metarepresentational hypothesis accounts for all the 'important' aspects of the autism triad; social, language and imaginative impairments.

However, whilst the metarepresentational hypothesis has its strengths, there are a variety of factors it fails to explain. Firstly, many studies have found children with autism to have impairments in functional play as well as in symbolic play (e.g. Jarrold et al, 1996; Stone et al, 1990). The metarepresentational hypothesis cannot account for these impairments as functional play does not involve the separation of literal and fictional

properties. Play in autism has also been described as simple, repetitive and based on the senses of touch and sound (Wolfberg, 1999) with some children seldom reaching functional play (Libby et al, 1998).

The method of elicitation has also shown to impact on the play abilities displayed by children with autism. When play has been elicited by an adult or peer, studies have found children with autism to be capable of producing symbolic play, but struggled with the production of acts in spontaneous conditions (Lewis and Boucher, 1988; Jarrold et al, 1996).

The generativity hypothesis (also known as executive functioning) attempts to explain the gaps left by the metarepresentational theory, explaining play impairments through deficits in planning and cognitive flexibility. It is thought that symbolic play requires all of the attributes of executive functioning; the decoupling of meaning (inhibition), the generation of new meanings (generativity) and a shifting in attention to the new meaning.

Lewis and Boucher (1988) challenged Leslie's (1987) metarepresentational account of play impairments by demonstrating that children with autism could produce symbolic play when elicited by a more experienced play partner. Lewis and Boucher theorised that children with autism were impaired in their spontaneous performance of play rather than competence. It was hypothesised that children understood the qualities of symbolic play but fail to generate these spontaneously as they fail at one or more stages of executive functioning. The generativity account explains why some children with autism also experience difficulties in simple object and functional play as well as symbolic play.

The generativity hypothesis has various strengths, especially in highlighting the importance of others in the role of play through minimising the competence-performance gap. However, there are methodological issues with the generativity theory. It has been suggested that children may show delayed learning or imitation when elicited by another. Jarrold, Smith, Boucher and Harris (1994) theorised that children with autism may actually experience motivational differences rather than performance issues when asked to demonstrate symbolic play which the generativity hypothesis fails to explain.

Weak central coherence theory (Frith, 1989) offers an alternative account to the play impairments demonstrated in autism - suggesting that children with autism possess a local processing bias - tending to focus on details of an array rather than the whole. This theory can be applied readily to the repetitive and simple play often demonstrated by children with autism. If children focus on aspects such as wheels on cars or buttons on a toy cash register, an explanation is that children attend to local rather than global details. Similarly children with autism are more likely to engage in solitary play rather than social, a finding that could be explained by the central coherence hypothesis as they may not be able to view themselves as part of the whole. However this theory cannot explain the entirety of play impairments experienced in autism, as not all play shown is repetitive in nature.

Social-developmental theorists hypothesise that the impairments experienced by those with autism are a result of problems with self-awareness and perspective taking. Hobson and colleagues (2009) studied children with autism in their performance of the mechanisms of symbolic play (imaginary properties; false attributes; object substitution; flexibility and creativity) as well as their playfulness. They found that children with autism had no problems in generating the mechanisms of play, however demonstrated a lack of playful pretend. The authors hypothesise this lack of playfulness to be underpinned by their social-developmental impairments, linking to theory that children with autism suffer from reduced motivation to play. However, children with autism can display impairments throughout the play spectrum, not just in symbolic play, and have been observed displaying many elements of playfulness (Misfud, Kelly, Dissanayake and Leekham, 2009).

2.7.1. Autism and psychological approaches to play

The theories outlined in section 2.2 not only highlight the importance of play in early development but have importance repercussions for evaluating the play deficit in autism and its consequences. Each of the three theories outlined earlier within this chapter have important consequences for development in children with autism and offer a theoretical base to compare empirical findings.

Parten's social categories emphasise the importance of play in establishing social relationships, which are known to present a complex problem in autism. If children fail to master play in a solitary situation this may have repercussions for future social play and therefore social relationships. Children with autism may experience difficulties when interacting with their peers and may never fully integrate into a collaborative play role.

Piaget's constructivist theory of play relates play at each stage to cognitive advancement. Therefore based on the observed failure in symbolic (and often functional) play behaviours, children in autism would not progress at the same rate as typically developing children and therefore not develop fully in cognitive maturity. This links to the large proportion of children with autism who present accompanying learning disabilities and their lack of cognitively matured play could, in part, explain these impairments. If play relates to learning at each stage, children with autism may not be exposed to the same opportunities to practice skills required for language and education.

Vygotsky's socio-constructivist theory highlights the importance of play for learning about society whilst recognising the irrefutable role of others. Due to impairments interpreting social cues and engaging with others, children with autism may fail to benefit from an 'expert other', such as their caregiver during play. Based on Vygotsky's theory the gap between the child's actual performance and their potential would fail to reduce over time and children with autism may get 'stuck' in more elementary and solitary forms of play due to their failure to interpret and respond appropriately to social cues. Children would also not get the same opportunities to learn about social roles, reciprocity and wider society. Vygotsky's theory will in part be tested in this current study, exploring the role that caregiver play in children with autism and their developmental progression in play.

2.8 SUMMARY

This chapter presented the theoretical conceptualisations of play and its development, before outlining its links to developmental progression in neurotypicals. The extent and nature of the play impairments experienced by children with autism were then discussed with reference to definition

conflictions and measurement issues. The literature surrounding play and development in autism was presented and the conceptualisations of impairments in play discussed.

What is evident from the literature presented in this chapter, is that play has an irrefutable influence on development. Play is also in turn influenced by the attributes of the player (explored further in chapter four) and interacts with development over time. The exact nature and cause of this delay or deviance has been debated for many years and is still unknown, yet continues to provoke exciting research opportunities with clinical implications.

CHAPTER 3: ATTACHMENT AND MATERNAL SENSITIVITY: RELATIONSHIP TO DEVELOPMENT AND AUTISM

Attachment theory (Bowlby, 1969) and maternal sensitivity (Ainsworth, Blehar, Waters and Wall, 1978) are concepts that have received a great deal of attention within developmental research. Both concepts provide a conceptual framework to study individual differences in early childhood (Shapiro et al, 1987) and have been widely applied clinically. The relationship between attachment, parental behaviours and subsequent proficiency in social, cognitive and emotional development is of key interest in both typical and atypical populations, whilst the exact nature of attachment in autism is far from resolved and widely debated.

3.1. WHAT IS ATTACHMENT?

Attachment theory originates from Bowlby's (1969) seminal research into interpersonal relationships. Attachment is defined as a "bond or tie between an individual and an attachment figure" (Prior and Glaser, 2006, pp.15). Bowlby theorised that attachment formation is a biological instinct which evolves to ensure survival and without which a child cannot develop normal social and emotional skills required for later life. The attachment relationship is hypothesised to be crucial for survival and is expressed through the display of proximity seeking behaviours towards the attachment figure in stressful situations.

This relationship is usually developed within the first year of life and children develop an internal working model based on the caregiving experiences within this time (Bowlby, 1969). An internal working model is similar to a cognitive map in that a child forms coded representations of attachments and learns to make assumptions based on early parent-child interactions. These models are not static and can change given new experiences such as early trauma. The internal working model is crucial for the child's future social development through generalisation of the original attachment relationship.

Attachment is represented through behavioural patterns termed attachment behaviours that seek to establish and maintain proximity in times of perceived

need and threat. The patterns of behaviours children express reflect the anticipations children hold based on early interactions with their caregiver. The attachment system is activated and operates through displaying 'predictable outcomes' (Bowlby, 1969) based on previous interactions and the child's internal working model. The child will seek proximity which in turn deactivates the stressor and the need for attachment behaviours.

In early childhood the attachment relationship is not mutual or reciprocal and is developed through a need for safety, security and protection. As children develop, the need for an attachment relationship does not disappear, but the way in which these relationships are expressed changes. Therefore it is important to look also at the dyadic processes involved in attachment formation.

3.2. CLASSIFYING ATTACHMENT

The majority of attachment research utilises the Strange Situation (Ainsworth et al, 1978) to classify infants into four distinct categories. The Strange Situation Paradigm (SSP) is based on a standardised observation consisting of eight distinct steps (lasting three minutes) involving separation and reunion with the caregiver and reactions to a stranger. The SSP is suitable for children between 9 and 18 months of age and has been used across a variety of cultures. The observation varies in stressfulness and infants are classified into one of four categories based on exploration behaviours and reaction to their caregiver and a stranger. The four categories are: secure, insecure avoidant, insecure resistant and disorganised/disorientated (developed later by Main and Soloman, 1986).

Attachment is measured through the amount of proximity seeking behaviours and exploration the child demonstrates during the SSP. Exploration is assumed to reflect the child's ability to use their caregiver as a secure base from which they can leave and return. Exploration is viewed as the 'antithesis' of attachment behaviours (Prior and Glaser, 2006) as takes the child away from their caregiver however reflects their pre-existing expectations of their caregiver. Ainsworth (1963 and 1967) believed attachment behaviours were

activated when the caregiver is inaccessible and the child cannot utilise their mother as a secure base.

The majority of children are classified as securely attached (approximately 70% based on various meta-analytical studies, e.g. van Ijzendoorn and Kroonenberg, 1988; Waters, Hamilton and Weinfield, 2000), exploring freely and engaging with strangers in their caregiver's presence. Children are noticeably upset when their caregiver leaves but easily comforted on return, engaging minimally with strangers whilst the caregiver is absent. Children who are classified as securely attached are thought to possess an internal working model which allows them to use their caregiver as a secure base who will be present when they return from exploring.

Infants and toddlers classified as insecure fall into two categories; insecure resistant or insecure avoidant. Insecure resistant children are anxious of strangers and resist exploring when their caregiver is present. These children become distressed when their caregiver leaves but resist interaction when they return. Insecure avoidant children show little emotion when their caregiver departs and returns. They can appear to avoid or ignore their caregiver and the stranger during the interaction, however responses can vary with some children showing much interest in the presence of a stranger.

Main and Soloman (1986) added a further classification of disorganised/disorientated. This classification was developed based on children who did not fit into any of the organised attachment classifications. Children classified as disorganised/disorientated may cry or show agitation when their caregiver leaves but avoid them on return, presenting an ambivalent pattern of attachment behaviours. This fourth attachment category has been linked to developmental psychopathology (Green and Goldwyn, 2002).

However, attachment is not solely a child attribute and cannot exist without the role of the caregiver. Caregiver behaviours are assumed vital for the development and maintenance of the attachment relationship and have been hypothesised to be the primary determinant in individual differences in attachment classifications (e.g. Goldberg et al, 2003).

3.3 CAREGIVING AND PARENTAL SENSITIVITY

Attachment is theorised to be largely determined by the caregiving environment (Ainsworth et al, 1978; Kivijarvi *et al*, 2001; Isabella, 1993). As fore mentioned, the child forms its internal working model based on the expectations of their caregivers responses, therefore, it is assumed that attachment and caregiving behaviours are activated simultaneously (Prior and Glaser, 2006). Caregiving is described as “providing protection and comfort so as to deactivate the need for attachment behaviour” (Prior and Glaser, 2006, pp.38) Sensitivity is one aspect of the caregiving environment which has received a great deal of attention.

The concept of maternal sensitivity (Ainsworth et al, 1978; referred to here as *parental sensitivity*) is thought to play a central role in the development and maintenance of the attachment relationship. Parental sensitivity refers to a parent's ability to recognise signals and act and prompt appropriately (Ainsworth et al, 1978). Parental sensitivity is one aspect of caregiving crucial for the development of an internal working model. Parental sensitivity has been viewed as the primary determinant of individual differences in attachment behaviours (Goldberg, Benoit, Blokland and Madigan, 2003, Kivijari et al, 2001) and the relationship between the two concepts has stood the test of time (Prior and Glaser, 2006).

Ainsworth et al (1978) found patterns of parental behaviours that associated with the three original attachment classifications; mothers of securely attached children displayed sensitive and consistent behaviours. Mothers of insecure avoidant children were rejecting in their behaviours, whereas insecure resistant children had mothers who were inconsistent in their caregiving. This has been replicated by Isabella (1993) who measured maternal behaviours at one, four and nine months in relation to infant attachment at one year. Infants classified as securely attached had mothers who were more responsive at all timepoints and less rejecting at both one and nine months.

Goldberg (2000) found that parental behaviours varied depending on how the child's attachment quality was classified. Securely attached children had parents who were sensitive in responsive, whereas the parents of insecure-

avoidant children were rejecting towards their child. Insecure-resistant children had parents who displayed inconsistent patterns of responsiveness. However, Goldberg (2000) did not assess the causality of these associations. Kivijarvi et al (2001) found that parental sensitivity represented a key indicator of the quality of the parent-child relationship replicating the earlier findings of Ainsworth et al (1978) and providing support for the associations found by Goldberg (2000).

De Wolff and van Ijzendoorn (1997) conducted a meta-analysis exploring the pre-requisites of a secure attachment. The findings replicated Ainsworth et al's (1978) findings, however, whilst sensitivity was important, it was not an exclusive condition and other factors played a role in the formation of a secure attachment. Braungart-Rieker, Garwood, Powers and Wang (2001) found that sensitivity at four months was associated with attachment security at one year; however the effect was mediated by infant affect regulation.

The findings confirm that whilst parental sensitivity is significant in the formation of attachment in typical development, other factors play a part in its development. It is difficult to disengage cause and effect, with infant factors such as affect and temperament contributing to the interaction, as well as dyadic factors such as mutuality.

3.4. MUTUALITY AND SYNCHRONY

Whilst the role of the parent is irrefutable and arguably a central feature in attachment formation (Isabella and Belsky, 1991), child behaviours and dyadic processes cannot be ignored, especially when studying a population who are impaired in social situations and social understanding. The concepts of synchrony and mutuality have also been linked to the development of attachment in typical development (Harrist and Waugh, 2002) as well as in children with autism (Siller and Sigman, 2002; Blazey, 2007).

As attachment is a two-way relationship, the co-construction of this is assumed to be dependent on both partners (Harding, Weissmann, Kromelow & Stilson, 1997). The concepts of parent-child mutuality and synchrony have been implemented in attachment research to capture the dyadic nature of interactions often disregarded. Whilst there is clear overlap with parental

sensitivity, synchronous and mutual interactions cannot exist solely on the parents' behaviours; recognising the irrefutable input of the child.

Synchrony and mutuality represent the flowing and smooth pace of an interaction, characterised by shared focus and reciprocity (Harrist and Waugh, 2002). Mutuality goes beyond synchrony to encompass turn taking, a sense of togetherness, acceptance and affect matching. These concepts have been shown to correlate and predict attachment security in typically developing populations (Isabella and Belsky, 1991; de Wolff and van Ijzendoorn, 1997). De Wolff and van Ijzendoorn (1997) measured parental behaviour as well as the dyadic concept of mutuality. Despite the importance of parental behaviours, mutuality was a stronger predictor of attachment security. Moreover these associations hold whether assessed using global ratings or structured assessments of attachment, such as the SSP.

Harrist and Waugh (2002) also recognised the importance of the interactional processes central to the attachment relationship. Synchronous interactions were highlighted as a crucial facilitator in the formation of a secure attachment and the internal working model. Harrist and Waugh (2002) found that regulated, reciprocal and harmonious interactions were contingent to a secure attachment relationship. Isabella and colleagues (1989) similarly acknowledged the two-way responsiveness required to form a secure attachment relationship; with an interactive process involved in establishing an appropriate 'fit' between the child and caregiver which can be generalised to other situations.

Whilst attachment security, parental and dyadic factors are undoubtedly intrinsically linked, they also exert an influence on wider development. The context of a secure and consistent attachment relationship provides a context in which the child can learn and develop. The influence of the parent-child relationship is explored in the following section.

3.5. ATTACHMENT, PARENTAL SENSITIVITY AND DEVELOPMENT

The following sections explore the associations between attachment, and its related constructs and development in a variety of domains.

3.5.1 Attachment

Establishing a secure attachment is a central developmental task (McElwain and Volling, 2004), but the attachment relationship also has consequences in subsequent development (e.g. Goldberg et al, 2003; Meins, 1997). There is “no shortage of developmental phenomena to which attachment security has been linked” (Belsky and Cassidy, 1994, pp. 318) and whilst its importance is irrefutable, attachment cannot relate to every aspect of future development. Instead a secure attachment is hypothesised to provide a protective factor against stresses and a foundation for developmental tasks and relationships.

Attachment classifications have been readily related to social abilities in typical development (e.g. Goldberg et al, 2003; Rose-Kransor, Rubin, Booth and Coplan, 1996). In particular, attachment security has been shown to relate to social competence; “the ability to achieve personal goals in social interactions while maintaining positive relationships with others over time and across situations” (Rubin and Rose-Kransor, 1992, pp. 285). As the attachment relationship is hypothesised to provide a model to generalise to other situations, a secure attachment is assumed to result in more positive social experiences compared to an insecure classification.

A secure classification promotes a context in which a child can develop positive social expectations and feelings of self worth (McElwain and Volling, 2004). The formation and success of peer relationships have been subsequently shown to correlate with early attachment security (Freitag et al, 1996) and attachment is predictive of subsequent social engagement (Rose Krasnor et al, 1996).

The Rosenberg project looked specifically at the relationship between attachment security at 18 months and a variety of social variables in non-risk families. Matas, Arend and Sroufe (1978) found that secure attachment at 18 months was predictive of higher positive affect and lower negative affect at 24 months. Children classified a secure also demonstrated greater enthusiasm, compliance and affective sharing during play episodes.

Matas et al (1978) found longer-term consequences of attachment security with a secure attachment in infancy leading to less emotional dependence at

school. Conversely, receiving a classification of insecure-avoidant in early childhood was the best predictor of teacher ratings of hostile behaviour (Lyons-Ruth, Aslpern and Repacholi, 1993) and aggression (Egeland and Carlson, 2004)

Security of attachment has also been linked to non-social variables. Early attachment quality has been shown to correlate with later problem and task solving abilities in typical development (Meins, 1997; Matas et al, 1978). Matas et al (1978) found security based differences in puzzle completion tasks at two years of age. Children classified as secure were more successful; a finding attributed to more compliance, persistence, attention and enthusiasm. Hazen and Durrett (1982) found securely attached children were more independent when exploring and more innovative in their ability to solve spatial tasks. Weinfield and colleagues (1999) found that a secure attachment was related to greater goal direction and effort; presenting a handful of studies providing clear associations between attachment security and cognitive tasks.

The relationship between language and attachment presents a more varied picture. van Ijzendoorn et al (1995) conducted a meta-analysis exploring the relationship between attachment security and language. Whilst securely attached children were generally more competent in language, issues with measurement were highlighted. Inconsistent results were found and, whilst overall a link between attachment and language was evident, this varied between studies.

Meins (1997) explored the relationship between attachment and language learning style. Meins found that children classified as securely attached were more likely to learn language referentially, due to their superior ability to use their caregiver as a reference. Securely attached children have been shown to have larger vocabularies at both 18 (Connell, 1976) and 19 months (Meins, 1997). These children are also more likely to have a longer mean length of utterance (Gersten, Coster, Schneider-Rosen Carlson and Cicchetti, 1986), however, this sample was drawn from a group of maltreated children therefore it is unclear whether the results can be generalised.

Meins (1997) explored the relationship between attachment and language further. Of those classified as 'faster' language learners, 77% were classified as secure using the SSP. Children classified as secure at 19 months not only had larger vocabularies, but used more common nouns, fewer frozen phrases and less meaningless speech. Meins (1997) theorised that maternal variables may mediate the association between language and attachment, however this was not directly explored.

Attachment security has been further linked to theory of mind and mentalising abilities, known to be impaired/delayed in children with autism (Baron-Cohen, 1987). Bretherton (1990) found both concurrent and longitudinal associations between attachment security and theory of mind. Meins (1997) similarly found children classified as secure were more likely to pass assessments of theory of mind compared to children classified as insecure.

McElwain and Volling (2004) hypothesised that it is theory of mind abilities which mediate the relationship between attachment and friendship success and quality. It was hypothesised that a secure attachment relationship leads to more competent theory of mind abilities, which in turn contribute to the development and maintenance of friendships, thus furthering the importance of attachment in social development.

The failure to form a secure attachment has been linked to subsequent problems in development. Disorganised attachment has been found to be higher in particular social and clinical groups (van Ijzendoorn, Schuengel and Bakermans-Kranenberg, 1999). The Minnesota study (Sroufe, Egeland, Carlson and Collins, 2005) explored the role of attachment overtime, using the attachment relationship as a framework to study subsequent development. Disorganised attachment in early childhood was the single strongest predictor of global pathology at 17 years. Main and Soloman (1984), when devising the classification of disorganised attachment, acknowledged its links to future psychopathology, and Bowlby (1969) discussed the implications of the failure to form a lasting attachment relationship with the primary caregiver.

Insecure-avoidant attachments have been associated with hostility and aggression in later childhood (Lyons-Ruth et al, 1993; Egeland and Carlson,

2004), extending the relationship beyond disorganised attachments. However, the cause of a disorganised or insecure attachment is likely to influence subsequent development. Disorganised attachment is more common in lower socio-economic families and in caregivers who misuse alcohol or drugs (van Ijzendoorn et al, 1999). Therefore, it is important to recognise the role of the environment in which attachment forms as this may mediate its impact on development or exert an independent influence.

3.5.2 Caregiver influences on development

One irrefutable environmental influence is the role of the caregiver. As discussed in section 3.3, caregiver behaviours are viewed as the primary determinant in attachment formation and maintenance (Ainsworth et al, 1978), therefore, they are likely to either mediate the relationship between attachment and development or exert their own unique influence.

It is thought that the mere presence of the caregiver is enough to raise the level of behaviours elicited - as having the caregiver available as a reference point will enhance behavioural expressions (Fein and Fryer, 1995). In line with Vygotsky's notion of a ZPD, the caregiver may scaffold interactions and allow the child to reach their potential in developmental tasks. However, the influence of sensitive caregiving is thought to pervade even in the absence of the caregiver. Conversely, the influence of insensitive or inconsistent caregiving is also assumed to influence development beyond the scope of the parent-child interaction.

Consistent with Vygotskian theory, researchers have hypothesised that caregivers who provide scaffolding and feedback will encourage and reassure their children (Wood et al, 1976). This encouragement is internalised and generalised to external situations. In addition, it is assumed that caregivers of securely attached children will be more sensitive to the child's actual and potential performance, but also view the child as an active participant in their own development (Meins, 1997).

Some researchers adopt the view that caregiver behaviours may serve as the primary determinant of individual differences in child behaviour (Goldberg et al, 2003). Meins (1997) hypothesised that individual differences may be

associated with maternal interactional style and found that maternal sensitivity associated with general development measures, as well as more specific language and social abilities.

Noll and Harding (2003) proposed that child cognitive development was a combination of the effects of both child and caregiver characteristics. The authors highlight the significance of mothers during play interactions and the social context created undoubtedly serves as an important mediator in cognitive and social development. Stern (1974) acknowledged the naturalistic setting of play as a context in which to study the parent-child relationship and development. Mothers were recognised as the primary force in promoting and maintaining social interaction as well as encouraging competence in a variety of developmental domains.

Isabella (1993) found that mothers of insecurely attached children were inconsistent in their responses which in turn created an inconsistent learning context. Conversely, mothers of securely attached children extend their consistent and reflexive caregiving beyond the immediate parent-child interaction to create a facilitating environment. Tamis-LeMonda, Bornstein and Baumwell (2001) found that maternal responsiveness predicted all child milestones above and beyond the child's competence at both nine and thirteen months. Beyond this age, child behaviours and competence played a role; however, in early development the caregiver irrefutably possesses a large degree of influence within the interaction.

It has been acknowledged that a secure attachment or sensitive caregiver could merely represent a co-operative child. Main (1983) suggested that the role of the caregiver and the attachment relationship may mask the child's basic ability to sit and co-operate in tasks, therefore, making children more receptive to sensitive caregiving. Undoubtedly a variety of factors will influence development including the relationship between the caregiver and the child, existing competencies and clinical diagnosis.

Language development is one area where maternal behaviours are thought to play a vital role. This idea stems from social-constructivist and interactive theories of language acquisition (Vygotsky, 1978; Bruner, 1975) which

highlight the role of others in development. It is thought that caregivers can create 'optimum occasions' - ensuring their speech and behaviour are congruent and focused on the child's attention (Bloom, 1993) - which will in turn facilitate language learning. However, a simple additive relationship has not been found and a reciprocal between child and caregiver behaviours is likely to exist. Concurrent and longitudinal relationships have been found and both positive and negative influences of caregiver behaviours have emerged.

A number of studies explore the association between caregiver encouragement and social interactive behaviours in relation to child language. Tamis-LeMonda and Bornstein (1991; 1994; 1999) have conducted a number of short term longitudinal studies exploring these associations. Maternal encouragement at five months was positively related to child language comprehension and production seven months later (Nicely, Tamis-LeMonda and Bornstein, 1999). However, positive associations were not always apparent - with caregiver symbolic play at 13 months exerting a negative impact on vocabulary at 20 months (Tamis-LeMonda and Bornstein, 1994) - a finding the authors attribute to the caregiver providing a sensory overload; not attuned to their child's current developmental capacity.

Vibbert and Bornstein (1989) looked at caregiver and social interactions as well as didactic behaviours and control strategies. Didactic behaviours, specifically caregiver encouragement, related to overall language ability. Caregivers who provided encouragement, demonstrated and elaborated on child behaviours produced the most positive impact on child language, supporting the research of Bornstein (1995) and Tamis-LeMonda and Bornstein (1989; 1990). Control strategies were also important in child language abilities, but only until the child could initiate for themselves, suggesting caregiver influences may reduce with age and child ability.

Tamis-LeMonda et al (2001) further explored the longitudinal relationship between maternal responsiveness and child language milestones. At all timepoints, caregiver responsiveness related to child language, both to overall ability and more specific aspects.

Looking more specifically at caregiver-child interactions, Laasko and colleagues (1999) explored caregiver maintenance, extension and redirection of child attention and how these influenced child language. Caregiver behaviours that expanded on the child's current focus had a beneficial effect on child language; framing language development within a referential context.

Legerstee, Markova and Fisher (2007) extended this relationship to pre-requisite language skills. Maternal attunement - comprising of attention maintaining and sensitivity - facilitated dyadic and triadic communication and the development between the two. These concepts are assumed to be vital for later language development (Laasko et al, 1999), therefore caregiver behaviours may influence early development and mediate the influence on later abilities.

Meins, Fernyhough, Fradley and Tuckey (2001) elaborated on the construct of maternal speech, assumed to have a beneficial impact on child language if used appropriately, exploring the concept of mind mindedness which recognises the child as an active participant in the relationship. Mind mindedness had a positive impact on child language, with more comments regarding the child's abilities, leading to higher language abilities in the child.

However, it is unclear whether caregiver influences on child language development are merely mediated by the child's ability to interact with their caregiver (van Ijzendoorn, Dijkstra and Bus, 1995). Caregivers of securely attached children are also assumed to simply be better 'teachers' and if these children are themselves more responsive, this combination is likely to have a beneficial effect on child development.

What is evident from the research presented here is that caregivers can exert a strong influence on child development, however, this maybe mediated by other factors. The impact of caregiver behaviours is assumed to influence other areas of development. One such area is that of social abilities and development.

McElwain and Volling (2004) hypothesised that the attachment relationship provides a foundation for future development and peer relationships. Children

can develop positive social experiences and self worth within and against the context of a secure attachment. McElwain and Volling explored whether parental sensitivity mediated the influence of attachment on peer relationships and theory of mind at four years or whether an independent effect of this variable was observed. Mother and father sensitivity accounted for a quarter of the variance in positive child peer interaction; however, maternal sensitivity was the strongest individual predictor. Children who had a more sensitive caregiver at one year also had better false-belief understanding at four years, suggestive of a long lasting influence between caregiver behaviours and child social abilities.

Kivijarvi et al (2001) explored the association between maternal sensitivity and child behaviour at three months and nine months. The authors hypothesised a reciprocal relationship between early maternal and child behaviours, with both influencing later development and one another. Maternal sensitivity associated with infant affect, expressed affect, social behaviours, initiations and responses at both timepoints, replicating early studies by Brazelton (1974) and Stern (1977). These findings also extend research indicating an influence between three and six months (Susman-Stillman, Kalkoske and Egeland, 1996) and later in development (McElwain and Volling, 2004).

More recently, studies have explored the relationship between the dyadic concepts of synchrony and mutuality to child developmental variables to see whether the parent-child relationship as a whole contributes to development rather than relying solely on caregiver behaviours. Lindsey, Mize and Pettit (1997) proposed a bidirectional association between parent and child behaviours that may inform the process of influence on child development. It was argued that by only taking into account individual perspectives, research will fail to fully appreciate and account for the other partner's contribution to the interaction. Therefore, it is assumed both individual and dyadic factors will influence concurrent and future development.

Lindsey et al (1997) found that dyadic constructs measured during play sessions with mothers or fathers were associated with greater social

competence and peer acceptance. This effect was independent of the child's own contribution.

Blazey (2007) measured the caregiver concept of sensitive responding and the dyadic construct of mutuality using a global observational measure. Sensitive responding and mutuality were both related to non-verbal development; but only mutuality was related to language development.

Caregiver and dyadic variables appear to exert both an independent and combined influence on child development. These associations have been found concurrently and over time, however, no consistent picture has been found and it is assumed child and caregivers exert an influence on one another and interact with each other. These associations may be independent or dependent on attachment or may mediate these relationships.

One clinical group in which the child may fail to learn effectively within a social context is the disorder of autism. The importance of attachment and caregiver behaviours, both on autism symptomatology and development in autism, are discussed in the following sections.

3.6. ATTACHMENT, PARENTAL SENSITIVITY AND MUTUALITY IN AUTISM

There has been much debate surrounding the attachment relationship and caregiving behaviours in children with autism. Early studies suggested that the caregiving environment was 'cold and insensitive' (Sauna, 1986); leading to an over-representation of insecure and disorganised attachments and autism. However, whilst this has been widely disputed, there is no consistent picture as to what attachment and the attachment-relationship 'looks' like in children with autism.

3.6.1. Attachment

The attachment relationship has been investigated widely within autism; however, inconsistent measurements and conflicting findings merit further investigation. Whilst Kanner (1943) did not explicitly discuss the attachment relationship in his observations of autism, he noted the absence of behaviours signalling the formation of this relationship. Attachment behaviours have been

included in previous DSM definitions of autism, with early descriptions of symptomatology including a failure to form attachments. In later versions, this was modified to a bizarre attachment relationship; however, recent DSM checklists no longer include items specifically relating to the primary attachment bond. DSM-IV does, however, recognise failure to cuddle and an aversion to affection and physical contact as key symptoms in the diagnosis of autism.

Early studies exploring the attachment relationship in children with autism produced inconsistent results. For example, Sigman and Ungerer (1984a) measured attachment behaviours through separation and reunion behaviours during a free play session; recreating the structure of the SSP but within a more naturalistic environment. The authors found that children with autism showed no preference for interacting with their mother, but did seek proximity after separation. Sigman and Mundy (1986) similarly found that whilst children did demonstrate differential behaviours towards their mother and behaved in ways indicative of attachment during a free play session, these behaviours were less frequent than those shown by neurotypical children.

Dawson, Hill, Spencer, Galpert and Watson (1990) found that during a play situation varying in communicative demands, children with autism displayed fewer social behaviours, gaze and affective contact than controls representing fundamental symptoms of autism as well as constructs of the attachment relationship. However, Shapiro and colleagues (1987) compared children with autism, language disorders and learning disabilities using a modified version of the SSP. Shapiro et al found that over two thirds of children with autism did show a change in behaviour upon separation from their caregiver. Children with autism demonstrated attachment in ways concordant with their capacity for affective display and understanding, suggesting that attachment may 'look' different in children with autism.

Rogers, Ozonoff and Maslincole (1993) highlighted the difficulties in using the SSP with children with autism and forcing traditional attachment classifications. Using the SSP, only half of children with an autism spectrum disorder or pervasive developmental disorder were classified as secure,

compared to approximately 70% of typically developing children. Attachment security did not correlate with autism symptom severity and IQ, suggesting that autism itself did not prevent the formation of an attachment relationship. Instead the authors propose that the attachment relationship is formed later than neurotypical controls and in idiosyncratic ways which are not captured by the SSP.

Capps and colleagues (1994) found similar results to Rogers et al (1993) with 40% of children with autism classified as securely attached using the SSP. However, 20% of the children were unclassifiable presenting further problems with the reliability and validity of using the SSP within this sample. Moreover, Capps et al (1994) found a higher proportion of disorganised attachments than previous studies as well as an interaction with accompanying learning disabilities. This finding has been supported in a recent meta-analysis in which attachment security was shown to correlate with learning disabilities in children with autism (Rutgers, Bakermans-Kranenberg, van Ijzendoorn and van Berckelaer-Onnes, 2004). Rutgers et al (2004) also found that when autism was more strictly defined, fewer children were classified as securely attached, suggesting an interaction with autism severity.

Dissanayake and Crossley (1996) used a free play session to measure attachment behaviours in typically developing children, children with an autism spectrum disorder and children with Down's syndrome. Results indicated that children with autism approached their caregiver less frequently. These children also did not sit on their caregiver's lap as often and orientated fewer behaviours towards their caregiver. Despite the emerging differences, the authors found that children with autism were capable of forming attachments and altering their behaviour accordingly; suggestive of behaviours indicative of attachment. However, clear deficits were still apparent in gaze directing and positive affect compared to neurotypical controls and children with Down's syndrome, indicating that attachment may be represented differently in children with autism.

Studies utilising a modified version of the SSP or global measures of attachment have emerged looking at the incidence of secure attachment

relationships in autism. Rutgers, van Ijzendoorn, Bakermans-Kranenberg and Swinkels (2007) used both SSP and the Attachment Q-Sort (AQS; Waters, 1995) to measure attachment security. Both measures revealed that children with autism were significantly less securely attached. Children were able to form attachments with their caregiver; however, these were less flexible and characterised as less synchronous. When autistic symptoms were more severe, children received fewer secure classifications and were less responsive to their caregivers, indicative of an interaction with autistic symptomatology.

Naber and colleagues (2007) recognised the need to distinguish disorganised attachment behaviours from autistic behaviours, a problem encountered when using the SSP. Naber et al (2007) did not find that disorganised attachment was over represented in the sample, compared to children with a pervasive developmental disorder, learning disabilities or a language disorder. Children with autism were capable of forming secure attachments; however, this classification was underrepresented. Autism severity accounted for 12% of the variance in attachment, with children with more autistic symptoms less likely to receive a secure classification replicating similar findings as Rutgers et al (2004).

Attachment in autism clearly represents an interesting and inconclusive picture. The next section examines how the role of the caregiver contributes or varies in the attachment relationship in autism, exploring whether traditional attachment assumptions remain in spite of the social and communicative impairments experienced by children with autism.

3.6.2 Parental Sensitivity

The role of the parent has been irrefutable in typical development; however, the notion of parental sensitivity has been approached with caution in samples of children with autism. Given the well established links between attachment and parental sensitivity in both typically developing children and children with Down's syndrome (Atkinson *et al*, 1999), it seems probable that this relationship will extend to children with autism and their caregivers. Similarly there has been an increase in parent-led interventions (e.g. Aldred, Green and

Adams, 2004; Green *et al*, 2010) that utilise parents as a vehicle for change; training them to recognise subtle communicative and interactive attempts and building on these early skills to enhance social interaction. Therefore, furthering our understanding of the role of the caregiver in attachment formation and maintenance will add to our comprehension of the disorder and possibly have clinical implications.

However, the difficulty of raising a child with autism must be acknowledged and researchers have recognised the stress accompanying this will no doubt impact the way in which the parent-child dyad flows (Rutgers *et al*, 2007b). Added to this, the social impairment experienced by those with autism actively defies typical interactive patterns (Doussard-Roosevelt, Joe, Bazhenova & Porges, 2003) and a vicious cycle of interaction failure and parental stress may further complicate the formation of attachments.

Capps *et al* (1994) found that parents of a securely attached child with autism responded more sensitively, in keeping with traditional assumptions of attachment theory suggesting that the relationship between these two concepts holds regardless of the social and interpersonal impairments experienced by children with autism.

However, various differences have been found between the parents of children with autism and control groups. When using global measures of sensitivity, differences may not emerge, however become apparent when a more fine-grained analysis is conducted. Looking at individual behaviours, Kasari, Sigman, Mundy and Yirmiya (1988) found that parents were just as responsive; however, they prompted their child more during interactions and were more likely to use strategies of control. Rutgers *et al* (2007b) found authoritative parenting to be more common in parents of children with autism compared to parents of children with a language disorder, learning disabilities or without any developmental delays. The impact of these differences on child attachment and subsequent development, however, were not explored.

Further qualitative differences have been found, with parents of children with autism smiling less during a play session (Dawson *et al*, 1990) and making more object and physical approaches (Doussard-Roosevelt *et al*, 2003).

Doussard-Roosevelt et al (2003) also found that parents made more non-verbal approaches. Differences could also be explained by parents having to alter their approach to their children with autism and non-verbal methods maybe more suitable given the well-documented language impairments experienced by this sample. Object and physical approaches may prove more compatible with a child with autism, especially if the child suffers from accompanying language impairments. Therefore, when looking at individual behaviours, it is important to acknowledge that differences may not be negative but contingent with the child's capacity for interaction and development.

As fore mentioned, parents of children with autism experience day-to-day challenges not encountered by parents of typically developing children. The differences found in parenting behaviours may represent compensation strategies utilised by parents to try and interact with their child. Whilst prompting children may be an attempt to structure an interaction and may appear, in the traditional sense, as authoritative parenting, it may be parents' only way of creating a dyad with their child.

van Ijzendoorn *et al* (2007) explored the relationship between parental sensitivity and attachment security in four samples: neurotypical, language-delayed, children with learning disabilities/delays and children with autism. Attachment was measured using the SSP and parental sensitivity rated globally. The authors found that parents of a child with autism did not differ in their responsiveness and sensitivity to the other groups. In all other groups a relationship was found between sensitive responding and secure attachment classifications. This relationship did not hold for those with autism, violating traditional assumptions. These results differ to those of Capps et al (1994) who found that the traditional relationship between attachment and parental sensitivity held in autism.

These findings raise the question whether it is the child's inability to interact with sensitive parenting to create a secure attachment which violates the traditional attachment-sensitivity relationship, or whether it is the parents who, despite acting in accordance to the typical definition of parental sensitivity,

need to vary their behaviours to accommodate a child who is impaired at understanding social relationships and situations. The likelihood is that parental behaviours and autism symptomatology combine to produce a collateral effect on the attachment relationship.

Koren-Karie and colleagues (2009) replicated the van Ijzendoorn et al (2007) study using the Emotional Availability Scales (EAS; Waters, 1995) and SSP in a group of children with autism and PDDNOS. In contrast to van Ijzendoorn et al's findings, Koren-Karie et al found parental sensitivity and attachment associated positively, supporting traditional assumptions of attachment theory. Parents of children who were securely attached were more sensitive than those classified as insecure, in support of Capps et al (1994) and the parent-child relationship in neurotypical development.

The above findings present a contradicting picture of attachment and caregiver behaviours in autism with some results violating traditional attachment assumptions and others support the typical pattern of association. The studies presented in this section differ in methodology and rigour and this may in part account for the differences between studies and samples.

Both van Ijzendoorn et al and Koren-Kaire et al implemented the EAS and the SSP. Whilst the EAS provides a good framework for studying parental behaviours it ignores the input of the child. Research has highlighted the importance of child factors such as temperament and synchrony (e.g. Isabella and Belksy, 1991). This is especially true for children with autism, whose social impairments make forming relationships difficult. The next section explores the influence of these dyadic behaviours on attachment in autism.

3.6.3 Mutuality and Synchrony

Only two studies to date have examined the role of dyadic variables in attachment formation. Siller and Sigman (2002) and Blazey (2007) explored the links between the dyadic constructs of synchrony/mutuality and attachment security in pre-school children with autism. Both synchrony and mutuality have been shown to be important constructs in the attachment relationship in typical development (Lundy, 2002; Isabella, Belsky and Vaneye, 1989), therefore, these two studies extend the literature base to children with autism.

Siller and Sigman (2002) recognised the importance of social interactions in development of children with autism. Caregiver synchrony was matched between caregivers of a child with autism and a child without, despite the social impairments experienced by children with autism. Caregivers were just as synchronous as their typically developing counterparts and focused on their child's attention. Siller and Sigman did not extend the research to explore the impact synchronous behaviours have on attachment formation and maintenance.

Blazey (2007) explored the links between the dyadic construct of mutuality and attachment. Mutuality extends beyond synchrony including affect matching and dyadic flow, as opposed to simply shared focus. Mutuality was measured using the Coding for Attachment Related Parenting for children with Autism (CARP-A; Blazey, 2007), taking into account shared aspects of the interaction, focusing on affect matching, dyadic play, shared focus, flow and orientation. The mutuality scale also measured how readily the child seeks involvement from their caregiver or accepts their involvement.

Blazey (2007) found that higher mutuality ratings and lower scores on child negative affect predicted attachment security in children with autism. However, the study did not explore the links between attachment and these constructs in neurotypical controls, therefore it is unclear how they relate to attachment in typical development.

Blazey (2007), however, did explore the differences between the six CARP-A constructs (caregiver and child positive and negative affect, sensitive responding and mutuality) in children with autism and neurotypical controls matched on non-verbal development. Differences were found between the two groups on parental sensitive responding and mutuality, with neurotypical controls scoring higher on these constructs. The control group also received higher ratings on both parent and child positive affect.

Blazey (2007) and Siller and Sigman's (2002) both highlight the ability of caregivers to interact with their child despite the social impairments experienced; however, Blazey's results suggest that differences are evident between groups. The applicability of the concepts of synchrony and mutuality

to development, both in typical development and autism, has been insufficiently studied and merits further investigation.

3.7 ATTACHMENT, PARENTAL SENSITIVITY AND DEVELOPMENT IN AUTISM

A handful of studies have extended the relationship found in typical development between attachment and development to samples of children with autism. The interpersonal context in which development occurs may be more important in children with autism as caregivers behaviours could be confounded by the social impairments exhibited by children.

Capps et al (1994) looked specifically at social behaviours in relation to attachment classifications in autism. Children with autism who were classed as insecure made fewer social initiations than those classified as secure. Similarly, Willemsen-Swinkels et al (2000) found that children classified as insecure made less eye contact and were less responsive during interactions. However, it is recognised by van Ijzendoorn et al (2007) that these studies could be confounded by the presence of autism symptomatology, specifically the social impairments expressed by children.

Sigman and Ungerer (1984b) found that in addition to social skills, securely attached children with autism had better non-verbal skills than children classified as insecure. Rutgers et al (2004) and Naber et al (2007) found that insecure attachment was more evident in children with autism who had accompanying learning disabilities, suggesting an interaction with cognitive abilities.

The relationship found between attachment and its' related constructs and language has also been extended in autism, with children classified as secure displaying more competent language than those classified as insecure (Rogers et al, 1993; Capps et al, 1994). Siller and Sigman (2002) explored the influence of synchronous interactions on language development extending the theorised relationship beyond attachment and caregiver sensitivity. More synchronous caregiver behaviours were associated with increased responses to joint attention and language gains in children with autism.

Blazey (2007) also found that mutuality was associated with better language competence in children with and without autism. Parental sensitivity also associated with better verbal and non-verbal skills, regardless of autism symptomatology, indicating a specific relationship between mutuality and language and a more encompassing one between caregiver sensitivity and general development.

The role of the attachment relationship and the caregiving environment still appear to exert an influence on development even when the social-learning context is confounded by the presence of autism. However, this has not been explored in as much depth as in typical development and further research is required.

3.8. SUMMARY

This chapter explored the formation and importance of the attachment relationship in neurotypical development before reviewing the environmental factors assumed to be vital for its formation. The impact of attachment on a wide range of developmental tasks and competencies was also discussed and the complex relationship between attachment and language reviewed.

Attachment and caregiver behaviours in autism represent a more complex picture with some studies revealing a violation of traditional attachment theory assumptions.

One area where caregivers and the attachment bond is assumed to have an influence is the domain of play, where children spend a large proportion of their time and caregivers are often a play companion. Any associations may be compounded by the presence of autism whereby, as discussed in chapter two, play is often less imaginative and solitary; reducing the chances for caregivers to exert a meaningful influence. The next chapter explores the associations found between the interpersonal relationship and play in children with and without autism.

CHAPTER 4: PLAY, ATTACHMENT AND PARENTAL SENSITIVITY

Attachment and play are two conceptually distinct aspects of the parent-child relationship (Kerns and Barth, 1995); however, with one third of mother-child interactions occurring within the context of play (Stern, 1974), the influence of attachment and parental behaviours are irrefutable, whilst simultaneously offering a useful framework in which to study development in autism.

4.1. PLAY AND ATTACHMENT IN TYPICAL DEVELOPMENT

The relationship between play and attachment has been explored for over 30 years (e.g. Slade, 1987a; Bretherton, Bates, Benigni, Camoioni and Voltera, 1979). Play offers a different domain in which to study the parent-child relationship, without relying on standardised measures such as the SSP. Due to the occurrence of play within everyday life, it presents a naturalistic method of assessing the attachment relationship which may be more appropriate for children with developmental disorders.

Bretherton and colleagues (1979) explored the association between play and the parent-child relationship. Rather than using attachment classifications, Bretherton et al looked at specific attachment behaviours displayed during the SSP and their relation to symbolic play. Children who displayed more contact maintaining and proximity seeking during the SSP were more likely to display more frequent, complex and diverse symbolic play. Rather than simply focusing on a secure-insecure split, the findings demonstrate the relationship between individual behaviours indicative of a secure attachment and play development.

Whilst this early study provided a base for many of the subsequent studies exploring play and attachment, the definition of symbolic play overlaps with that of functional play. In addition, the focus on specific behaviours assumed to represent attachment security does not provide any information on the specific associations with overall attachment security or classifications of attachment.

Using Ainsworth et al's SSP classifications, Slade (1987a) looked at the relationship between attachment classifications and symbolic play. Results indicated that attachment security was related to episode length of play. Securely attached children spent more time planning play, also resulting in more complex behaviours. These children benefited more from maternal involvement, perhaps indicative of their ability to use their mother as a secure base during play episodes. Whilst Slade (1987a) highlighted the importance of attachment security in the domain of play behaviours concurrently, the research did not look at the contribution attachment security/insecurity made to play longitudinally.

Belsky, Gourduque and Hurnoir (1984) similarly explored the links between secure and insecure attachment ratings and play behaviours in typically developing children. The authors proposed that children who were securely attached would explore more readily during a free play session due to their ability to use their mother as a secure base. Belsky et al (1984) found that securely attached children demonstrated a similar level of complexity and exploration during solo play as they did during play which was evoked. Insecurely attached children, however, displayed less exploration when alone; a finding the authors attribute to securely attached children having a smaller competence-performance gap. This finding extends Slade's (1987a) findings, as solo play also benefited from a secure attachment relationship suggesting the transference of the attachment relationship to situations when the caregiver was not present. However, it is acknowledged that Belsky et al focused on exploration behaviours rather than play per se, therefore, it is unclear whether play itself was enhanced or whether securely attached children simply explored more; meriting further investigation to the wider play behaviours.

More recently, researchers have focused on play complexity and the qualities of play a secure attachment may enhance. Meins and colleagues (1998) measured children's ability to use feedback during play and their flexibility to suggestions. The authors found, that not only were securely attached children more flexible during play, they were able to incorporate feedback more effectively. These results indicate that security based differences are found on

both global and focused levels of analysis and these differences may influence learning and the ability to use the caregiver in development.

Meins (1997) further explored elicited and instructed play, finding that securely and insecurely attached children did not show any differences when pretence was elicited; suggesting both groups of children were able to incorporate play suggestions. Quality of response to suggestions did not differ between securely and insecurely attached children in either measurement condition.

Meins' research highlights the importance of measurement type in play research. Whilst differences emerged during spontaneous conditions, these failed to demonstrate when structured conditions were employed. This finding mirrors elements of the 'play in autism' debate, with children often demonstrating a selective impairment when spontaneous conditions were used (Jarrold et al, 1996). Therefore, it is important to acknowledge possible side effects of measurement condition.

More recently, Kerns and Barth (1995) used secure and insecure attachment classifications to look at play in mother-child and father-child dyads exploring differences across parents. This relationship was extended to look at the influence these relationships had on peer competence. The authors looked specifically at the quantity and quality of physical play and the quality of the parent-child interaction.

Kerns and Barth found that a secure mother-child attachment classification resulted in more play engagement, but did not influence the quality of the play displayed. Conversely, children classified as secure with their fathers demonstrated more positive responses during play and made more suggestions/initiations than insecurely attached children; indicating that the quality of the play interaction was enhanced. The authors' further link these qualities to preschool measures of peer sociability with mother-child play quantity and father-child attachment security positively and independently associating with social behaviours. Kerns and Barth conclude that whilst associations are found between play and attachment, these vary by the parent studied and the measurement utilised, therefore, view these concepts as independent components of the parent child relationship. This study highlights

the importance of the role of the parent in play and attachment development and raises implications for the parent involved in interventions, with fathers enhancing the quality of play more than mothers.

Whilst the studies all present slightly varied findings, the general consensus is that a secure attachment relationship with the primary caregiver promotes more enhanced play behaviours. This finding is encouraging as it demonstrates the lasting impact of a secure attachment in areas considered distal from the context of the attachment relationship. However, inconsistency of measurements and differing samples render cross-study comparison difficult. Added to this, there is insufficient early/exploratory work focusing on actual play complexities, leaving gaps in the literature that require further clarification.

However, whilst attachment security does appear to have an impact on play, it is unclear whether this effect is mediated by the influence of a sensitive caregiver or child characteristics. The relationship may simply be a manifestation of caregiver and/or child characteristics. In addition, it is unclear whether the presence of a developmental disorder modifies this association. The play and attachment relationship is explored in the following section for children with autism to see whether the traditional relationship remains, or whether this is modified by the presence of autism symptoms. Following this, the impact of caregivers on play will be explored to see how parental behaviours influence play behaviours.

4.2. PLAY AND ATTACHMENT IN AUTISM

To date, only three published studies have examined the relationship between play and attachment in children with a diagnosis of autism. Sigman and Ungerer (1984a), Naber et al (2008) and Marcu et al (2009) have all extended the relationship found in typical developing children between attachment and play complexity to a sample of preschool children with an ASD.

Sigman and Ungerer (1984a) were the first researchers to explore the association between behaviours indicative of attachment and play in a small sample of children with autism. The authors posed the question whether attachment formation and expression are reliant upon cognitive functioning in

children with autism, focusing on the representational skills of symbolic play and language. Attachment behaviours were assessed during a free play session and a series of separation and reunion episodes, mirroring the SSP but in a less structured way assumed to be beneficial for children with autism.

Results indicated that the more attachment behaviours evident (indicating a securer attachment relationship), the more advanced the symbolic play behaviours shown. This relationship was only found for symbolic not functional play skills and did not extend to language, despite literature linking these two domains in typical development (e.g. Meins, 1997).

Sigman and Ungerer's research highlights the importance of other factors influencing developmental capacities in children with autism and the authors' propose that children with autism require more advanced representation abilities to form attachments to their primary caregiver. However, the sample utilised was very small and the average age of the children was over four years, therefore, the incidence of behaviours indicative of attachment maybe reduced compared to toddlers. Additionally, it is unclear whether the free play session and the attachment section were coded from the same segment of the assessment; therefore the measures may not be independent. Despite these shortcomings, Sigman and Ungerer's study has recently been expanded by Naber et al (2008) and Marcu et al (2009), providing the base for this current research.

Naber et al (2008) predicted that, in line with typically developing literature, children with an ASD who were classified as securely attached would be more playful and socially engaged during play. These qualities were hypothesised to be due to their caregiver creating an optimal play environment. Naber and colleagues predicted that regardless of clinical group, a secure attachment would enable the child to use their caregiver as a secure base from which to explore, in turn making play behaviours advanced. Disorganised attachment, coupled with a diagnosis of ASD, was predicted to produce a specific delay in social play. Naber et al (2008) used the SSP and standardised free play session. During the play session, mothers were instructed not to stimulate and only get involved if their child sought their involvement.

Regardless of group (ASD, non-ASD, neurotypical, atypical), securely attached children demonstrated more complex play behaviours and more time engaged in play. When the ASD and non-ASD groups were analysed independently, this relationship held after controlling for chronological and developmental age. Children classified as disorganised demonstrated simpler play than their securely attached counterparts. This relationship only held for the clinical groups, including ASD, and continued to be significant after controlling for chronological and developmental age.

Naber et al (2008) concluded that attachment quality enhanced play regardless of clinical status. Children with an ASD who were securely attached displayed longer and more complex episodes of play. Disorganised attachment interacted with clinical status producing a collateral effect on play complexity.

As acknowledged by Naber et al (2008), the young age of the children (under 36 months) meant that symbolic play abilities may not be present especially in children with an ASD and suggest the impact of attachment needs to be explored longitudinally to see if the effects found are lasting. The study had a relatively small sample of children with core autism and whilst a wide range of different clinical groups and controls were studied, the numbers were small therefore reducing the statistical power. The inclusion of children with a diagnosis of PDD-NOS in the ASD group also weakens the conclusions drawn as it is questionable whether the results found can be accounted for by the inclusion of PDD-NOS children and if a secure attachment would result in more complex play if only children with core autism had been utilised.

Marcu and colleagues (2009) further explored the link between attachment and play, specifically symbolic play. Marcu et al extended the Naber et al study in three ways: firstly they assessed the frequency, diversity and complexity of play behaviours. Marcu et al also increased the sample to 45 preschoolers with an ASD whilst widening the age range of the children in their study from 32 to 69 months of age therefore increasing the likelihood that symbolic play behaviours would be expressed. Symbolic play was assessed using a free play session as well as doll play with the child's mother. The

authors scored symbolic play, play novelty, play initiations and duration of play. Marcu et al analysed the sample in two ways, based on a secure/insecure split as well as a disorganised/organised split.

Marcu et al (2009) found no differences on any of the symbolic play measures (frequency, duration and novelty) between children with a diagnosis of ASD classified as secure or insecure using the SSP. However, differences emerged when dividing the sample based on organised and disorganised classifications. Children classified as organised produced a higher frequency and duration of symbolic play. Play was more diverse and complex in children with an ASD classified as organised as opposed to disorganised.

Marcu et al highlight the importance of using alternative classifications of attachment rather than relying on a secure/insecure split; however, dividing the sample based on organised and disorganised classifications reduced the power of the analysis due to the small number of children classified as disorganised ($n = 10$). It is also unclear from the Marcu et al study whether these differences emerge during the free play or doll play session, as these were grouped together in the analysis. Research suggests that children with autism perform better when play is structured (Jarrold et al, 1996) therefore the differences found maybe attributable to organised children being better at following direction. Similarly the impact of the caregiver during the doll play session is unclear as maternal behaviours were not studied independently or in relation to child play. A more sensitive caregiver may facilitate play through the context of parental behaviours and creating a secure and productive attachment context.

Whilst both Marcu et al and Naber et al recognise the importance of the caregiver environment, this was not explored further. Naber et al (2008) discuss the role of the caregiver in creating an optimal play environment. Therefore, this will be examined within this thesis, for the first time, in a sample of children with autism to see if the traditional patterns found remain in autism in addition to the relationship found with attachment classifications.

Caregiver influences on child play have been studied within typical development, focusing generally on behaviours indicative of sensitive

caregiving. This literature is outlined in the following section, building on the assumption that the attachment relationship promotes more complex play behaviours.

4.3 CAREGIVER INFLUENCES ON CHILD PLAY BEHAVIOUR

As a third of parent-child interactions are reported to occur within the context of play (Stern, 1977), the influence the attachment relationship and construct of parental sensitivity is also understood to be widespread. During play, caregivers have the capacity to positively and negatively influence child play and future development. Caregiver behaviours may also influence beyond the immediate context of the attachment relationship, influencing development in other areas. Play offers a setting for the parent to 'teach' the child about roles and society within a 'safe' context (Vygotsky, 1978) therefore the impact of the caregiver is assumed to pervade concurrent and longitudinal development.

Slade (1987b) explored the role of the mother during play episodes, expanding on previous research looking at the attachment relationship (Slade, 1987a). Slade viewed the mother's role as pivotal, acting as a play partner with the capacity to influence symbolising development through the mechanisms of joint attention and scaffolding. Slade assessed the construct of maternal availability, measured through the length of maternal episodes of play. This was categorised as no involvement, commentary and interactive. Slade also recorded the number of mother and child play initiations.

Results indicated that longer episodes of maternal availability predicted longer episodes of child play. Maternal availability associated with higher levels of child symbolic play. However, this influence was not a simple additive effect and children were differentially affected by the way their mothers played rather than simply the length of involvement. When mothers' initiated play and interacted, the child's play was at its highest level. The duration of child play was also enhanced by maternal involvement. However, as the child began to initiate play itself (assessed through the number of child play initiations), the influence of maternal involvement diminished suggesting that parental influence on play reduces as the child develops.

Slade (1987a) further explored the relationship between maternal and child play in relation to attachment security. Regardless of the attachment classification, maternal involvement enhanced the duration and complexity of play; suggesting that the associations found previously with attachment security may merely be mediated by caregiver behaviours. However, maternal involvement decreased the length of episodes of pretence, indicating there is not a simple additive effect of maternal involvement. This finding suggests that more immature forms of play benefit from maternal involvement, whereas more advanced forms can be hindered. In Slade's research the caregiver appeared to 'overload' the child, and factors such as freedom and ability to explore were freedom and exploration are required for advancement.

An interaction with attachment was found - with mothers of children classified as secure - producing a higher quality of play of their child. This effect did not extend to the quantity of play expressed, indicating that maternal involvement can be used to enhance play quality, which is thought to be a correlate and/or predictor of development in language and social functioning. Whilst this was not directly studied by Slade, it would be interesting and clinically relevant to see whether maternal involvement had a knock-on effect on subsequent development and whether this was dependent on attachment quality or overrides the impact of this relationship.

Whilst informative, early studies have been confounded by research complications and limitations. For example, Slade's (1987b) method is subject to a warm-up effect in the dyads and small sample sizes further complicate the applicability of the research. Many studies instruct the parent to only get involved when the child seeks their involvement (e.g. Slade 1987a; Naber et al, 2008). Assessing maternal involvement when the mother has been told to not get involved, unless sought out, creates a measurement condition in which caregiver play may not be readily shown and or ideally sensitive. This method of study may fail to capture parent-child play in a naturalistic way, especially when studying children with developmental disorders. For example, children with autism may not interact with their caregiver or seek their involvement; therefore parent play may not be accurately measured in these conditions.

Fiese (1990) attempted to overcome these past limitations by increasing the sample size and comparing different play conditions, covering both spontaneous and structured conditions. Looking at 57 parent-toddler dyads, Fiese varied the play conditions, observing solitary play two episodes of mother-child play and one modelled by the parent. Play was at its' simplest when the child played alone and more complex in the social conditions. When play was modelled by the mother, play was at its most complex. This effect reduced with age; possibly attributable to the child requiring and using more opportunities to learn for themselves, indicating that the age of the child, and, therefore, their capacity to learn and play may be a crucial factor when exploring the impact of caregiver behaviours.

Fiese explored the impact of individual parental behaviours on different types of play behaviour. Simple forms of play, in particular exploratory play, positively associated with maternal questioning and intrusiveness, whereas more complex forms of play, such as functional play, were positively linked to directing of attention. The most advanced form of play, symbolic, was inversely related to maternal intrusiveness and questioning indicating that more complex play requires the parent to take a step back and allow the child to explore and engage themselves. Reciprocal interactions often preceded symbolic play, signifying a more dynamic social environment is conducive of more complex forms of play, possibly attributable to the ability to use the caregiver as a secure base when needed. Fiese did not directly address the issue of a ZPD created by the caregiver, however, highlights that certain methods of instruction may not be uniformly positively related to play. Caregiver behaviour may need to be adapted given the age and developmental status of the child.

Some studies do provide what could be taken as direct examples of the ZPD influencing child play development. Vibbert and Bornstein (1989) explored maternal stimulation during a mother-child interaction, focusing specifically on encouragement, directing of attention and social exchanges in relation to child play. A combination of encouragement and attention directing influenced child play, with the individual variables themselves not predicting play. More sophisticated play was evident when mothers encouraged and directed

attention appropriately; however, specificity to play complexity and forms of play was not studied.

More recently, Roggman, Boyce and Newland (2001) explored behaviours indicative of attachment during a free play session on child play behaviours. Overall, attachment was not predictive of play complexity, however maternal responsiveness emerged as a key variable suggestive of a specific relationship with caregiver behaviours rather than the whole attachment relationship.

Two different hypotheses have been proposed regarding caregiver involvement in child play and development. The motivational hypothesis proposes that child play is enhanced by the mere presence of the caregiver. This influence is assumed to enhance duration of play, but not spill over into quality or complexity of play. Support for this hypothesis was found by Fein and Fryer (1995) who conducted a review of maternal contributions to child play between one and three years.

An alternative hypothesis, the developmental hypothesis, proposed that, in line with Vygotskian thinking, caregivers can influence the quality and quantity of play by promoting advancement and development. This hypothesis focuses on specific caregiver behaviours rather than the mere presence of the caregiver. Support for this hypothesis has been provided by Slade (1987a and b), Beizer and Howes (1992), Bornstein and Ruddy (1984) and Bornstein and Tamis-LeMonda (1995).

Bornstein and Ruddy (1984) found maternal participation and guidance increased the frequency and overall duration of symbolic play expression in children. The level of play also benefited from maternal behaviours, suggesting both a motivational and developmental impact of caregiver contributions. Following on from this, Bornstein and Tamis-LeMonda (1995) explored the developmental impact of caregiver involvement through an in-depth analysis of caregiver play behaviours, focusing specifically on demonstrations of play behaviours and solicitations which expanded on child behaviours. Solicitations, not demonstrations, were associated with higher

levels and rates of play; a finding the authors attribute to mothers offering an expansion of existing play behaviours, creating a ZPD for the child without intruding.

Noll and Harding (2003) provided further support for Bornstein and Tamis-LeMonda (1995), exploring maternal options limiting and options promoting behaviours. Specific relationships were found with symbolic and non-symbolic play. Frequency of symbolic play was enhanced by options promoting behaviours, but hindered by options limiting. The reverse relationships were found for non-symbolic play, suggesting symbolic play requires a specific form of behaviour from caregivers. Specifically affirmations of child behaviours independently predicted the time children spent in symbolic play, providing the child support and encouragement.

The studies reported here suggest a differential relationship between maternal behaviours and play, with different responses producing different effects. It is clear that quality of maternal behaviours is important, with a simple additive effect of involvement not found. These studies have wider implications for clinical interventions as simply increasing caregiver input may not have a spill over effect into child behaviours.

Most studies reported within this section focus specifically on mother-child dyads, however research has indicated that play with male caregivers maybe more informative to child development. Fathers are more likely to spend more time engaged in play activities, whereas mothers may focus on more caregiving tasks (Parke, 2002). De Falco, Esposito, Veunite and Bornstein (2008) looked at fathers input during a 10 minute play session. The authors found that fathers enhanced child play, however no association was found between paternal emotional availability and child play, suggesting that the emotive aspects of play may be a domain where mothers have more of an impact. Further exploration of parental differences may further clinical practice and the specific relationship between caregiver behaviours and child play.

The impact of caregiver behaviours in child with developmental disorders has explored the applicability of using caregivers for change within a clinical

framework. For example, research with children with Down's syndrome has highlighted the parent-child dyad as an area potentially influential for intervention (e.g. Greenspan, 1997). Venuiti, De Falco, Giusti and Bornstein (2008) recognised the context of the parent-child interaction as crucial for subsequent development, especially in the early years. Venuiti et al (2008) found the presence of mothers of children with Down's syndrome in a play context enhanced child play in terms of complexity and duration. Interestingly this effect was only found in simple exploratory play and the presence of the mother did not enhance symbolic play, contrary to findings in typical development. This section shed light on the associations between caregiver and child play, however, very few studies have focused specifically on caregiver play behaviours; choosing to frame research within an attachment framework looking at behaviours assumed to facilitate attachment formulation.

Whilst these behaviours are in no doubt informative, a clearer understanding of what caregivers actually do during play episodes is required as it may not be sensitivity or responsiveness that impacts on child development, but caregivers use of play. Differences in the relationships found have been evident between the neurotypical literature and children with Down's syndrome, suggesting a differential impact of caregiver behaviours on play dependent on clinical symptoms. Clarification of this relationship in autism is thus important as caregivers often communicate with their child within the domain of play and interventions are regularly framed within this context. Understanding the direct impact of caregivers in this population will help further clinical practice whilst assessing the applicability of traditional psychological theories of play and development within this sample.

4.4. CAREGIVER INFLUENCES ON CHILD PLAY BEHAVIOUR IN AUTISM

Very few studies have looked specifically at how caregivers play with their child with autism despite the use of caregivers within an intervention context. Playing with a child with autism is acknowledged as being challenging due to their impaired play and social skills, as well as the presence of RRBs during play. In typical development the influence of the interpersonal context in which play occurs has been shown to influence child play behaviours. In autism,

children are impaired in interpreting social situations, therefore may not gain as much from their caregivers and peers during play episodes and this maybe further complicated by originally impaired play abilities.

No study to date has looked directly at caregivers influence on child play in autism. A handful of studies have explored caregiver responsiveness during play, however, in relation to language development but not play behaviours. Similarly no study has looked specifically at caregivers' actual play behaviours, replicating research trends in typical development; therefore it is unclear whether caregiver play is contingent with child play and developmental theories of play.

Only two studies have looked at caregivers influence on play in children with autism. Gillett and LeBlanc (2007) explored the impact of a parent-implemented intervention on both language and play in caregiver-child dyads. The authors looked specifically at inappropriate and appropriate play (termed here functional play). Benefits of the caregiver-led intervention were seen in two of the three dyads, with increased appropriate and inappropriate play. However, no firm conclusions can be drawn from this study due to the small sample size. Caregiver play behaviours were also not directly explored in relation to child play and development; however it does provide some evidence of caregiver input in child play within the field of autism.

El-Ghoroury and Romanczyk (1999) looked at family members play interactions with children with autism. The authors recognised the irrefutable impact of family members with most early interactions occurring within the family. The study looked specifically at the play interactions of mothers, fathers and siblings but did not explore the impact of these behaviours on the child with autism.

Parents exhibited more play behaviours towards their child with autism than siblings; a finding perhaps unexpected given the context of play siblings often interact within. Parents also demonstrated more 'setting' behaviours, which served to scaffold the play interaction. Interestingly, the number of parental play behaviours was negatively related to child characteristics, similar to the

findings of Tamis-LeMonda and Bornstein (1994). The authors suggest caregivers may over compensate for their child's disabilities. Further support for this vein of thought is provided by the fact that caregivers with a child with greater developmental delays displayed more play behaviours. Siblings on the other hand did not over-compensate for their siblings delays and were more likely to treat the child with autism as a peer, mirroring more typical play situations rather than a scaffolding interaction.

Taken together, these two studies indicate the importance of exploring what caregivers do during play and how this may impact on child development. Many studies have explored the constructs of sensitivity, affect and mutuality during free play sessions (e.g. Blazey, 2007); however, this study will go beyond that to look at a quantitative measure of caregiver play behaviours to see how caregiver play influences child play in autism and in turn is influenced by child characteristics and behaviour. Combining the findings and themes of both Gillett and LeBlanc (2007) and El-Ghoroury and Romanczyk (1999) will enable this research to explore the impact of caregiver behaviours indicative of attachment quality as well as actual caregiver play and the impact these may have on child behaviours.

4.5. SUMMARY

This chapter explored the impact of the interpersonal relationship between the caregiver and child and its impact on play. Whilst most research presented has focused particularly on attachment security or behaviours assumed to precede and nurture this relationship, some evidence points to specific and important associations between caregiver and child play, providing support for Vygotskian notions of development. Few extensions of these research themes have been seen within the field of autism, however a small, but growing, literature base indicates to a continuation of the associations found in typical development. This research combined many of the themes outlined here, whilst extending the study with the inclusion of caregiver play over multiple timepoints. The following chapters outline the hypotheses developed based on the preceding literature chapters, the sample used to explore these and how this research was conducted.

CHAPTER 5: RATIONALE AND HYPOTHESES

This chapter outlines the rationale behind this thesis, stemming from the literature outlined in the introductory chapters. The research hypotheses were developed based on the rationale presented in section 5.1 and evidence base surrounding play and attachment in autism outlined in the four preceding chapters.

5.1. RATIONALE

This section outlines the aims of this thesis which led to the hypotheses developed in section 5.2. The methods through which these aims were achieved are also discussed before defining the sample and deconstructing the method in chapters six and seven.

5.1.1. Aims

Whilst there is a large evidence base surrounding play (Baron-Cohen, 1987; Jarrold et al, 1996) and attachment (Capps et al, 1995; Kasari et al, 1988) in children with autism, only three studies to date that have explored the relationship between these two constructs (Ungerer and Sigman, 1984; Naber et al, 2008; Marcu et al, 2009). This thesis therefore aimed to explore the association between play and attachment further. However, two differences set this study apart from the literature that precedes it. Firstly, only children with a diagnosis of core autism were studied, allowing specificity of the relationship before extending the research findings to a wider sample in future research. Secondly the sample was studied three times within the course of 13 months, exploring the dynamic and possibly changing nature of the associations found.

In addition to attachment, the constructs of sensitive responding and mutuality were studied and their relationship to attachment and play overtime examined. This is an extension of the typically developing literature that indicates caregiver and dyadic behaviours have an impact on child development (Meins, 1997), including play behaviours (Slade 1987a and b). The impact of these constructs on play development in autism has not been explored previously,

therefore this thesis sought to address whether the relationship found in typical development extends to children with autism.

Through assessing the associations between attachment, its related constructs and play over time, the influence of the attachment relationship could be explored within a defined developmental period. In typical development, the influence of the attachment relationship is assumed to persist longitudinally (Tamis-LeMonda et al, 2001; Kivijarvi et al, 2001) but reduce overtime with other factors becoming more influential. It is unclear whether this relationship exerts the same longitudinal influence in autism, therefore, this thesis addressed the possible lasting influence of attachment and its related constructs on play development.

In typical development, the role of the caregiver is irrefutable. In line with Vygotskian principles, the caregiver can shape the play environment; playing to a higher complexity creating a zone of proximal development (ZPD) for the child. Caregiver play has not been studied in children with autism; therefore, this study was the first to look specifically at caregiver play behaviours, how these may differ to caregivers of a typically developing child and how any differences impact on child play development. Child development and play were also explored in relation to caregiver play, in line with the theory that a reciprocal relationship between caregiver and child behaviours pervades development, with child characteristics such language influencing caregiver actions.

In addition to the relationship between play and attachment, concurrent and longitudinal associations between play and other variables known to associate with play in typical development was explored. These include language and non-verbal development; both known associates and predictors of play development (Meins, 1997; Lyytinen et al, 1999). The specificity of the relationship between play and language has been debated throughout the literature, with conflicting findings indicative of a specific association with symbolic play or a spectrum wide association, with development mirroring language development throughout. This study sought to clarify these associations cross sectionally and longitudinally.

5.1.2. Methods

In an attempt to specify the nature of the play impairment in autism, group differences were explored at three timepoints. This repeated measured design has the strength of enabling clarification as to whether play in autism as a whole is delayed, whether symbolic play impairments are central to the disorder or if functional play is also affected by the presence of autism. This is a key issue in the field of play in autism, with conflicting results produced from different studies and methodologies (Baron-Cohen, 1987; Jarrold et al, 1996). Play progression over time was also explored to help clarify the specificity of the play impairment in autism and it's persistence in development. Play behaviours that produce a group difference were explored for possible associations with attachment behaviours, caregiver play and child developmental variables.

The association between these constructs was explored over the course of three timepoints, adding to the existing literature base that largely relies upon cross-sectional research, with no research conducted longitudinally in children with autism (Naber et al, 2008; Marcu et al, 2009).

Caregiver play was examined for the first time in a sample of children with autism and their caregivers. The same methods used to measure child play were used to measure caregiver play; a method that has garnered support from Tamis-LeMonda and Bornstein (1991), to allow comparison between caregiver and child play.

5.1.3. Summary

In summary, three veins of research were explored; firstly, play behaviour in children with and without autism, its relation to development and its development over time. Secondly, caregiver play was studied - exploring group differences, their relation to child development and autism and their role in developing child play. Thirdly, the relationship between attachment and play was explored - looking specifically at group differences in attachment and its related constructs, the interconnectivity of these variables and their role in play development. The hypotheses that were tested based on this rationale are outlined below.

5.2. RESEARCH HYPOTHESES

Three research hypotheses were derived from the literature presented in chapters one to four. These look at play in autism, caregiver play, and attachment and play.

Hypothesis One: Patterns of play behaviour in autism. Compared to matched neurotypical controls, children with autism will show:

- a. *More simple exploratory play and less advanced functional and symbolic play.*
- b. *Slower developmental trajectories in play.*
- c. *The level of play will be related to language ability as well as to presence of autism.*

Hypothesis one is based upon the literature and clinical descriptions of autism, which indicate distinct play impairments displayed by children with autism. However, within the literature there is little consensus as to the specificity of this impairment and this study seeks to clarify the impairment. Based on the findings of Libby et al (1998) and van Berckelaer-Onnes (2003), a developmental slowing of play was predicted with more simple play behaviours and less advanced forms of play, specifically advanced functional and symbolic behaviours.

Following from hypothesis 1a, 1b predicted that these impairments will be present throughout the course of the repeated measures longitudinal study and development in all play domains will be slower; simple play behaviours will reduce at a slower rate whilst advanced behaviours will increase at a slower rate.

This study therefore adds to the literature that precedes it by exploring group differences in the play of children with autism relative to neurotypical controls at three successive time points within a longitudinal study. This repeated testing adds significant strength to previous cross-sectional findings from previous research regarding play differences in autism. Additionally, this study is the first to employ such a rigorous statistical method in order account for the

inevitable proportionality in measures of play type. It also reduces the heterogeneity of sampling that can make previous studies difficult to interpret; by utilizing a sample of children with core autism alone and within a narrowly defined age-range.

Hypothesis 1c was developed based on the findings that both the presence of autism symptomatology and delayed/deviance language will impact on play development within the preschool years (Baron-Cohen, 1987; Meins, 1997; Rutherford et al, 2007).

Hypothesis Two: Relationship between caregiver play and child play.

Compared to matched controls:

- a. Caregivers of a child with autism will show less advanced play behaviours.*
- b. Group differences in caregiver play behaviour will be predicted by child autism, child language and child play.*
- c. Caregiver play behaviours will predict future child play, in line with the theory of the 'Zone of Proximal Development (ZPD)'.*

Hypothesis two explored the relationship between caregiver and child play. Based on the notion that caregivers will be aware of their child's abilities in play, hypothesis 2a predicted that caregivers of a child with autism will demonstrate less advanced play behaviours. This study was the first to explore this relationship in a sample of children with autism, therefore, draws from typically developing literature, supposing that caregivers in the autism sample will use similar methods as those in the control sample.

Hypothesis 2b predicted that any differences found between the two samples would be attributable to the presence of autism, child language and play. This was based on the notion of a ZPD, with the caregiver working within a developmental framework to facilitate child development.

Hypothesis 2c again draws from the typically developing literature, specifically Vygotsky's notion of a ZPD, and predicts that child play benefits from caregiver play behaviours that are in-line with their development both

concurrently and longitudinally, providing the first test of Vygotskian theories of development in children with autism and their caregivers.

Hypothesis Three: Attachment ratings will be lower in children with autism:

- a. Mutuality will be lower in children with autism, however sensitive responding will not vary between the caregivers*
- b. Attachment will be predicted by higher ratings of mutuality and sensitive responding*
- c. Attachment and mutuality will relate positively to advanced play behaviours*

Hypothesis three builds on the growing literature base suggesting children with autism may fail to develop attachment in accordance to typical development, or develop these relationships in different ways. Hypothesis 3a extended this further to the dyadic construct of mutuality building on the exploratory work of Siller and Sigman (2002) and Blazey (2007). Sensitive responding - a construct dependent solely on caregiver behaviours - was predicted, however, to be similar to that seen in typical development. The rationale behind this was due to the global measurement implemented to measure sensitive responding (see section 7.2.3 For further details), with differences tending to emerge on more fine grained analyses of caregiver behaviours (Kasari et al, 1988).

Based on the assumptions of traditional attachment theory (Bowlby, 1969), attachment was predicted to be related to and dependent on sensitive responding from the caregiver. In addition, the dyadic construct of mutuality was assumed to be as important; reflecting the attributes of children as well in the formation of attachment (Hardy et al, 1997; Harrist and Waught, 2002).

Attachment and mutuality were also predicted to be important in the development of play behaviours, accounting in part for any group differences found. Hypothesis 3c drew from the findings of Naber et al (2008) and Marcu et al (2009) but also recognised the importance of dyadic behaviours.

The following two chapters focus on the sample identified to test the research hypotheses and the methods implemented.

CHAPTER 6: THE SAMPLE

The previous chapters defined the concepts of play and attachment, explored the relevance of these behaviours in typical development and their significance in autism. The aim of this thesis was to build on the existing literature base, exploring differences between typically developing children and children with autism and how the concepts of play and attachment develop and relate to one another overtime.

As preschool children with autism were compared to children with no known cognitive or behavioural impairment (defined as 'neurotypical controls'), two groups of children had to be recruited. These groups had to be matched on particular aspects to ensure any statistical differences could be confidently attributed to the diagnostic differences between the samples. This chapter summarises how the sample were identified and recruited and what measures where used to define these samples.

The decisions made in this chapter were (i) defining the sample (ii) rationale for the control group (iii) inclusion and exclusion criteria (iv) diagnostic measures (v) matching criteria (vi) ethical issues and (vii) recruitment and retention procedures. These issues are especially important when conducting research with children with autism.

6.1. DEFINING THE SAMPLE

Children with a diagnosis or suspected diagnosis of core autism were chosen for this current study. Autism is a spectrum disorder, with varying degrees of symptom severity. The spectrum includes autism, Asperger's Syndrome, autism spectrum condition, and PPD-NOS. Previous research looking at the relationship between play and attachment in autism has grouped children with autism spectrum conditions and children with PDD-NOS together, however it was decided to just include children with core autism as defined by International Classification of Diseases ([ICD-10]; World Health Organisation, 1992) and Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). This decision was made to explore the relationship between the two constructs in a core sample, before expanding future research to the range of spectrum

conditions. The diagnosis of autism was confirmed with the Autism Diagnostic Interview Revised (ADI-R; Lord, Rutter and Le Couteur, 1994) and the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, Dilavore and Risi, 2002).

Children in the preschool period were chosen for inclusion in the study, including children aged between two and five at the time of referral. The preschool period is set apart from infancy and middle childhood and was opted for as the Preschool Autism Communication Trial (PACT; see Green et al, 2010 for further details) was aimed at children of that age. To best capture the attachment relationship in its purest form, middle childhood was ruled against as attachment at this age may 'look' different and include multiple figures in a variety of contexts. Attachment in infancy (before two years) would have presented an ideal timeframe, however many children with autism have yet to receive a formal diagnosis of autism before the age of two years and symptoms may not be fully apparent.

6.2. THE CHOICE OF CONTROL GROUP

A control group was required to address the question of how the autism group may differ in their play behaviours and attachment relationship. Firstly, the decision had to be made as to which control group to choose. Previous research looking at the attachment relationship in autism has included a range of control groups, including neurotypicals, children with a language disorder, children with Down's syndrome and children with learning disabilities.

Neurotypical controls were opted for as a comparison sample for two reasons. Firstly, recruiting children without any other developmental delays or disorders enabled the sample size of the control group to be comparatively large compared to previous studies. With two relatively large samples, the power of the study was therefore increased and firmer conclusions could be drawn. Breaking the control group down further into smaller samples of children with language disorders and Down's syndrome would have weakened the statistical power of any analysis undertaken.

Secondly, this study aimed to explore how the parent-child relationship in autism differed to those without. In order to do this, children with autism had to be compared to children without autism before similarities or differences could be extended to children with other disorders. Others studies have compared children with a diagnosis of autism to children with other developmental delays/disorders (e.g. Naber et al, 2008), however it is still far from clarified if and how the attachment relationship and associated constructs differ to typical development. This study made an attempt to clarify this before making recommendations to extend the exploration to samples known to also have developmental difficulties.

6.3. EXCLUSION AND INCLUSION CRITERIA

Preschool children with autism and their primary caregiver were referred to the Pre-school Autism Communication Trial (PACT; see www.medicine.manchester.ac.uk/pact and Green et al, 2010 for further information). Referrals were based on the child meeting the inclusion criteria set by the PACT study: the child had a diagnosis/suspected diagnosis of core autism and aged between two years and four years 11 months at the time of referral. Due to the child participating in the PACT study, two further inclusion criteria had to be met: a non-verbal developmental age of at least 12 months to ensure the child has the capacity to communicate in both assessments. Sufficient English, preferably the first language spoken at home, also had to be spoken in order to ensure success in assessments and possible communication based-intervention sessions if randomly allocated to the PACT intervention. Referrals excluded cases with a severe hearing and/or visual impairment in the child and/or the caregiver. Any caregivers who were currently suffering from a severe psychiatric illness were also excluded. Children with epilepsy requiring regular medication, and twins were excluded. The sample was drawn from an unselected sample of clinical referrals to the PACT study, who met the inclusion criteria and consented to take part.

Inclusion criteria for the neurotypical controls included the child being aged between one and five years of age with a non-verbal developmental age of at least 12 months at the time of the first assessment. Children with suspected

autism or any other developmental disorders/delays were excluded. Children who had a sibling or parent with a diagnosis of autism were also excluded. The sample was drawn from an unselected sample of self referring families who met the inclusion criteria and consented to take part in the study.

Only children who could be individually matched to one of the 52 children with autism were included in the final sample. Children were matched based on non-verbal development raw scores and sex (see section 6.5. for matching procedure). 66 children were seen originally, 45 were suitable matches.

6.4. DIAGNOSIS CONFIRMATION

Whilst children referred to the study had a diagnosis or suspected diagnosis of autism, this was confirmed by the research team for inclusion into the study. Referred families completed a caregiver interview (the ADI-R) and if met criteria set by the PACT study, the child completed a diagnostic observation (ADOS).

The ADI-R is a structured interview conducted with caregivers to assess the presence of past and present behaviours associated with autism spectrum disorders. The ADI-R is suitable for the assessment of past and present symptoms for children aged between four and over, and the assessment of present ASD symptoms in children under four. The ADI-R is considered one of the most valid measures of present symptomatology in preschool through to adulthood (Lord et al, 1994) and is a diagnostic algorithm for ICD-10 and DSM-IV definitions of autism spectrum disorder. It is viewed as one of the most accurate parental measures available.

The ADI-R measures behaviours indicative of reciprocal social interaction, communication and language and patterns of behaviours. The interview lasts approximately two hours and is issued by a trained researcher in order to gain a full developmental history of the child's behaviour. The ADI-R consists of 93 questions falling into five categories: opening questions, communication, social and play, RRBs and general behaviour problems. The questions are open-ended and scored after the interview.

The ADI-R has good levels of reliability and validity and is seen as an excellent companion for the ADOS. Children had to reach the cut-off score on two out of three scales for further inclusion in the PACT study. If children met this cut off they were referred for an ADOS assessment. If children did not reach criteria, they were excluded from the study.

The ADOS (Lord et al, 2002) is an observation measure which is used to provide an indication of symptom severity at the present time. It is complimented by the ADI within the age range of this sample and together collates past and present symptomatology in a variety of settings. The ADOS consists of four modules; modules one and two were utilised in this study. Module one is suitable for children with no or limited speech, whereas module two was administered to children with phrase speech at T1.

The T1 and T2 ADOS assessments were administered by a research associate. These were filmed by the author whenever possible. The ADOS consists of a series of activities and 'presses.' These are administered to elicit and rate behaviours designed to indicate the presence or absence of an autism diagnosis. Items from the ADOS module one and two are reported in table one and two.

The ADOS takes around between 30 and 45 minutes to administer. Following the ADOS, scores are entered into a diagnostic algorithm and domain scores are calculated for reciprocal social interaction, communication, imagination and RRBs. The total ADOS score is calculated from the reciprocal social interaction and communication scores. For this current study and inclusion into the PACT study, the children had to reach a total score of at least 12. This score was the cut off for autism, rather than PDD-NOS or a spectrum condition.

Neither the ADI-R nor the ADOS were administered to the control sample. This was due to variety of reasons. Firstly, the study recruitment materials specified the inclusion and exclusion criteria of the control group. This included excluding children with autism from the control sample. Secondly, the author spent time discussing the child's development with the caregiver and

administered two standardised developmental assessments with the child. If any problems were raised regarding the presence of autism symptomatology, these were discussed with the parent and the child was not included in the final sample. It is acknowledged that conducting either the ADOS or the ADI-R in the control sample would have enhanced any group differences found, attributing these to the presence of autism.

Table 1: Items and behaviours observed in ADOS module one

Item	Focus of Observation
Free play	Child spontaneously seeks engagement. Explores materials functionally or symbolically. Stays at activity for appropriate period of time
Response to name	Consistency of response to name
Response to joint attention	Whether child can follow shift in gaze or whether pointing is required.
Bubble play	Observation of child's affect, initiation of joint attention, shared enjoyment, requesting and motor behaviour.
Anticipation of a routine with objects	Same as bubble play
Responsive social smile	Response to social smiling
Anticipation of social routine	Observation of child's affect and attempts to initiate a repetition of routine
Functional and symbolic imitation	Child's use of objects to imitate familiar actions.
Birthday party	Child's interest and ability to join in the script.
Snack	Determine if and how child demonstrates preferences and requests.

Table 2: Items and behaviours observed in ADOS module two

Item	Focus of Observation
Construction task	See whether child indicates need for more pieces.
Response to name	Consistency of response to name
Make-believe play	If child uses objects beyond their obvious intention.
Joint interactive play	Focus on reciprocity shown by child.
Conversation	Extent to which child build on examiners statements
Responsive to joint attention	Whether child can follow shift in gaze.
Demonstration task	Whether child can represent familiar actions and objects.
Description of a picture	Example of child's spontaneous language and communication.
Telling a story from a book	As above
Free play	Whether child spontaneously seeks engagement. Extent to which child explores materials. Time child spends with objects. Extent of repetitive actions
Birthday Party	Child's interest and ability to join in with the script.
Snack	Determine if and how child demonstrates preferences and requests.
Anticipation of routine with objects	Observation of child's affect, initiation of joint attention, shared enjoyment and motor behaviour.
Bubble play	As above

6.5. MATCHING PROCEDURE

A neurotypical control group was required to address the question of how the autism group differed to their typically developing counterparts. It was important to control the ways in which the two groups differed. Previous research has focused on three areas as matching criteria: language, social competence and learning disabilities. Both language and social abilities are central to the diagnosis of autism and learning disabilities are an associated feature, therefore, seen as three areas in which children with autism differ from neurotypical children.

It is generally deemed appropriate to match on a variable closest to the variable central to the study (Jarrold and Brock, 2004), which in this study would either be social or language abilities as both skills have been shown to associate with both play (Charman et al, 2000; Meins, 1997) and attachment security (Slade, 1987a; Naber et al, 2008).

Social competence is one area that suffers from a lack of standardised measures. The nature of the social impairment experienced by children with autism raises doubt as to whether a social match can be found; without assuming that this impairment is characterised by a delay rather than deviant development. These issues, therefore, made controlling for social abilities difficult in this present study.

Matching on language abilities is a widely accepted method and accounts for a variable central to the diagnosis of autism (Charman, 2004). Standardised language measures are also widely available; making matching on language abilities a simpler task than matching on social competence. Since both attachment and play have been readily associated with language abilities in typical development (Meins, 1997; Spencer and Meadow-Orlans, 1996) and autism (Stanley and Konstanterous, 2007; Charman et al, 2000), language represents an important confound variable to control for. However, as language was both a variable which was used in the analysis as well as a characteristic of the sample, matching on language abilities was viewed as inappropriate.

The children with autism in this study have a diagnosis/suspected diagnosis of core autism rather than an ASD, therefore many had significant language impairment. As the children were of pre-school age when first seen, many had very low language capabilities (lowest age equivalent five months at T1). This would mean recruiting controls during the infancy period; impacting on the capability of the children to complete research assessments and interact dyadically with their parent and the researcher. This also raised the issue of whether it is possible to compare like with like due to the large chronological age differences between samples; therefore, the variable of language was inappropriate to match upon for a pre-school sample.

The non-verbal development of the children was opted for as this controlled for the difference in learning ability between the two groups. As there was a discrepancy between the developmental and chronological age of the children with autism, this would result in a difference with the chronological age in the neurotypical controls. However, as a larger difference would have occurred if a language match had been selected, the use of total raw scores on a non-verbal developmental measure was viewed as the most matching appropriate variable. Chronological age has also failed to shed light on play ability (Belsky and Most, 1981), therefore the differences between the groups is assumed not to be as important as differences in developmental capacity.

When recruiting the control sample, each child with autism was originally individually matched to control participants based on gender and non-verbal developmental raw score. However, as full recruitment was not reached for the control group, group matching was opted for based on the recommendations of Shaked and Yirmiya (2004). As both samples were relatively large, group matching was seen as appropriate.

The appropriateness of the matching procedure was confirmed using total raw scores from the Mullen Scale of Early Learning (Mullen, 1995). Raw scores were used instead of age equivalents based on the recommendations of Mervis and Klein-Tasman (2004). When reported, age equivalents were used for the purpose of clarity but were not measured on an interval scale, therefore, violate many statistical assumptions.

The combined raw scores gained on the fine motor and visual reception scales of the Mullen Scales of Early Learning (Mullen, 1995) were used for matching. No statistically significant difference was found between the two groups ($t = -.69$, $p = .48$), therefore they can be considered sufficiently overlapping to be matched (Frick, 1995; Mervis and Klein-Tasman, 2004; and Mervis and Robinson, 2003).

As outlined above, many of the children with autism were functioning at a lower non-verbal age than their chronological age. This disparity led to the control children being significantly younger than their autism counterparts ($t = 11.09$, $p = .01$). This was seen as an unavoidable side effect of the matching strategy implemented but, based on the findings of Belsky and Most (1981), assumed to not be as significant in predicting play as developmental variables. The chronological age was controlled for in any statistical analysis to ensure differences found are not attributable to this disparity.

Whilst the two samples were not matched on language ability, data was collected using the Preschool Language Scales (PLS; Zimmerman, Steiner and Pond, 1997). Statistically significant differences were found between receptive ($t = -3.52$, $p = .01$) and expressive ($t = -3.19$, $p = .01$) language scores. Again this difference was viewed as unavoidable. Table three displays the sample characteristics for chronological age, non-verbal and language raw scores, indices of mass deprivation (IMD) score (a measure of socio-economic status deprived from UK postcode statistics), ADOS module and score and caregiver and child gender.

6.6. ETHICAL ISSUES

Research with both children and atypical populations raises certain ethical concerns. These were all considered in this present study. The issues centred around informed consent, risk, right to withdraw, data protection and anonymity and researcher blindness.

Table 3: Descriptive statistics for both samples by gender

	Children with autism (n = 49)		Neurotypical controls (n = 44)	
	Male	Female	Male	Female
N	43	6	38	6
Chronological age	44.26 (8.81)	46.83 (7.41)	25.45 (9.16)	23.00 (6.26)
Non-verbal score	25.92 (6.84)	24.91 (5.15)	27.13 (7.29)	28.75 (8.02)
Language mean score	15.79 (10.05)	16.75 (9.32)	21.75 (8.82)	27.08 (11.02)
Receptive language score	16.23 (9.82)	17.33 (7.50)	21.37 (8.88)	25.67 (10.15)
Expressive language score	15.53 (10.77)	16.17 (11.34)	22.18 (9.04)	28.50 (12.03)
IMD score	30.56 (20.03)	22.97 (21.90)	19.86 (12.54)	22.85 (18.34)
Ethnicity:				
White (any background)	36	5	36	6
Black African	2	1	-	-
Black Caribbean	1	-	-	-
Indian	1	-	-	-
Chinese	1	-	-	-
Pakistani	1	-	-	-
Mixed race (White and any Asian background)	1	-	-	-
Mixed race (White and Black Caribbean)	-	-	2	-
Female caregivers	40	6	35	5
Male caregivers	3	0	3	1
ADOS Module One: Two	34:9	5:1	-	-
ADOS Score	16.53 (2.52)	16.17 (4.16)		

(i) Informed Consent

Due to the participants being aged between one and five, consent was obtained by their caregiver. In line with British Psychological Society and University of Manchester suggestions, written informed consent was gained from the caregiver on behalf of the participant before they entered the study. A copy of the consent form is included in Appendix A (A4) and covers the participants' right to withdraw, consent to video recording and the dissemination of results.

(ii) Risk protection

Every attempt was made to reduce the risk of children experiencing stress or discomfort during the assessment produce. The author spent time with the child and their caregiver prior to the administration of measures to allow familiarisation to occur. Breaks were offered between assessments to ensure the child was not completing tasks for a prolonged period of time. Similarly if the assessment was not successful, or the child was irritable/uncooperative, it

was rearranged for another time. It is therefore assumed that the research assessments posed no greater risk to the child than everyday life; fitting with the ethic criteria outlined by Chen, Miller and Rosenstein (2003) for 'minimal risk.'

The toys and materials included in the assessment kit were regularly checked and cleaned for safety. Some toys contained small parts (e.g. the marble run). These were identified to the parent if the child was under three at the time of the assessment. Broken toys were removed from the assessment kit and replaced.

Caregivers were advised through the study information sheet (see Appendix A2) the circumstances under which confidentiality was withheld or broken (if the researcher had sufficient reason to believe they or the child was at risk).

(iii) Right to withdraw

As fore mentioned, the consent form stated the families' right to withdraw at any point without giving reason. Despite the children not giving their own consent, their right to withdraw was acknowledged from the child's behaviour or language indicating their discomfort in taking part.

(iv) Data protection and anonymity

On referral/self-referral to the study, all participants were given an anonymous code. The master file containing the ID files was kept separate from data files. Only the author and immediate research team had access to the ID codes. All data collected (assessment forms and video files) was identified using the participants ID and contained no personal information. All files were kept securely on University of Manchester premises. This is in accordance with the Data Protection Act (1998). If families withdrew from the study, their data was destroyed.

(v) Researcher blindness

Ideally the author would have been blind to the group status of the participants and the objectives of the research. However, this was not possible due to the author being responsible for the recruitment of controls, coding of videotapes and controls assessments. In addition, the author worked alongside a

research associate, therefore was often present during the diagnostic checks. Further to this, the age difference of the participants and the different settings of the groups assessments meant it was impossible to be blind to group status.

As the author did not interact with the children during the free play session, it is assumed this was not biased through differential behaviour. Inter-rater reliability was conducted by another researcher.

All of the above issues were discussed and submitted to the University of Manchester Medical and Human Sciences ethics committee prior to control recruitment. The PACT study had previously been submitted to Central Manchester Multi-Centre Research Ethics Committee (05/Q1407/311). Both these proposals met full approval.

6.7. RECRUITMENT PROCEDURES

52 preschool children with autism and their primary caregiver were recruited from the Greater Manchester area following referral to the Pre-school Autism Communication Trial (PACT; see www.medicine.manchester.ac.uk/pact and Green et al, 2010 for further information). These referrals were made by a variety of clinicians (psychiatrists, clinical psychologists, paediatricians, speech and language therapists and child development unit co-ordinators).

45 neurotypical children and their primary caregiver were recruited from the Greater Manchester area as study controls. Study information sheets and posters (see A1 and A2) were sent to local nurseries and play centres. An article regarding the study was also featured in a local family magazine and advertised on the University of Manchester research opportunities website to encourage recruitment.

Many parents were recruited via word of mouth from families who had already participated in the research project. Whilst this method of recruitment is not ideal, without these referrals the power of the study would have been significantly reduced.

Only children who could be individually matched to one of the 52 children with autism were included in the final sample. Children were matched based on non-verbal developmental scores and sex (see section 6.5. for matching procedure). 66 children were seen originally, 45 were suitable matches.

6.8. SAMPLE RETENTION

To maintain the 97 families recruited at time one, regular contact was maintained. Communication through quarterly newsletters (autism group only; see www.medicine.manchester.ac.uk/PACT), birthday cards and Christmas cards was employed to prevent attrition.

Letters were sent to the primary caregiver one month before the time two and time three assessments (see Appendix A3 for sample letters). These suggested an estimated date of the next appointment and a time frame in which the assessment should ideally be completed. The letter invited families to phone or email to schedule a visit. If caregivers did not contact within a week, the research contacted them via phone.

In the autism group, one child (male) was lost to follow-up at the time two assessment as the research team were unable to contact the family. Two further children (both male) were lost between the time two and time three assessments for the same reason. This left a time two sample of 51 children and 49 children at time three. Recruitment and retention is shown in figure one for the autism group.

In the neurotypical control group, one child (male) was lost at the time two follow up due to the family relocating. This left a time two sample of 44 children. No further children were lost at time three leaving a final sample of 44 children. Recruitment and retention is shown in figure two. All analysis was completed using the 49 children with autism and 44 neurotypical controls.

At time three, participants in the autism group received a gift voucher as a token of appreciation. They were also given a report charting their child's progress in the research assessments and copies of the DVDs if they wished. Children in the control group received a small gift and a thank you card.

Figure 1: Autism sample recruitment and retention

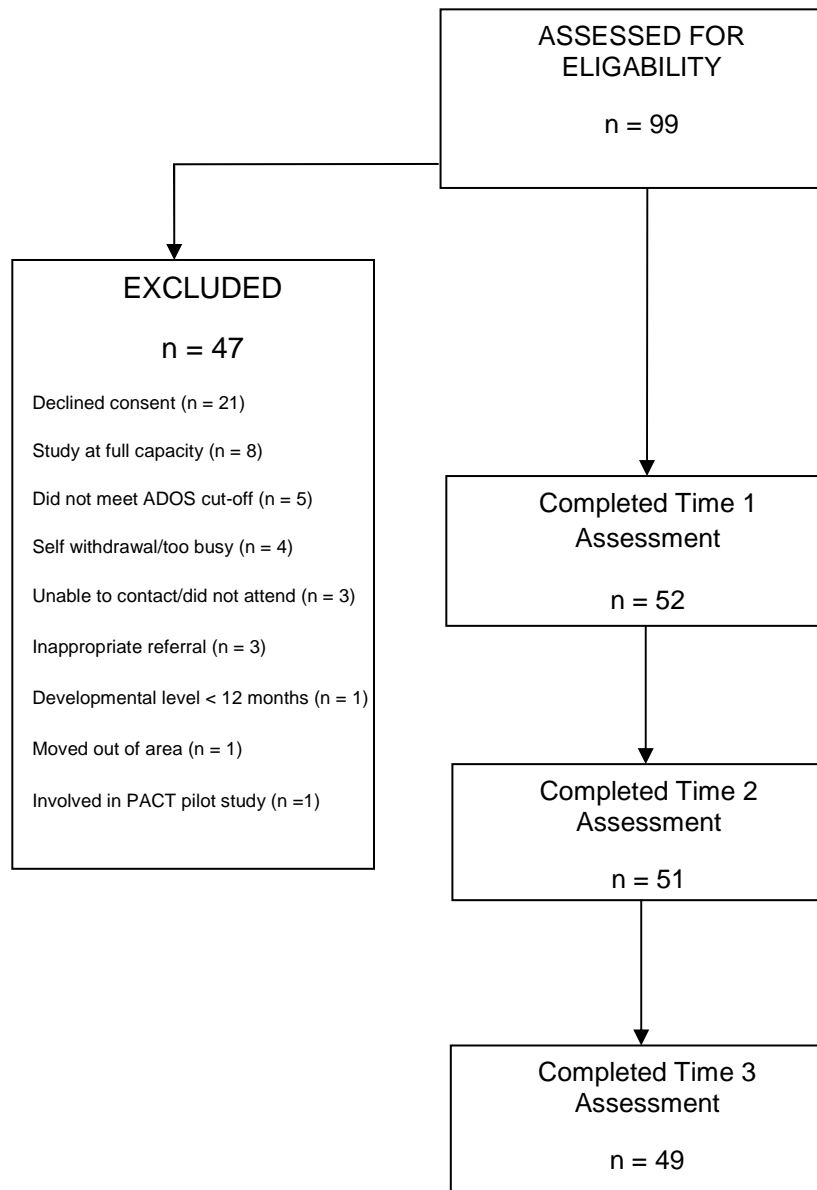
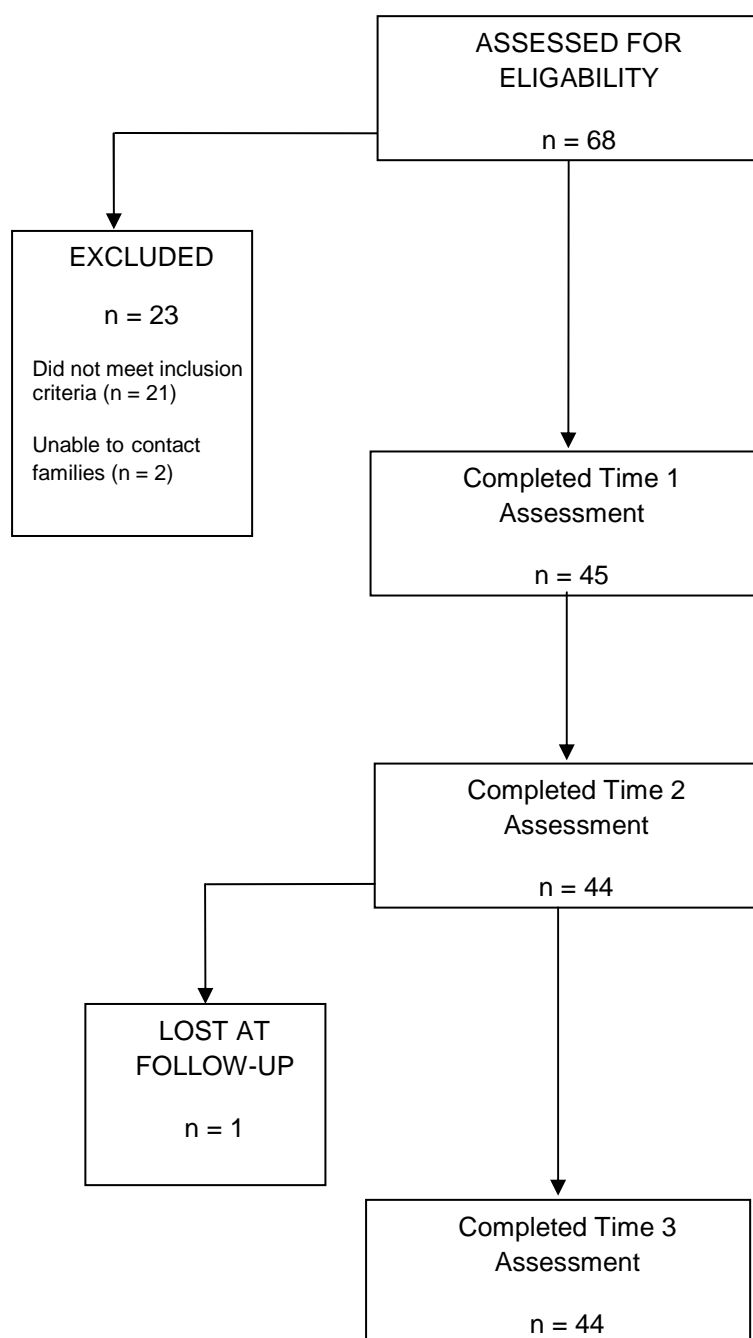


Figure 2: Neurotypical control sample recruitment and retention



Parents were also sent a short report charting language and play development and copies of the DVDs if requested.

6.9. SUMMARY

This chapter aimed to report how the samples studied were identified and recruited. The children with autism were defined using clinically recognised measures and parental report data. All children were in the preschool period and matched on non-verbal development and gender. Whilst there were differences in language, these were controlled for in the analysis in order to make confident conclusions that any group differences are attributable to the group status of the children.

CHAPTER 7: METHOD

This chapter outlines the method applied to approach the research questions presented in chapter five. This chapter covers the three timepoints at which the sample was seen and the measures used. These measures included child and parent play, attachment and related variables, non-verbal development and language. For each measure the rationale, materials used (if applicable), timing, coding and definitions (where needed) are outlined. The procedures followed at each timepoint are discussed as well as the coding and inter-rater reliability methods utilised. In the final section the analysis plan and data preparation methods are presented.

7.1. TIME POINTS

Children and their primary caregiver were seen at three time points within 13 months between September 2006 and July 2010; time one (T1), time two (T2; approximately seven months after T1) and time three (T3; approximately 13 months after T1). This was to explore child and caregiver play behaviours overtime and in relation to developmental and attachment variables.

7.1.1 Time One

All children (52 children with autism and 45 neurotypical controls) were seen at T1. The T1 visit was scheduled with the families with a child with autism following referral to the PACT study (see section 6.7. for details). Families were contacted by the research team and those who consented to take part and met inclusion criteria were invited for a clinic visit. Visits were conducted in alternative settings (two at home, one at school) if a clinic visit was not possible. Control families were seen at home following self-referral to the study. All 45 assessments with the neurotypical controls were conducted at home after discussion with the researcher (see section 6.7. for details).

7.1.2 Time Two

Families were contacted one month before the estimated date of their T2 assessment. 50 children with autism and their primary caregiver were followed up at T2, approximately seven months after their original T1 assessment. 47 of

these were conducted within the research clinic and three at home. 44 control families completed the T2 assessment. All of these assessments were conducted in the families own home.

7.1.3 Time Three

Families were contacted one month before the estimated date of their T3 assessment. This visit was completed approximately 13 months after their T1 assessment and six months after their T2 assessment. 49 children with autism and their primary caregiver completed their T3 assessment. 46 of these were completed in the research clinic and three at home. 44 control families completed this assessment in their own home.

7.2 MEASURES

Child and parent play was measured at all three timepoints using the Coding and Measurement of Parent-Child Play (Holt, 2008). Child attachment was measured at T1 and T3 using the Brief Attachment Screening Questionnaire (Bakermans-Kranenberg, Willemsen-Swinkels and van Ijzendoorn, 2003). Parental sensitivity and the dyadic construct of mutuality were assessed using the Coding of Attachment-Related Parenting for use with children with Autism (Blazey, 2007) at T1 only.

The Mullen Scale of Early Learning (Mullen, 1995) was issued at T1 to all children to assess non-verbal development for inclusion into the study and matching purposes. The Preschool Language Scale (Zimmerman et al, 1997) was administered at T1 and T3 to all children as a measure of expressive and receptive language ability. The Autism Diagnostic Observation Schedule Revised (ADOS-R; Lord et al, 2002) was conducted at both T1 and T3 with the children with autism. A summary of the measures by timepoint is shown below in table four.

Table 4: Study measurements by timepoint, subject and group

Measure	Variables measured	Timepoint			Subject		Group	
		T1	T2	T3	Child	Caregiver	Autism	Controls
Coding and Measurement of Parent-Child Play	Play complexity	x	X	x	x	x	x	x
Brief Attachment Screening Questionnaire	Attachment-related behaviours	x		x	x		x	x
Coding of Attachment Related Parenting for use with children with Autism	Parental sensitivity and mutuality	x			x	x	x	x
Mullen Scales of Early Learning	Visual reception and fine motor skills	x			x		x	x
Preschool Language Scale	Auditory comprehension and expressive communication	x		x	x		x	x
Autism Diagnostic Observation Scale	Autism symptoms and severity	x		x	x		x	

7.2.1 Child and Parent Play: Coding and Measurement of Parent-Child Play

The Coding and Measurement of Parent-Child Play (CAMPP; Holt, 2008) was designed to measure a variety of play behaviours in pre-school children with and without autism. The constructs of child and parent play complexity, toy choice and restricted and repetitive behaviours were developed based on previous research and coding schemes (See Appendix B1 for complete CAMPP scheme).

Only child and parent play complexity is reported in this current study. The development and rationale behind the new measure are outlined in this section.

7.2.1.1 Child Play Complexity

Rationale: Child play complexity (referred to in previous studies as 'level of play' or 'play behaviour') has been widely investigated in both autism and neurotypical development. Previous studies have utilised a range of measurement conditions and scales, many of which have been drawn from in the development of the CAMPP, but individually did not represent a standardised measure that can be used within this sample without sufficient modification. The methodology and findings of key studies are outlined in table five.

A new measure was designed in order to build on the research described in table five and help alleviate the short comings of previous methodology. These failings include inconsistent measurement conditions, conflicting definitions, incompatible scales and varying materials and coding strategies. Whilst the CAMPP built on many influential studies (such as Naber et al, 2008; Baron-Cohen, 1987), the measure represents a standardised, computer coded method for coding caregiver and child play during a free play session.

Firstly, the method of measurement had to be decided. Previous studies have utilised parent report, researcher directed play and free play; with different methods producing varying results. Many of these studies are discussed in table five.

Table 5: Summary of key studies drawn from in the development of the CAMPP

Study	Outline	Sample and Size	Method of play measurement	Behaviours scored
Naber et al (2008)	To assess the relationship between attachment security and play.	41 clinical children (AD, PDD-NOS, MR and LD) 14 to 36 months 16 Atypical and 16 Typical controls	Coded using Noldus Observer (1991). Free play session with caregiver. Caregiver instructed not to stimulate but join if asked.	Percentage of time spent playing in each category: manipulative, functional and symbolic.
Caveats	Developmental ages of groups different, therefore groups not matched appropriately as possible. Percentages were used therefore data is proportional. This was not corrected for in the analysis and ignores the interdependence of variables. Small sample sizes and narrow age range limit expression of symbolic play. Did not assess input of caregivers.			
Williams, Reddy and Costall (2001)	To assess functional play in children with autism.	45 children aged between 11 to 65 months. Three groups: ASD, TD, DS. Matched on developmental age.	Solitary free play session with a standardised set of toys. Coded using Noldus Observer (1991).	Five different categories of play; Simple functional play (two levels) and elaborated functional play (three levels).
Caveats	Authors did not look at simple/elementary forms of play which may also be impaired. Large age range but small sample. Authors analysed differences in duration of types of play, but did not account for the fact that the data is proportional therefore the results gained may not be truly representative of the relationships between types of play. Participants were matched on developmental age; however age equivalents were used and are not viewed as suitable for matching criteria.			
Jarrold, Boucher and Smith (1996)	To assess the generativity hypothesis in children with autism	14 children with autism, matched on language age to children with mild learning disabilities and typically developing children.	Three experimental conditions; spontaneous and instructed play. Durations of play coded as percentages	Five levels of play: pretend; intermediate pretend; functional; manipulative and no play.
Caveats	Jarrold et al calculated percentages of play and analysed as independent variables, therefore ignoring the			

	interdependence of the categories.			
Tamis-LeMonda and Bornstein (1994)	Explored maternal contributions to play and language.	41 TD mother infant dyads. Seen at 13 and 20 months	15 minute free play sessions between child and mother.	Eight 'levels' of play coded at 15 second intervals from functional to advanced symbolic. Also coded maternal play behaviours.
Caveats	Interval coding is not as accurate as continuous coding, however does tackle the issue of proportional data sets.			
Lewis and Boucher (1988)	To assess spontaneous and elicited play in children with autism	45 children with comparable language ability; 15 autism; 15 mild learning disabilities; 15 typically developing	Coded time spent in play in spontaneous and elicited/instructed conditions.	Coded symbolic and functional play.
Criticisms	Children were relatively high functioning and older than children usually studied for play research.			

A = Autism
 ASD = Autism Spectrum Disorder
 TD = Typically developing
 DS = Down Syndrome

The CAMPP was designed to code play during a free play session - specifically a ten minute session. A free play session was chosen instead of a structured play session as it allowed for interactions to be naturalistic. When structured play has been used, varying results have been produced (Jarrold et al, 1996) and it is unclear whether the child is merely following instructions or has an understanding of play and would demonstrate these behaviours spontaneously. As structured play session would have required the researcher to direct/aid play, it was questionable whether the child would play to the best of their abilities when playing with another individual as opposed to their caregiver, whilst also limiting measurement to only child play. Children with autism often experience difficulty following instructions and staying on task, therefore a structured assessment may have failed to capture the play of a child with autism to the best of their capabilities.

A retrospective questionnaire was opted against due to the lack of reliability and methodological rigour. Whilst these methods have been used previously (e.g. Knickmeyer, Wheelwright and Baron-Cohen, 2009), the specificity of the research questions outlined may have failed to be answered if questionnaires had been utilised. A standardised free play session therefore eliminated confounds such as reporter bias, different toys and a varying context whilst capturing naturalistic play.

Materials: A standardised set of toys were used in each observation (See Appendix C1). These were chosen based on their developmental appropriateness and their likelihood of inducing dyadic play between the parent and child. The session was filmed using a JVC video camera.

Timing: The free play session lasted between 15 and 20 minutes. A ten minute sample was used coded for analysis as previous studies validate the use of this timeframe in play research (e.g. Bornstein, O'Reily and Painter, 1996). Whilst the CAMPP in this study was used to code ten minutes of play behaviours, it could be used on wider parameters if required.

Coding: The ten minute section of play was coded using The Observer XT 7.0 (Noldus, 1991). The Observer is a computer based ethnogram which allows the coder to score and time operationally defined behaviours. Behaviours can

be temporally tagged to allow for precise frequencies and durations to be calculated. The Observer has been used in previous research measuring play behaviours in autism (e.g. Watts, Wetherby, Barber and Morgan, 2008; Naber et al, 2008) validating its use in this study. A computer based coding system also allows for other researchers to use the scale and inter-rater reliability to be calculated easily, ensuring all researchers are using the same parameters when coding.

Videos were coded ideally between two and twelve minutes. A two minute warm-up period was allowed for to settle the child into the observation situation. This also allowed the parent to ask any questions outside the designated coding time. If recordings were shorter than 12 minutes, the coding started ten minutes from the absolute end of the clip. Only a few recordings failed to last ten minutes and were no less than nine minutes in total.

Definitions of Child Play Complexity: Whilst many studies have measured play during a free play session, a new scale of play was developed with clear definitions to overcome the inconsistencies of previous research. Many studies have 'transposed' existing definitions or scales onto a free play session (e.g. Stanley and Konstantareas, 2007; Lyytinen et al, 1997; 1999), however this could lead to an incompatibility of measurement condition with the original scale.

Formulating revised definitions based on previous research and pilot observations helped overcome the lack of consistency in defining play. These definitions are reported in table six. Six different categories of 'play complexity' were measured in this study; simple exploratory play, cause-effect/construction play, game/drawing/bubble play, simple functional play, advanced functional play and symbolic play. The time children spent not actively engaged in play was also recorded.

Table 6: Definitions of child play categories and rationale

Category	Description/Definition	Rationale
Simple Exploratory	Involves the child exploring a toy visually or using proximal senses such as touch. The child engages with a toy, but only extracts information rather than play with the toy in the way that is intended	This form of play has been shown to be heightened in children with autism, who may choose to visually explore toys, often close to their eyes, rather than play with them in a functionally appropriate way (Libby et al, 1998).
Cause and Effect	Categorises play that combines toys or actions to produce an effect. Examples include playing with a pop-up toy or building towers using stacking cups or pushing buttons on toys.	This form of play goes beyond simple exploratory play as the child extracts more than visual/tactile information from the toy and combines actions.
Game and Bubble	Involves the child engaging in one of a range of behaviours. Game play involves the child engaging in play, often with their caregiver, such as nursery rhymes or tickling. Chasing and climbing are also included in this category. Bubble play involves the child playing with bubbles as an active participant, either blowing bubbles themselves or engaging in dyadic play with them. Drawing denotes the child actively engaging in play with the crayons and paper included in the set of toys.	These three forms of play have been grouped together for ease of coding and were seen as distinct from the other five categories of play.

Simple Functional	Describes behaviours where the child uses toys in a functionally appropriate way i.e. playing with a toy in the expected way. Examples include using a toy telephone or pushing a car down a ramp. Children may accompany their play with vocalisations, but these are short and do not extend into play scripts.*	Simple functional play is distinct from advanced functional play. Behaviours are often brief and unconnected. The decision was made to split functional play in two based on the findings of Williams et al (2001) who found children with autism were impaired on more advanced, but not simple functional behaviours.
Advanced Functional	Goes beyond simple functional play extending on functionally appropriate behaviours. The child still plays with toys in a functionally appropriate way but elaborates on these events. Examples include having a tea party with their parent or creating a crash scene with the garage and cars. Children may also draw from past events and incorporate these in their play.*	The distinction between simple and advanced functional play was opted for based on the results of Williams et al (2001) who found differences emerged on more elaborate forms of functional play.
Symbolic	Involves the child using an object in a way that defies its predefined use. The child therefore uses their imagination to redefine the use of an object. Examples include using a toy banana as a telephone or pretending stacking cups symbolise people. The child also creating a new 'imaginary' person is also categorised as symbolic play. Symbolic play as defined in this present study is drawn in part from Leslie's (1987) conceptualization where by players	Functional and symbolic play have previously been combined together to form a larger category of 'pretend play' or 'symbolic play' (Toth et al, 2006). It was decided to separate these two forms of play to explore the specificity of the relationship between play and other areas of development and to clarify the nature of the play impairment in autism.

	assign new meanings to objects which differ from their pre-defined use.**	
No Play	No play behaviours are shown.	

* Naming of toys was also excluded from the definition of both simple and advanced functional play. This has previously been included by researchers (Baron-Cohen, 1987) however it is debatable whether naming of objects represents the appropriate use of objects.

** Many researchers have included behaviours such as 'pouring tea from a teapot' into symbolic play (Baron-Cohen, 1987; Leslie, 1987). This was decided against in this study for the following reasons; firstly despite the imaginary properties not being there, the action does not violate the predefined use of the object. Indeed tea can be poured from a teapot, whereas medicine is generally not, therefore this would merit the classification of symbolic play as it attributes an imaginary property but also goes against its predefined use. Secondly it is debateable that there is a large distinction between placing a teacup on a saucer and then going a further step to 'pour' from it. These are both functionally appropriate actions, yet the second example is classified by many studies as symbolic play (Baron-Cohen, 1987). The decision was made to include symbolic behaviours which involved object substitutions or attributed a false property, such as pouring medicine from a teapot. 'Pouring tea' from a teapot was classified as into the two categories of functional play due to the appropriateness of the action to the object.

There is very little consensus within developmental research as to what constitutes different forms of play, in particular the distinction between functional and symbolic play, as discussed in section 2.3. These two terms have been used interchangeably over the past 30 years and incorporated in the wider term of 'pretend play.' Based on the theoretical assumptions that symbolic play and language stem from the same underlying ability to meta-represent (Piaget, 1962), it is appropriate to keep symbolic and functional play separate during coding and analysis enabling exploration of the specificity of the play impairment in autism (e.g. Baron-Cohen, 1987; Lewis and Boucher, 1988). Functional play was split into two categories: simple and advanced. This was based on the prediction that differences may emerge on a functional level when more complex play behaviours/scripts were separated from simple acts (Williams et al, 2001).

Validity: The CAMPP is a new composite measure which combined and integrated pre-existing published measures and definitions in order to fill an acknowledged gap in the current research literature. Definitions of play used in the source measures were coded in the development of the measure to ensure, whilst changing definitions based on inconsistencies, the definitions overlapped and built on previous items. Distributions of the CAMPP items at T1 (and the transformed scores used in any statistical analysis at T1) are reported in Appendix E.

7.2.1.2 Parent Play Complexity

Rationale: No study to date has looked at parents' play behaviours in children with autism and the impact these behaviours may have on child play. Understanding what parents do during play episodes will further add to the understanding of the wider context in which play occurs and could also have clinical implications for parent-implemented interventions in autism. Similarly, very few studies have looked specifically at parents' play complexity in typical development; with most research focusing on caregivers' use of language and their responses with regards to sensitivity. Yet as theories of play pervade education and play training programmes (such as Webster-Stratton, 2006),

further clarification of the influence of caregiver play in typical development was also needed.

Parenting style was not targeted when designing the CAMPP as an alternative measure of parent behaviour was available (Coding of Attachment-Related Parenting for use with children with Autism; see section 7.2.3 for details). It was hoped that the Coding of Attachment Related Parenting for use with children with Autism would complement the parent section of the CAMPP. Using a global measure of caregiver and dyadic attributes, in comparison to a more fine grained analysis of parent play complexity, would hopefully provide an overall picture of what caregivers do during play episodes. For example, caregiver play that is one level ahead of that of child play and accompanied by sensitive caregiving within the context of play may provide the optimal developmental context for children.

Materials: The toys used were the same as for child play.

Measurement: In line with the rationale for child play complexity (see section 7.2.1), a free play session was decided upon instead of parental report or directed play. The same measurement scale was used as for child play complexity, adopting the same technique as Tamis-LeMonda and Bornstein (1991) who transposed an existing child scale onto the measurement of parent play. The results gained by the authors support the use of this method; however, an additional category of ‘facilitating’ play was added based on preliminary observations.

Definitions of Parent Play Complexity: All definitions for parent play complexity were the same as outlined for child play complexity (see table six for details). An additional category of ‘facilitating play’ was coded. This included behaviours such as scaffolding, commentary or encouraging the child to perform play actions for themselves or supporting them to achieve these.

Whilst the category of ‘facilitating play’ captured parental behaviours that did not fall into any categories, it did not give a measure of quality of these behaviours. For example a caregiver may be quite forceful in their promoting of play and rather than scaffold play take over. The ‘sensitive responding’

scale of the Coding of Attachment-Related Parenting for use with children with Autism was thought to capture this element of the interaction.

Timing: The same ten minute timeframe was used as was for child play complexity. This time period has been validated in previous studies (Bornstein et al, 1996). The CAMPP could be used in wider timeframes if desired.

Coding: The coding technique for caregiver play was the same as that used for child play, using The Observer 7.0 (Noldus, 1991).

Validity: As discussed previously for child play complexity, the CAMPP was not fully validated prior to implementation in the research. Distributions of the CAMPP at T1 (and the transformed scores used in any statistical analysis at T1) are reported in Appendix E.

7.2.2 Attachment: Brief Attachment Screening Questionnaire

Attachment in this investigation was measured using the Brief Attachment Screening Questionnaire (BASQ; Bakermans-Kranenberg et al, 2003). This measure was opted for a variety of reasons outlined below with a discussion of alternative measures of attachment security.

7.2.2.1. Measuring attachment: Finding an alternative to the Strange Situation

The Strange Situation Paradigm (SSP; Ainsworth et al, 1978) has been considered the gold standard for the measurement of infant attachment since its introduction in the late 1970's. The SSP has provided a wealth of data surrounding the formation of attachment relationships and the impact of attachment on subsequent development (see section 3.2 for a full discussion). However, it has been recognised that this structured procedure may not be universally suitable, especially when studying abnormally developing samples, therefore the implementation of a more naturalistic approach may yield more representative ratings of attachment.

Whilst the SSP has been generalised to a variety of different cultures, it has also been criticised due to its dependency on brief observations that may not fully capture the attachment relationship (Rutter, 1995). The paradigm assumes that all children hold the same meanings of separations and

reunions, which may not be true for children with developmental disorders or from non-western cultures (Rutter, 1995). Cultural differences in the distribution of attachment classifications have been highlighted, with cultures such as Japan rarely experiencing separation from their primary caregiver in early childhood.

The use of forced attachment classifications have also been questioned, especially in children with developmental delays or disorders, such as autism. The SSP may not present an ideal method for measuring attachment in children at risk or with established physical/mental disabilities (Vaughn *et al*, 1994). An example of this is children with Down's syndrome - who show awareness of separation during the SSP but are often not visibly distressed (Vaughn and Goldberg, 1990) - leading to an under-representation of secure classifications, raising the issue that the SSP may not be interpreted equivocally across samples.

Added to this, forced classifications often leave a number of children with developmental disorders unclassifiable (e.g. Vaughn *et al*, 1994; Capps *et al*, 1994). This was found by Capps *et al* (1994) when implementing the SSP on a sample of children with autism, indicating that alternative methods maybe more suitable. As a result many researchers have sought to conceptualise attachment on a continuum from insecure to secure to gain an overall security score rather than distinct categories (Cummings, 1990).

The Attachment Q-Sort: One such method is the Attachment Q-Sort (AQS; Waters, 1995). Over the past decade, the AQS has garnered support as an alternative measure of attachment security (Smeekens, Riksen-Walraven and van Bakel, 2009). Consisting of 90 cards, each depicting secure base behaviour, the AQS requires an observer to sort statements from 'most descriptive' to 'least descriptive.' These sorts are correlated against a 'typical sort' for a securely attached child to gain a security score, rather than forcing the child into a category of attachment. In a recent meta-analysis, the AQS was viewed as having sufficient construct validity in measuring the concept of attachment (van Ijzendoorn, Vereijken, Bakermans-Kranenberg and Riksen-Walraven, 2004).

The AQS requires extensive observations - typically the researcher/observer would visit the family for three hours on three separate occasions - therefore gaining a compressive view of attachment in a naturalistic setting.

Differences between the SSP and AQS: There are key differences between the SSP and AQS (van Ijzendoorn et al, 2004). The SSP captures the dynamic aspect of attachment through stressful situations known to activate the attachment relationship. Bowlby (1969) viewed these behaviours, such as proximity seeking, central to the study of the attachment relationship. However, these behaviours are only activated when the child is alarmed. The AQS on the other hand requires an extensive observation to capture low intensity attachment behaviours in everyday situations. The AQS captures attachment through the observation of attachment behaviours as well as exploration and, if certain behaviours are not displayed, attachment in its dynamic nature may not be captured by the AQS.

In its unmodified form, there is a moderately significant association between the SSP and AQS; indicating they are measuring the same underlying attachment construct but differ in subtle ways (van Ijzendoorn et al, 2004). Therefore the implementation of either measure will depend on the theoretical framework adopted by studies and the samples under investigation. The AQS has been modified in recent research, with observations taking less than three hours (e.g. Lucas-Thompson and Clarke-Stewart, 2007). However, shorter observation times have reduced the association with the SSP (van Ijzendoorn et al, 2004).

Brief Attachment Screening Questionnaire: The Brief Attachment Screening Questionnaire (BASQ; Bakermans-Kranenberg et al, 2003) is a questionnaire format of the AQS developed to gain a more appropriate method of attachment rating in children with developmental disorders, in particular children with autism, where structured or prolonged assessment may not be possible. The BASQ is based on eight items drawn from the AQS and rates the child's comforting behaviours, how much they follow their caregiver, the ease at which they settle with their caregiver, social referencing and the demands they place on their caregiver. The child's behaviour is rated on a

scale and a mean score is gained, with higher scores indicating a more secure relationship. The BASQ is ideally scored based on a two to three hour observation. The BASQ has only been used in one published study to date (Rutgers et al, 2007) but is gaining recognition within the field of attachment in children with autism (Blazey, 2007).

Rationale: The implementation of the BASQ was most appropriate given the sample under investigation and the importance of reducing the burden on families, especially those with a child with autism. Many of the children in the autism and control sample were chronologically and developmentally older than the age range the SSP is designed for (Ainsworth et al, 1978). The Preschool Strange Situation (Cassidy and Marvin, 1992) could have provided an alternative to this, however, this was not suitable for two reasons. Firstly, many of children with autism lacked the verbal competencies required for this measure therefore rendering it inappropriate for a large proportion of the sample. Secondly, many of the controls were too young for the preschool SPP. The Strange Situation would have been suitable for many of the children in the control sample but inappropriate for older children, both in the control and autism sample, who were chronologically and developmentally old enough to complete the preschool version. Adopting two different measures of attachment would have meant that the results gained would not be comparable across the whole cohort.

In addition the SSP (both original and preschool) would have further added to an already demanding assessment battery and therefore may not truly represent the child's attachment quality due to confounds such as tiredness and lack of motivation. The implementation of the AQS was also ruled out due to its time consuming nature; the AQS requires extensive observations within the home environment, therefore the burden placed on families was considered too great to justify its implementation.

As the BASQ is based on the same theoretical assumptions as both the SSP and the AQS, it was viewed as suitable for this particular sample. Due to its specificity to younger populations, the BASQ was the most suitable

attachment measure for this current study allowing it to be used across the whole cohort.

Measurement: The BASQ consists of eight items derived from the same security factor from the AQS (see Appendix B2 for copy of BASQ scoring sheet). Attachment behaviours are rated on a scale from one (“Does not fit at all”) to seven (“Fits very well”) based on how the described behaviour fits the behaviours displayed by the child. The scoring for items five to eight is reversed so a score of one (“Does not fit at all”) was awarded a seven. If there is not enough displayed behaviour to score an item, a score of zero is given.

7.2.3. Parent-Child Interaction: Coding of Attachment-Related Parenting for use with Children with Autism

Rationale: In addition to attachment, this study was concerned with the impact of caregiver sensitivity and the dyadic construct of mutuality on parent-child play. Sensitivity has been studied extensively with the majority of research implementing the EAS (Biringen, Fidler, Barrett and Kubicek, 2005). Other global measures are available, such as a five point scale of sensitivity originally used in a sample of children with Down’s syndrome and their parents (Crawley and Spiker, 1983; Capps et al, 1994).

The EAS conceptualises observations within a framework of emotional availability, capturing the affective quality of dyadic interactions. The EAS aims to measure caregiver emotional expression and awareness/responsiveness to the child’s emotional expression. Whilst emotional availability is assumed to overlap with attachment theory, it represents a conceptually distinct approach. As this study was primarily focused on exploring the association between play and attachment, adopting a measure from a different background could have weakened the conclusive power of the findings.

The Coding of Attachment Related Parenting (CARP; Matias, 2006) is based on attachment theory and represents an alternative measure to capture the constructs of caregiver sensitivity and dyadic behaviours. The CARP comprises six scales assessing parental sensitivity, mutuality and parent and child affect (both positive and negative). Parent sensitivity is conceptualised through the scale of ‘sensitive responding’ whilst ‘mutuality’ is coded

dyadically, taking into account the behaviours of both caregiver and child. The original CARP was developed and piloted on a sample of school aged disadvantaged children (Matias, 2006) and modified by Blazey (2007) in order to render it suitable for a sample of pre-school children with autism.

Blazey (2007) modified the CARP based on two crucial factors: firstly the children in the sample were younger both chronologically and developmentally than those used to originally develop the CARP and secondly to account for the developmental deviance in children with autism. Modifications were made based on the impairments in verbal communication and joint attention to both the sensitive responding and mutuality scale. Mutuality was also adapted due to impaired initiations made by children with autism and their ability to engage in turn-taking activities. Whilst the sensitive responding scale required minimal modifications, mutuality needed more adaptations due to the social and communication impairments displayed by children with autism. However, an exploratory analysis confirmed that scoring on CARP was not significantly different to the revised Coding of Attachment Related Parenting for use with children with Autism (CARP-A; see Blazey, 2007, for full modifications).

The CARP-A consists of the same six scales as the CARP. These scales are sensitive responding, parent positive affect, parent negative affect, child positive affect, child negative affect and mutuality. This study only measured the constructs of sensitive responding and mutuality to keep the specificity of the research questions posed in section 5.2. It was also thought that whilst the CARP and CARP-A conceptualise affect in an attachment framework, these constructs lend themselves highly to an emotional availability framework and were not seen as compatible with the conceptual background of this study.

Definitions: Sensitive responding captures behaviours indicative of parental sensitivity. It is measured through the presence or absence of key behaviours: responsiveness to child, sensitive child mind mindedness, responsive facilitation, responsive encouragement, encouraging/promoting autonomy and warmth.

Mutuality is measured dyadically, taking into account the balance of behaviours expressed by both the caregiver and child. Features of mutuality

include; acceptance of caregiver involvement, joint play, shared attention, positive affect matching, flow of the interaction, and coordinated/shared body orientation.

The constructs are rated on a seven point scale ranging from one (no evidence of behaviours indicative of e.g. sensitive responding) to seven (pervasive/extreme evidence of behaviours signally e.g. mutuality). Ratings are global and take into account both frequency and intensity. The current author was trained by the author of the CARP-A to an excellent level of IRR. The CARP-A and accompanying score sheet are in Appendix B3.

Materials: As the CARP-A was coded using the free-play session, the material used were the same as for the CAMPP.

Measurement, timing and coding: The CARP-A was measured during the parent-child free play session. Parents were told to play as they normally would at home and they were free to play with as many or as few toys as they wish. The researcher sat out of shot and filmed for up to 20 minutes whenever possible.

Videos were coded ideally between two and twelve minutes. Ten minutes has been used consistently in parent-child research and is thought to represent an acceptable time frame to code a range of behaviours (Bornstein et al, 1996). A two minute warm-up period was allowed for to settle the child into the observation situation. This also allowed the parent to ask any questions outside the designated coding time. If recordings were shorter than 12 minutes, the coding started ten minutes from the absolute end of the clip. Only a few recordings failed to last ten minutes and were no less than nine minutes in total.

Coding was completed following the assessment. The coder was required to make notes on the categories included in the CARP-A. Only one viewing of the session was required to obtain enough information for this global measure. The coder then scored the items based on the notes they had made. As fore mentioned, only sensitive responding and mutuality are reported in this current study.

The CARP-A was measured at T1 in both samples. This was due to research indicating that variables concerned with the attachment relationship are relatively stable over time (Waters, Hamilton and Weinfield, 2000). This was presumed to be especially true within a short-term longitudinal study like this present research.

The CARP-A and BASQ scores were dependent on different overall sections of the assessment procedure. The BASQ was coded from the entire assessment, spanning a much larger time frame than the ten minutes of free play used to code the CARP-A. Whilst the BASQ did include behaviours observed in the free play session, it was not solely dependent on this aspect of the assessment. This was seen as important as the two measures are from similar perspectives, but it was vital to ensure independence of measurement. In the children with autism, the CARP and BASQ were coded by different researchers, further ensuring an independence of the measures. This was not possible for the majority of the children in the control sample as most assessments were conducted independently by the author.

7.2.4 Non-Verbal Development: Mullen Scales of Early Learning

The Mullen Scale of Early Learning (Mullen, 1995) is a researcher-administered assessment of cognitive development. This standardised assessment is based on a variety of play tasks and structured observations, each designed to elicit the developmental level of the child. The scales are appropriate for use on children from birth to five years and eight months and are based upon normal sequential development.

The Mullen Scale of Early Learning comprises five individual scales: gross motor, visual reception, fine motor, receptive language and expressive language. The scales measure five distinct and separate cognitive abilities; therefore the researcher is not required to administer the entire assessment. This study utilised the fine motor and visual reception scales as a combined measure of non-verbal development. The two language scales were not required as another measure of language ability was included in the study (see section 7.2.5). The gross motor scale was not used as it is only suitable

for children up to 33 months and would, therefore, not be appropriate for many children in the study.

Table 7: Example Items for the Mullen Scales of Early Learning

Scale	Item	Skills Demonstrated
Visual Reception	12. Looks for car under two washcloths	Child demonstrates object permanence
Visual Reception	19. Sorts spoons and blocks by category	Child can visually distinguish items and follow instructions to sort based on visual differences
Visual Reception	23. Memory for one picture	Child has visual memory
Fine Motor	11. Bangs in midline, horizontal movement	Child can imitate actions and use hands to grasp blocks and bring together
Fine Motor	17. Stacks blocks vertically	Child can follow instructions and use fine motor skills to build a tower of at least four blocks
Fine Motor	25. Folds paper three time	Child can imitate folding of paper using fine motor skills.

The visual reception scale measures the child's ability to deal with visual input, specifically their processing of visual patterns. The fine motor scale assesses the child's ability to deal with visual output, in particular visually directed motoric planning through tasks assessing visual discrimination and motor control. Examples of items from the Mullen Scales of Early Learning are shown table seven.

7.2.5 Language: *Preschool Language Scales*

The Preschool Language Scales (PLS; Zimmerman et al, 1997) is a standardised researcher administered assessment suitable from two weeks to six years eleven months. The assessment consists of two scales, measuring expressive communication and auditory comprehension. The PLS assesses the child's current language abilities as well as precursory skills.

Table 8: Examples of Pre-School Language Scale Items

Scale	Item	Skills Demonstrated
Auditory Comprehension	10. Follows simple instructions with cues. e.g. Place the keys near the child. <i>"Give me the keys."</i>	Child can follow simple instructions with cues using objects.
Auditory Comprehension	16. Understands verbs in context. e.g. <i>"Teddy's thirsty. Give him something to drink."</i>	Child can understand verbs within the context and acts on these.
Auditory Comprehension	30. Makes inferences. e.g. <i>"Charlie played outside and got his shoes all wet. What was it like outside?"</i>	Child can make inferences from sentences and accompanying pictures.
Expressive Communication	13. Has vocabulary of at least ten words.	Child demonstrates at least ten different words during the observation.
Expressive Communication	20. Uses plurals	Child identifies plurals from pictures e.g. socks, bricks, shoes.
Expressive Communication	28. Talks about remote events e.g. <i>"What do you do before you cross the road?"</i>	Child answers questions about remote events, drawing on their previous experience.

The auditory comprehension scale measures the child's receptive language abilities through items involving attention, vocabulary, concepts, morphology, structure, syntax and integrative thinking skills. The expressive communication scale assesses the child's competence in expressive language abilities

through items aimed at vocal development, social communication, semantics, vocabulary, concepts, structure, morphology, syntax and integrative thinking skills. Examples from both the auditory comprehension and expressive communication scales are shown in table eight.

7.3 PROCEDURE

7.3.1. Time One

The majority of T1 assessments were completed in the clinic for children with autism and in their family's home for neurotypical controls (see section 7.1. for details). The order of assessments was randomised based on the child's motivation. For example, if a child was shy with the researcher, the free play session was conducted first to ease the child into the assessment. Whenever possible, the standardised assessments were conducted first followed by the free play session.

Parent-child play was measured during a 15-20 minute free play session embedded within the research assessment. The child was filmed playing with their primary caregiver with a standardised set of toys (see Appendix C for full list). The caregiver was told to play as they normally would at home and get as involved as they wished. The researcher sat away from the dyad whilst filming so to not interfere with the play session.

Despite the disparity between the two groups in the context in which the free play session was filmed, previous research suggests that the play shown by parents and children is robust to context whether based in the lab or at home (Bornstein, Hayes, Legler, O'Reilly and Painter, 1997). The free play session also gave the child a break from the demanding assessment battery and therefore shows the child's play in the best light, rather than through a structured or directed condition designed to elicit certain play behaviours.

Ten minutes of the free play session was coded using The Observer XT 7.0 (Noldus, 1991) after the assessment for the CAMPP (see section 7.4.1 for details).

Ideally the Mullen Scale of Early Learning was completed with the author or a research associate with subject sat around a small table. However,

sometimes, especially with younger control children, the subject may have been sat on the caregivers lap. Caregivers were asked not to direct their child or influence their answers.

All children completed the visual reception and fine motor scales from the Mullen Scales of Early Learning during their first assessment. Combined raw scores from the two scales were converted into age equivalents to confirm the child's eligibility to take part in the study. Combined raw scores were also used to match neurotypical controls to the autism group. Matching was firstly completed individually within plus or minus two points to the score of a child with autism. However, as full recruitment was not reached in the control group, an overall group matched approach was used. Data from both scales was combined to form an overall raw score of non-verbal ability on which any statistical analysis was based.

The PLS was administered by the author or a research associate. The PLS was administered in the same way as the Mullen Scale of Early Learning, with the researcher and subject sat round a table. Again, if this was not possible, the child would sit on their caregivers lap or on the floor. The caregiver was instructed not to interfere with their child's responses or direct them in any way.

The scores from the auditory comprehension and expressive communication scales were reported separately and raw scores used for any statistical analysis undertaken.

The ADOS was administered by a research associate at T1. The sessions were filmed by the author or another member of the research team if needed. As with the Mullen Scale of Early Learning and the PLS, the examiner and the child sat around a table. The caregiver was sat to the side of the room, as responses to the caregiver were also coded. The ADOS lasted between 30 to 45 minutes. The order of the items was randomised by the examiner based on the child's current motivation.

7.3.2. Time Two

The T2 assessment only consisted of the parent-child free play session. This procedure did not differ from T1.

7.3.3. Time Three

The T3 assessment comprised of the free-play session, PLS and ADOS. The procedures did not differ from T1.

7.4 CODING AND INTER-RATER RELIABILITY

7.4.1 Coding

T1: Following the T1 assessment, four measures required coding; the CAMPP, the CARP-A, the BASQ and the ADOS.

The author coded the CAMPP from the recorded free play session. Coding was based on a ten minute section of recording. Coding began from two minutes to allow for a sufficient 'warm-up' period. If this was not possible, for example if the researcher was in shot or the clip did not last 12 minutes, decisions were made to start coding when the film was clear of distractions or begin coding ten minutes from the absolute end of the recording to ensure ten minutes (or as close to) were coded. As fore mentioned, previous studies using a ten minute play session add validity to the use of this time frame (e.g. Bornstein et al, 1996; 1997). Coding of the CAMPP was completed using The Observer XT 7.0 (Noldus, 1991).

The CARP-A was coded by the author using the same time frame designated for the CAMPP. The coding was completed based on the behaviours observed only in the ten minute section of video.

BASQ coding was completed for all children immediately after their T1 assessment, based on the range of observed behaviours during the visit. Another researcher (either alone or with the author) coded these for all children with autism. The author completed all the control coding, except when a research associate was present on research visits. In these situations, the BASQ was coded together.

Due to the differences in the observation environment and the addition of the diagnostic schedule in the autism group, the context in which the BASQ was scored was not ideally controlled. This is acknowledged in the research design and any differences found may in part be due to the differences in the observation context.

The ADOS was coded by a research associate based on the video recording of the assessment following the assessment session. Scores were based on the observation of behaviours outlined by Lord et al (2002) and discussed in section 6.4.

T2: Only the CAMPP required coding at T2. Coding was completed for all children who completed the T2 assessment. Coding was conducted in the same way described above for the T1 assessment.

T3: Three measures required post-assessment coding following the T3 assessment: the CAMPP, the BASQ and the ADOS. The CAMPP-A and BASQ were coded at T3 for all children who completed the final assessment. Coding was conducted in the same way as described for the T1 assessment. The ADOS was also coded by a research associate following the T3 assessment. All children completed the same module as they did at T1 to avoid measurement confounds.

7.4.2 Inter-Rater Reliability

Inter-rater reliability (IRR) had to be obtained for three of the measures used in the study; the CAMPP, the CARP-A and the ADOS.

IRR on the CAMPP was done in collaboration with a research assistant trained to undergraduate level. IRR cases were picked at random from the two samples and three time points. 20% of all cases for both the child and parent were coded for IRR. Child play obtained excellent levels of inter-class correlations (ICC). Based on single measure statistics, all scores were between 0.70 and 0.90 apart from symbolic play. This received an ICC of 0.52 which is thought to be attributable to the low levels of symbolic play expressed by the sample.

Parent play also received good to excellent levels of ICC. These ranged from 0.60 to 0.90. Both simple exploratory play and symbolic play had too low levels of occurrence to produce ICC scores.

IRR for the CARP-A was obtained with a research assistant trained to masters level. This was on 20% of cases. ICC for sensitive responding was 0.80 and 0.74 for mutuality.

ADOS IRR was completed between research associates working on the PACT study. This was completed for 66 codings of 15 randomly selected cases within the whole PACT cohort (N = 152). The ICC for ADOS algorithm scores was 0.79.

Both the Mullen Scale of Early Learning and the PLS are standardised measures therefore did not require additional IRR. Due to the nature of the BASQ coding, spanning both recorded and unrecorded aspects of the research assessment, IRR could not be obtained. Within the Manchester site, both the author and a research associate were present during the majority research visits with the children with autism and coded cases together in case the researcher filming or administering assessments missed vital behaviours indicative of attachment. Across sites, there was not enough information from the recorded elements of the session to obtain reliable and accurate IRR scores. This is therefore acknowledged as a flaw to the current study and the implementation of the BASQ is discussed further in chapter 12.

7.5 DATA PREPARATION AND ANALYSIS PLAN

The next section reviews the analysis that was undertaken to test the research hypothesis outlined in section 5.2. Due to the nature of the measures used in the research, additional data preparation was required before the data can be used in parametric statistics.

7.5.1. Data Preparation

Prior to the statistical techniques outlined in section 7.5.2, some of the data produced by the measures within this chapter required further attention based on some of the issues highlighted throughout with other studies.

Specifically the CAMPP produced data that required modification based on two assumptions: firstly that the data categories (different play types) were not independent and secondly that normal distribution could not be automatically assumed.

The six categories of child and caregiver play, plus the categories of 'no play' and 'facilitating', are non-independent; as the percentage of one variable increases, the percentages of the other variables will decrease. Unlike simple frequency counts, high percentages of one play type are automatically accompanied by lower percentages of other forms of play. Due to this, traditional statistics can be misleading when applied to this kind of data. The non-independence increases the likelihood of type one errors or spurious results. An alternative approach would have been to limit the analysis to one play category, focusing the analysis, for example, on symbolic play. However, this would automatically ignore the complexity and wealth of data collected and coded. Yet, through analysing the whole dataset, and thus including the depth of the behaviours coded, ignores the interdependence of the variables and may produce false positives.

In addition to the issue of non-independence, previous studies have adopted the technique of calculating mean percentages followed by traditional statistics (Naber et al, 2008; Williams et al, 2001). However, this fails to account for the group variance and assumes the data is normally distributed. By adopting this stance, this method may fail to detect the heterogeneity in disorders such as autism.

An alternative method that avoids both these potential problems is based on geological research techniques and was first implemented in developmental psychological research by Pennington, James, McNally, Pay and McConachie (2009).

Pennington et al (2009) adapted methods used in geological and biomedical research to account for the interdependence of interaction data to allow for full comparison of entire patterns of behaviours within datasets. The statistical technique was piloted on two samples of children with communication

difficulties; children with motor impairments leading in intelligible speech and children with autism.

A statistical technique used by Pennington et al (2009) was adopted here with further adaptation to control for possible co-variables. This involves creating new variables transformed from proportional data sets. These new variables can then be analysed with the assumption that they have a multivariate normal distribution. Pennington and colleagues suggest that group differences can be analysed to compare two or more transformed variables. These transformed variables can be used in both univariate and multivariate methods.

Whilst Pennington et al (2009) suggest that the log ratio transformations generate the assumption that the new variables are normally distributed, this cannot be certain. Whilst skew and kurtosis values were not calculated for these variables (as these are largely dependent on sample size), selected the frequency distributions at T1 for both child and caregiver transformed variables are reported in Appendix E.

A reference point for each timepoint was created. This reference point was derived from the totals of the variables where there was no group difference at either T1, T2 or T3. A series of paired sample t-tests were run between the variables that produced between group differences and the newly created reference point to ensure these were statistically different. Only variables that produced a significant difference were transformed using the technique described by Pennington et al. A log ratio transformation was conducted on significant variables to create a new variable, which was used for all subsequent analysis. The formula for this transformation is reported below:

$$Y1 = \ln\left\{\frac{x1+1}{xR+1}\right\}, Y2 = \ln\left\{\frac{x2+1}{xR+1}\right\}, Y3 = \ln\left\{\frac{x3+1}{xR+1}\right\}, \dots$$

In refers to the log ratio transformation. x1, x2, x3 etc refer to the variables being transformed. xR refers to the reference variable for the particular time point; either T1, T2 or T3 and either child or caregiver. The variables that were transformed and the process involved are discussed for each time point in the result chapters.

Further log ratio transformations were performed on the data when looking at changes over time. Based on the recommendations of Pennington et al (2009), changes between T1, T2 and T3 child play were explored using a series of paired-sample t-tests. Variables that produced significant changes between T1 and T2 were transformed based on the following formula;

$$y1 = \ln\left\{\frac{x2 + 1}{x1 + 1}\right\}, y2 = \ln\left\{\frac{w2 + 1}{w1 + 1}\right\} etc..$$

For example, x2 refers to the particular variable at T2, x1 is this variable at T1. In refers to the log ratio transformation performed. y1 is the new variable created. The new variables are then analysed for between group differences and entered into any univariate and multivariate analysis. Examples of this analysis are shown in Appendix D.

In addition, the development/change across the two groups between T1 and T2 and T2 and T3 was explored by comparing the transformed scores already gained in the change analysis.

The CARP-A was analysed at T1 for homogeneity of variance and parametric assumptions. This is conducted and explored within the individual chapters. The BASQ was also explored in this way at T1 and T3.

7.5.2. Analysis Plan

A predefined analysis plan was developed prior to analysis and was implemented at each timepoint based on the hypotheses outlined in section 5.2. Group differences were analysed using a range of traditional methods, controlling for covariates, and newly developed techniques by Pennington et al (2009). Predictive analysis were explored preliminary using univariate analysis and multivariate analysis was used to explore the predictive significance of variables in play and attachment.

To test hypothesis 1a, ANCOVAs, controlling for the differences in IMD score and chronological age, were conducted between the two groups on each of the categories of play. To explore hypothesis 1b, developmental trajectories were presented graphically across the three timepoints and paired sample t-tests explored change between subsequent timepoints separately for the

children with autism and neurotypical controls. In addition to the graphs, differences between T1 and T2 and T2 and T3 will be explored using the transformed variables gained to see if there are group differences in play change. To test what variables predict child play behaviours in hypothesis 1c, the association between play variables and developmental factors were tested using univariate analysis, controlling for group allocation. Significant correlations were then explored further using multivariate regression analysis.

Hypothesis two was explored much in the same way as hypothesis one. For hypothesis 2a, caregiver play differences were analysed in the same way as child play, controlling for IMD score and child chronological age. The relationships between caregiver play and child variables in hypothesis 2b were firstly assessed using univariate analysis, followed by multivariate regression analysis. Multivariate regression analysis was also used to explore how caregiver play predicted child play change over time to test the assumptions of hypothesis 2c.

Hypothesis 3a tested between group differences in attachment, sensitive responding and mutuality through ANCOVAs, controlling for chronological age and IMD score. To explore the assumptions of hypothesis 3b, univariate analysis was conducted between attachment scores and variables assumed to associate with this construct, specifically sensitive responding and mutuality. Any significant associations were further explored using a multivariate regression analysis. The relationships between attachment and its related variables to play behaviours were explored throughout the analysis with univariate statistics to answer hypothesis 3c. If significant associations were found these were explored further using multivariate statistical methods.

7.6 SUMMARY

This chapter presented the method in which this thesis and its research questions were approached. The three timepoints at which the children were seen were discussed and the measures administered at each timepoint. The procedure followed at each research assessment was reported and the coding and IRR procedures which followed. The analysis plan and data preparation

were discussed in detail, leading the results gained in the following results chapters.

CHAPTER 8: TIME ONE RESULTS

As outlined in chapter five, this study was primarily interested in between group differences in play behaviours and the variables that predict any differences found in children with and without autism and their caregivers. The four results chapters explore play differences at all three timepoints, play change over time and attachment at T1 and T3.

This chapter is split into four sections; firstly, focusing on child play and what predicts these differences. Analysis then turned to caregiver play and what predicts any differences found at T1. In section 8.3 child attachment is explored to clarify what variables predicts attachment in children and any group differences found. The relationship between attachment and play is also discussed in section 8.4.

8.1 CHILD PLAY COMPLEXITY

Group differences in child play complexity were explored controlling for chronological age and IMD score as these differed between the two groups. These variables were controlled for throughout the analysis. The impact of developmental variables on child play was explored to see how development associated with play. The specific relationship between play and language was also assessed for all levels of play, to explore the specificity of the language-play association.

8.1.1. Descriptive Statistics

Table nine displays the mean percentage of time children with and without autism spent engaged in the six different levels of play complexity and the time not engaged in play at T1.

Children with autism spent more time engaged in simple exploratory play (21.48% compared to 13.57%). They also spent more time not actively playing (29.59% compared to 18.84%). Neurotypical controls spent more time playing to a simple functional (28.15% compared to 16.79%) and advanced functional level (10.91% compared to 5.12%). Very few children demonstrated symbolic play (0.31% and 0.14%).

Table 9: Mean percentage of time children with and without autism spent engaged in different play complexities at T1

Percentage of time	Autism Group (n = 49)	Control Group (n = 44)
Simple Exploratory	21.48 (20.56)	13.57 (15.00)
Cause and Effect	21.77 (16.33)	25.68 (20.33)
Game and Bubble	4.83 (9.12)	2.52 (6.49)
Simple Functional	16.79 (15.73)	28.15 (21.18)
Advanced Functional	5.12 (12.91)	10.91 (19.79)
Symbolic	.31 (1.22)	.14 (16.86)
No Play	29.59 (16.86)	18.84 (10.08)

8.1.2 Analysis of Between-Group Differences

As described in section 7.5.1, ANCOVAs were conducted between the two samples to explore between group differences. Any non-statistical categories were grouped together to create a T1 reference point. A detailed description of the analysis procedure is available in section 7.5.1 and in Appendix D.

Four significant differences were found between the two groups; children with autism spent more time engaged in simple exploratory play ($F = 13.04$, $p < .01$) Age also made a significant contribution to the group difference found ($F = 10.33$, $p < .01$), however the effect remained after controlling for this variable. Children with autism also spent more time not actively playing ($F = 5.75$, $p = .02$) and less time engaged in simple functional ($F = 5.73$, $p = .02$) and advanced functional play ($F = 29.69$, $p < .01$). Whilst age made a significant contribution to this group difference ($F = 32.11$, $p < .01$), the difference remained after controlling for this variable ($F = 29.69$, $p < .01$).

Cause and effect/construction play, game/bubble play and symbolic play were grouped together for the T1 reference point (see section 7.5.1 and Appendix D for definition and background) to which the four significant variables were compared. Results are reported in table ten.

Simple exploratory play continued to produce a significant group difference ($F = 16.46$, $p < .01$). Again age made a significant contribution to this difference ($F = 20.89$, $p < .01$), however the group difference remained after controlling for this variable. Advanced functional play also produced a group difference ($F =$

38.67, $p < .01$); again age also produced a significant difference ($F = 34.09$, $p < .01$) however the group difference remained. The associations with age will be explored in sections 8.1.3 and 8.1.4 to see if chronological age continues to have an effect even after inclusion of other variables found to associate.

The transformed variables (see section 7.5.1 and Appendix D for description and formula) will be used in any subsequent analysis.

Table 10: Paired sample T-tests between T1 child play complexity and T1 reference point

	Mean	Std. deviation	t	df	Sig (2- tailed)
T1 Simple Exploratory - T1 Reference	17.74 27.59	18.48 19.08	-3.76	92	.00
T1 Simple Functional - T1 Reference	22.17 27.59	19.27 19.08	-1.60	92	.11
T1 Advanced Functional - T1 Reference	7.86 27.59	16.69 19.08	-6.48	92	.00
T1 No Play - T1 Reference	24.51 27.59	15.00 19.08	-1.23	92	.22

8.1.3 Predicting T1 Child Play Complexity Differences

The following analysis identified the variables that correlated with simple exploratory and advanced functional play. The multivariate analysis was limited to these two variables however all play variables were explored in relation to language before specifying the analysis to the variables that produced between group differences.

8.1.3.1 Play and Language Associations

Partial correlations were conducted for all the play variables (using original variable values) to explore whether the relationship between play and language was specific to certain forms of play or play behaviours as a whole. The analysis controlled for group.

At T1, simple exploratory play associated negatively with mean language scores ($r = -.38$, $p < .01$). This relationship was not specific to receptive or expressive abilities. T1 advanced functional play positively associated with

language ($r = .658, p < .01$). Again this was not specific to either receptive or expressive abilities. Symbolic play at T1 produced a marginally significant association with mean language ($r = .209, p = .045$). This association was accounted for by the relationship between symbolic play and receptive language ($r = .21, p = .04$) as the association with receptive language was not significant. The time children did not spend playing at T1 also associated with language ($r = -.21, p = .047$). However this relationship only just reached significance and was accounted for by the association between 'no play' and expressive language ($r = -.25, p = .015$).

The following section will focus specifically on the two variables that produced a between group difference, using the transformed values.

8.1.3.2. Univariate Analysis

Partial correlations were conducted, controlling for group, for simple exploratory and advanced functional play and possible predicting variables, outlined in hypothesis 1c and 3c. These were attachment, sensitive responding and mutuality. Expressive and receptive language were included in the analysis as were chronological age and non-verbal development. IMD scores were excluded as they did not co-vary in section 8.1.2. Only correlations with a significance level of at least 0.01 were accepted and included in the multivariate analysis.

Simple exploratory play correlated with mutuality ($r = -.28, p = .01$) but not with sensitive responding or attachment. Expressive ($r = -.46, p < .01$) and receptive language ($r = -.49, p < .01$) correlated with simple exploratory play. These variables will be combined in the multivariate analysis as the relationship is not specific to one form of language ability; replicating the findings in section 8.1.3.1. Non-verbal development ($r = -.44, p < .01$) and chronological age ($r = -.43, p < .01$) also correlated with this form of play. All significant correlations were negative.

Mutuality correlated with advanced functional play at T1 ($r = .34, p < .01$). Receptive and expressive language were also both highly correlated with this form of play ($r = .72, p < .01$; $r = .66, p < .01$ respectively). Chronological age (r

=.53, $p < .01$) and non-verbal development ($r = .54$, $p < .01$) both correlated with advanced functional play. All significant correlations were positive.

Advanced functional play and simple exploratory play correlated with one another ($r = -.46$, $p < .01$). Both forms of play were independent of ADOS score in the autism group.

8.1.3.3 Multivariate Analysis

The robustness of developmental and attachment-related variables in predicting T1 child play differences was assessed using a series of multivariate linear regressions. The analysis included known associates of play (derived from the associations found in section 8.1.2.2) to see if these variables accounted for the group differences found.

Simple exploratory play was entered as the dependent variable. Group status was entered in the first model; followed by non-verbal development, language (combined) and chronological age. Advanced functional play was entered at stage three; followed by mutuality in model four.

Table 11: Summary of multivariate analysis predicting T1 child simple exploratory play

Model	Variables Entered	R	R ²
1	Group	.124	.015
2	Age	.518	.268
	Language		
	Non-verbal		
3	Advanced	.531	.282
	Functional		
4	Mutuality	.544	.296

Table 11 reports the models produced by the multivariate analysis predicting T1 simple exploratory play. Group accounted for 1.5% of the variance in the cohort, despite the group differences found in section 8.1.2. When the variables of non-verbal development, language and chronological age were entered, the predictive significance of the model increased to 26.6%. Advanced functional play and mutuality increased this to 28.2% and 29.6% respectively. The coefficients of the regression analysis are shown in table 12.

One variable was individually predictive of simple exploratory play; only chronological age in months at T1 significantly predicted the time spent in exploratory play at T1, however this was only marginal in model two ($t = -2.04$, $p = .04$) and when advanced functional play and mutuality were included, was no longer significant ($t = -.165$, $p = .10$).

Table 12: Coefficients for multiple regression analysis predicting T1 child simple exploratory play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.42	.18		13.21	.000
	Group (autism or controls)	-.32	.26	-.12	-1.19	.24
2	(Constant)	4.73	.71		6.62	.000
	Group (autism or controls)	-.73	.46	-.29	-1.61	.112
	Chronological age at T1	-0.4	.02	-.36	-2.04	.044
	Language score	-.04	.02	-.38	-1.96	.053
	Non verbal score	-.01	.03	-.01	-.032	.974
3	(Constant)	4.46	.74		6.02	.000
	Group (autism or controls)	-.60	.46	-.23	-1.29	.200
	Chronological age at T1	-.03	.02	-.30	-1.65	.103
	Language score	-.03	.03	-.19	-.96	.339
	Non verbal score	-.01	.03	-.05	-.27	.788
	T1 Ad.Functional Play	-.17	.13	-.18	-1.30	.196
4	(Constant)	5.30	.99		5.33	.000
	Group (autism or controls)	-.56	.46	-.22	-1.20	.234
	Chronological age at T1	-.03	.02	-.33	-1.78	.079
	Language score	-.01	.03	-.11	-.53	.595
	Non verbal score	-.01	.03	-.08	-.48	.656
	T1 Ad.Functional Play	-.16	.13	-.17	-1.21	.23
	Mutuality	-1.35	1.07	-.14	-1.25	.214

A multivariate analysis was conducted for advanced functional play. Group was entered first; followed by age; non-verbal development and language. Simple exploratory play was then entered; and mutuality scores in model four.

Table 13: Summary of the multivariate analysis predicting T1 child advanced functional play

Model	Variables Entered	R	R ²
1	Group	.261	.068
2	Age	.755	.570
	Non-verbal		
	Language		
3	Simple Exploratory	.760	.578
4	Mutuality	.761	.579

Group predicted 6.8% of the variance in the time children engaged in advanced functional play at T1. This increased to 57% with the inclusion of chronological age, non-verbal development and language. Simple exploratory play at T1 increased this to 57.8% and mutuality to 57.9%. The coefficients of the regression analysis are shown in table 14.

Table 14: Coefficients for multiple regression analysis predicting T1 child advanced functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.54	.19		2.86	.005
	Group (autism or controls)	.70	.27	.26	2.58	.011**
2	(Constant)	-1.57	.58		-2.72	.008
	Group (autism or controls)	.77	.37	.28	2.09	.039
	Chronological age at T1	.03	.01	.34	2.50	.014
	Language score	.11	.02	.78	5.97	.000
	Non verbal score	-.04	.02	-.23	-1.74	.085
3	(Constant)	-1.04	.70		-1.48	.143
	Group (autism or controls)	.69	.37	.25	1.85	.068
	Chronological age at T1	.03	.01	.30	2.17	.032
	Language score	.10	.02	.75	5.60	.000
	Non verbal score	-.04	.02	-.23	-1.75	.083
4	T1 Simple Exploratory Play	-.11	.08	-.10	-1.30	.196
	(Constant)	-1.34	.92		-1.46	.148
	Group (autism or controls)	.67	.37	.25	1.80	.075
	Chronological age at T1	.03	.01	.31	2.21	.030
	Language score	.09	.02	.72	5.00	.000
	Non verbal score	-.04	.02	-.22	-1.64	.104
	T1 Simple Exploratory Play	-.10	.09	-.10	-1.21	.23
	Mutuality	.45	.88	.04	.51	.607

Group was a significant predictor of advanced functional play in model one ($t = 2.58$, $p < .01$) and model two ($t = 2.09$, $p = .04$). Age and language were significant in model two (age: $t = 2.50$, $p = .01$; language: $t = 5.97$, $p < .01$) and remained significant throughout the analysis. Mutuality and simple exploratory play were not individual predictors of T1 advanced functional play. Language and chronological age were the only individually significant predictors in model four (age: $t = 2.14$, $p = .03$; language: $t = 5.04$, $p < .01$).

To summarise, two group differences were found between the children with autism and neurotypical controls; children with autism spent more time engaged in simple play behaviours but less time in advanced functional play. Simple exploratory play differences were predicted by a combination of variables; however, no one variable was individually significant. Just under

30% of the variance of simple exploratory play was explained by group, chronological age, language, non-verbal development, mutuality, and the time spent in advanced functional play. Advanced functional play differences were predicted by a combination of group, age, non-verbal development, language, simple exploratory play and mutuality. These variables accounted for nearly 58% of the total variance. Language emerged as the strongest predicting variable; however, chronological age also remained significant.

8.2. CAREGIVER PLAY COMPLEXITY

The following section explores between group differences in caregiver play. Possible associations with attachment, attachment-related variables, child development and play were also examined.

8.2.1 Descriptive Statistics

Table 15 displays the mean percentage of time caregivers of a children with autism and caregivers in the neurotypical control group spent playing to the different play categories as well as facilitating play and not playing.

Table 15: Mean percentage of time caregivers spent engaged in different play complexities at T1

Percentage of time	Autism Group (n = 49)	Control Group (n = 44)
Simple Exploratory	.48 (1.22)	6.83 (17.94)
Cause and Effect	4.07 (6.58)	2.83 (4.28)
Game and Bubble	6.99 (11.46)	2.16 (4.86)
Simple Functional	8.01 (8.93)	1.69 (2.42)
Advanced Functional	5.83 (10.79)	6.55 (9.66)
Symbolic	.05 (.26)	1.51 (3.85)
Facilitating	38.11 (17.34)	43.93 (15.32)
No Play	36.23 (16.85)	31.69 (22.63)

Caregivers in the control group spent more time engaged in simple exploratory play (6.83% compared to 0.48%). The autism group caregivers spent more time engaged in simple functional play (8.01% compared to 1.69%). Overall, the groups were relatively similar in their play behaviours, spending the majority of their time facilitating play (38.11% and 43.93%).

8.2.2 Analysis of Between-Group Differences

T1 caregiver play data was prepared in line with the methods utilised in section 8.1.2 and described in section 7.5.1 and Appendix D.

Four significant differences were found; caregivers in the autism group spent more time engaged in cause and effect play ($F = 5.45$, $p = .02$). Child age also made a contribution to this difference ($F = 5.89$, $p = .02$), however the difference remained after controlling for this. Caregivers of a child with autism also spent more time engaged in game and bubble play ($F = 9.02$, $p < .01$) and simple functional play ($F = 9.02$, $p < .01$). Caregivers in the control group spent more time engaged in symbolic play ($F = 7.64$, $p < .01$); however, this difference was treated with caution due to the small percentages in both groups.

Simple exploratory, advanced functional, facilitating and no play were grouped to create the T1 caregiver reference point to which the four variables that produced a group difference were compared.

Table 16: Paired sample t-tests between T1 caregiver play complexity and T1 reference point

	Mean	Std. deviation	t	df	Sig (2-tailed)
T1 Caregiver Cause & Effect -	.93	1.02			
T1 Caregiver Reference	84.61	15.84	-41.90	92	.000
T1 Caregiver Game & Bubble –	.87	1.20			
T1 Caregiver Reference	84.61	15.84	-34.65	92	.000
T1 Caregivers Simple Func. -	1.27	1.00			
T1 Caregiver Reference	84.61	15.84	-38.63	92	.000
T1 Caregivers Symbolic -	.22	.60			
T1 Caregiver Reference	84.61	15.84	-38.63	92	.000

All the remained significantly different. These variables were transformed (see section 7.5.1 and Appendix D for description and formula) then re-compared to see if group differences were maintained.

T1 caregiver cause and effect play remained significant ($F = 6.55$, $p = .01$). Child age continued to exert a significant effect on the group difference ($F =$

9.17, $p < .01$), yet the difference remained after controlling for this variable. The association with child age will be explored in sections 8.2.3 and 8.2.4 to see if chronological age continues to have an effect even after inclusion of other variables found to associate. Both the group differences originally found between caregiver simple functional ($F = 19.24$, $p < .01$) and symbolic play ($F = 8.98$, $p < .01$) also remained significant. However, the group difference between game and bubble play was no longer significant following transformation. Therefore the following analysis did not include this category. All subsequent analysis was conducted using the transformed variables.

8.2.3. Predicting T1 Caregiver Play Complexity Differences

The variables that contributed to the caregiver play differences found in 8.2.2 were explored. These included child play complexity, child developmental factors and attachment/attachment-related constructs. Univariate analysis was conducted primarily, followed by multivariate analysis to explore predictive associations.

8.2.3.1 Univariate Analysis

Correlations were conducted between the caregiver play variables; cause and effect, simple functional and symbolic play; and a variety of other variables hypothesised to predict or confound caregiver play. These included child age, child non-verbal development, child language, child play, attachment, mutuality and sensitive responding. Group was controlled for during the analysis. An individual analysis was conducted for the autism sample using ADOS scores. Due to the number of correlations run, only significance levels of at least 0.01 were accepted to maintain power.

Caregiver cause and effect play associated negatively with all the child developmental variables; age ($r = -.31$, $p < .01$), non-verbal development ($r = .29$, $p < .01$), expressive language ($r = -.31$, $p < .01$) and receptive language ($r = .31$, $p < .01$). Sensitive responding also correlated negatively with caregiver cause and effect play ($r = -.28$, $p < .01$). ADOS scores did not correlate with this form of play.

Caregiver simple functional and symbolic play did not associate with any child developmental or attachment variables to the significance of 0.01.

Partial correlations were conducted to explore the associations with child play. Caregiver cause and effect play associated positively with child simple exploratory play ($r = .283$, $p < .01$) and negatively with both simple functional ($r = -.236$, $p = .02$) and advanced functional play ($r = -.285$, $p < .01$). Caregiver simple functional play only associated with child cause and effect play ($r = .361$, $p < .01$). Caregiver symbolic play did not correlate with any child play variables.

8.2.3.2. Multivariate Analysis

A series of linear regressions were conducted for each of the caregiver play variables that produced a between group difference in section 8.2.2. Variables that associated with caregiver play in section 8.2.3.1 were entered into the regression analysis.

Caregiver cause and effect play was examined first. Group was entered in the first model. This was followed by the variables child chronological age, non-verbal development and language. In model three, child simple exploratory, simple functional and advanced functional play were included. Sensitive responding was entered in the final model.

Table 17: Summary of the multivariate analysis predicting T1 caregiver cause and effect play

Model	Variables Entered	R	R ²
1	Group	.073	.005
2	Age	.362	.131
	Non-verbal		
	Language		
3	Child Simple Exploratory	.419	.176
	Child Simple Functional		
	Child Ad. Functional		
4	Sensitive Responding	.468	.219

As shown in table 17, group accounted for 0.5% of the variance in caregiver cause and effect play, despite the significant group difference found in section

8.2.2. This increased to 13.1% with the inclusion of the variables of child age, non-verbal development and language. The inclusion of the child play variables further increased this to 17.6% and sensitive responding 21.9%.

As shown in table 18, group was not a significant individual predictor in any of the four models. The only significant variable was sensitive responding in model four ($t = -2.164$, $p < .01$).

Table 18: Coefficients for multiple regression analysis predicting T1 caregiver cause and effect play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.00	.14		6.86	.000
	Group (autism or controls)	-.15	.21	-.07	-.70	.490
2	(Constant)	2.28	.62		3.70	.000
	Group (autism or controls)	-.37	.39	-.18	-.95	.343
	Chronological age at T1	-.02	.01	-.25	-1.32	.191
	Language score	-.02	.02	-.24	-1.30	.195
	Non verbal score	.00	.03	.00	.01	.991
3	(Constant)	2.09	.79		2.65	.010
	Group (autism or controls)	-.23	.40	-.11	-.56	.575
	Chronological age at T1	-.02	.01	-.24	-1.16	.247
	Language score	-.02	.02	-.21	-.95	.346
	Non verbal score	.01	.03	.04	.21	.829
	T1 Child Simple Exploratory	.04	.10	.6	.46	.643
	T1 Child Simple Functional	-.01	.00	-.19	-1.74	.085
	T1 Child Advanced Functional	-.03	.11	-.03	-.23	.815
4	(Constant)	3.34	.99		3.39	.001
	Group (autism or controls)	-.15	.40	-.07	-.39	.699
	Chronological age at T1	-.02	.01	-.22	-1.09	.278
	Language score	-.01	.02	-.13	-.57	.568
	Non verbal score	-.00	.03	-.02	-.09	.931
	T1 Child Simple Exploratory	.06	.10	.08	.64	.526
	T1 Child Simple Functional	-.01	.00	-.18	-1.62	.109
	T1 Child Advanced Functional	-.01	.11	-.01	-.10	.920
	Sensitive Responsibility	-2.04	.99	-.21	-2.05	.043

Caregiver simple functional play was entered as the dependent variable in the next analysis. Group was entered first; accounting for 27.7% of the variance. The inclusion of child cause and effect play in model 2 increased this to 37.1%. These models are reported in table 19.

The coefficients of the regression analysis are reported in table 20. Group was a significant predictor throughout the analysis (1: $t = -5.90$, $p < .01$; 2: $t = -5.86$, $p < .01$). In model two, child cause and effect play was also a significant predictor of caregiver simple functional play ($t = -3.67$, $p < .01$).

Table 19: Summary of the multivariate analysis predicting T1 caregiver simple functional play

Model	Variables Entered	R	R ²
1	Group	.526	.277
2	Child Cause & Effect	.609	.371

Table 20: Coefficients for multiple regression analysis predicting T1 caregiver simple functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.77	.12		14.41	.000
	Group (autism or controls)	-1.05	.18	-.52	-5.90	.000
2	(Constant)	2.14	.15		13.40	.000
	Group (autism or controls)	-.99	.17	-.49	-5.86	.000
	T1 Child Cause and Effect	-.02	.00	-.31	-3.67	.000

Caregiver symbolic play was entered into a linear regression, producing just one model, shown in table 21. Group was the only variable entered into the model. This accounted for 9.3% of the variance.

Table 21: Summary of the multivariate analysis predicting T1 caregiver symbolic play

Model	Variables Entered	R	R ²
1	Group	.304	.093

As shown in table 22, group was a significant individual predictor of caregiver symbolic play in model one ($t = 3.05$, $p < .01$).

Table 22: Coefficients for multiple regression analysis predicting T1 caregiver symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.04	.08		.54	.590
	Group (autism or controls)	.37	.12	.30	3.05	.003

In summary, three group differences found between caregivers in the two groups; caregivers of a child with autism spent more time in cause and effect play and simple functional play but less time engaged in symbolic play. The

differences found in cause and effect play were accounted for by a variety of variables, but only sensitive responding predicted the differences found; with lower ratings of sensitivity relating to higher percentages of this play. Group and child cause and effect play associated with caregiver simple functional play and predicted the variance explained by the model. Symbolic play in the caregivers did not relate to any child developmental or play variables and group accounted for 9.3% of the total variance.

8.3. ATTACHMENT, SENSITIVE RESPONDING AND MUTUALITY

Attachment behaviours were explored using mean scores derived from the BASQ. Sensitive responding and mutuality scales from the CARP-A were explored at T1.

8.3.1. Attachment

Attachment scores were explored descriptively and for parametric assumptions before group differences were analysed.

8.3.1.1. Descriptive Statistics

Table 23 reports the means scores for the children with autism and neurotypical controls on the complete BASQ. Means were calculated based on the total score by the number of items the child scored at least one or above on. Controls scored higher overall than children autism and the range in their scores was smaller than the autism group.

Table 23: Descriptive statistics for T1 attachment scores

	Mean	SD	Min.	Max.
Autism (n = 49)	4.84	.95	2.14	6.67
Controls (n = 44)	6.34	.56	4.80	7.00

8.3.1.2. Data Preparation

An exploratory analysis was conducted on the items included in the BASQ. The first issue was to address whether there were any differences in the scoring of the items and if any items had a disproportional number of zero responses (indicating “not enough information”).

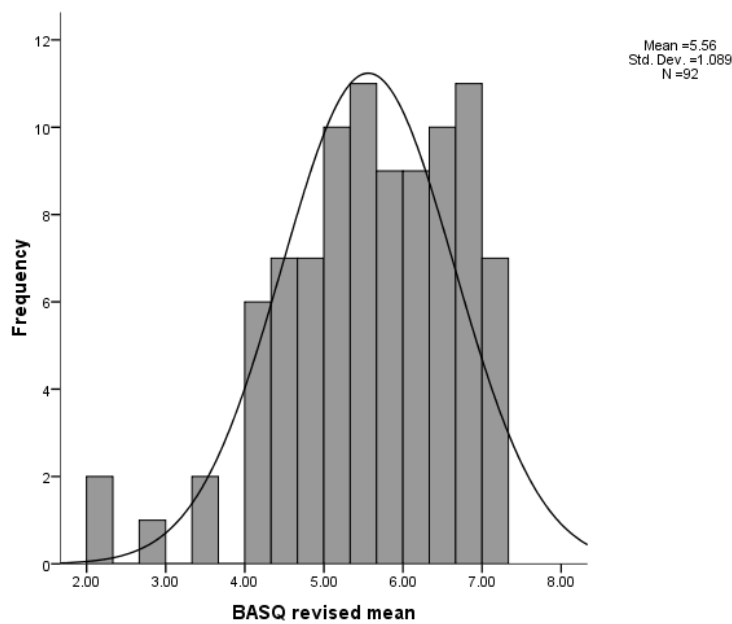
The mean number of items scored was 6.70 out of a possible eight. The lowest number of responses was four. Nearly a third (28.9%) of children scored on all eight items. A further quarter (25.8%) scored on seven items and 32% scored on six items.

Over two thirds (68.9%) of control children did not score on item one ("If held in mother's arms, child stops crying and quickly recovers after being frightened or upset"). Nearly half (48.1%) of the children with autism also failed to score on this item. It was assumed that this large percentage in controls could in part be attributable to the research assessments being conducted in the child's home environment as it is thought that the child will be more relaxed and therefore not react to a new person. It is acknowledged that many of the children in both the autism and control group were older than the age of children held by their caregiver as a form of comfort; automatically rendering scoring on this item unsuitable. Problems with affect expression are also an associated feature of autism (Hobson, 1986); therefore the child may not seek comfort or contact with their caregiver in situations of distress and children with autism can become inverted or resistant to being held.

The decision was made to exclude item one, producing a mean score based on seven items. Nearly half (45.4%) of all subjects received a score on all seven items. A further 39.2% scored on six items.

Further exploratory analysis was conducted to ensure the BASQ data had a normal distribution. Whilst the figure three displays a slight positive skew in the data, the skewness and kurtosis values were not greatly above zero and within the range of +1 and -1 (skewness = -.811; kurtosis = .701). Therefore revised mean scores were used during the T1 analysis.

Figure 3: Histogram of mean attachment scores at T1



8.3.1.3 Analysis of Between-Group Differences

Between group differences in mean attachment scores were analysed using an ANCOVA, controlling for chronological age and IMD score. The control group scored significantly higher than the autism group ($F = 32.61$, $p < .01$) and this difference was independent of both SES and age.

8.3.2. Sensitivity Responding and Mutuality

Mean scores for sensitive responding and mutuality on the CARP-A were explored in the same way as attachment scores.

8.3.2.1 Descriptive Statistics

As shown below in table 24; the control group scored higher on both sensitive responding and mutuality on the CARP-A. Scores were similar for sensitive responding.

Table 24: Mean CARP-A scores at T1

	Sensitive Responding		Mutuality	
	Mean	SD	Mean	SD
Autism group (n = 49)	4.45	1.02	3.78	1.21
Control group (n = 44)	4.95	1.01	4.82	1.06

8.3.2.2 Data Preparation

The two scales of sensitive responding and mutuality were explored to ensure parametric assumptions were met. Figures four and five demonstrate the normal distribution of data for sensitive responding and mutuality. This was confirmed by small skewness and kurtosis values (sensitive responding: skewness = $-.281$; kurtosis = $-.368$; mutuality: skewness = $.152$; kurtosis = $-.897$).

Figure 4: Histogram of mean sensitive responding scores at T1

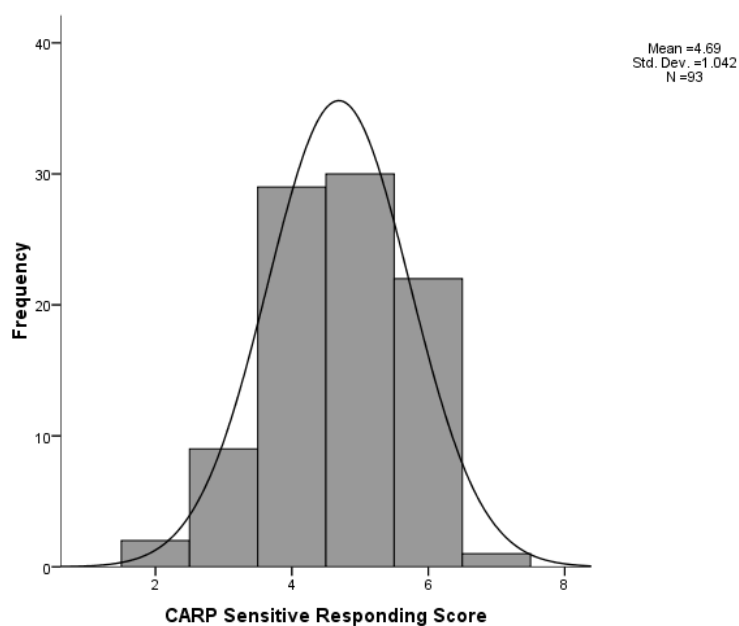
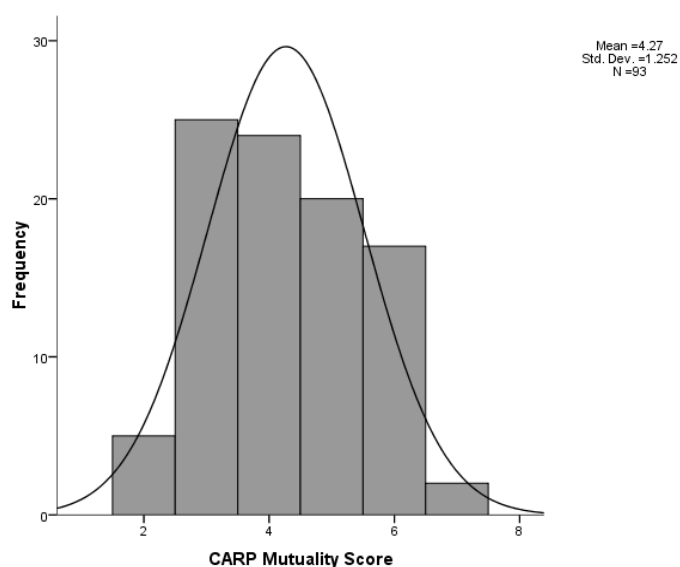


Figure 5: Histogram of mean mutuality scores at T1



8.3.2.3. Analysis of Between-Group Differences

The autism and control group had a similar distribution of scores; ranging from two to seven. Despite the similar means on the sensitive responding scale (autism = 4.45, controls = 4.95), this difference was significant when controlling for chronological age and SES. ($F = 5.48$, $p = .02$). The control group also scored more highly on the mutuality scale (autism = 3.78, controls = 4.82). This difference was significant ($F = 15.92$, $p < .01$), independent of possible covariates.

8.3.3 Predicting T1 Attachment

Analysis explored what variables correlated and predicted attachment scores at T1. These variables were aspects of child development and attachment-related constructs.

8.3.3.1 Univariate Analysis

Partial correlations were conducted between attachment, sensitive responding and mutuality; controlling for group. The univariate analysis explored the association with potential confounds and predictive variables. These included language, non-verbal development, and ADOS score in the autism group. Chronological age and IMD score were not entered as these did not co-vary in section 8.3.2.3.

Mean attachment scores were associated with both sensitive responding ($r = .24$, $p = .02$) and mutuality ($r = .30$, $p < .01$). These associations were positive. Attachment did not associate with ADOS scores or non-verbal scores but did relate positively to language scores ($r = .24$, $p = .02$).

Sensitive responding was significantly and highly correlated with mutuality scores ($r = .69$, $p < .01$).

8.3.3.2 Multivariate Analysis

The robustness of sensitive responding and mutuality in predicting attachment was assessed. Simple linear regressions were conducted first for sensitive

responding and mutuality before entering other possible predicting variables into the analysis.

As shown in table 25, sensitive responding accounted for 11.6% of the variance in attachment scores and visa versa. Mutuality was a stronger predictor accounting for 23.6%. Mutuality and sensitive responding both accounted for 49.9% of each others variance. Further multivariate analysis was conducted to see how the total variance was explained by these constructs with the inclusion of other variables.

Table 25: Summary of the multivariate analysis for attachment, sensitive responding and mutuality at T1

Dependent Variable	Variable Entered	R	R ²
Attachment	Sensitive Responding	.341	.116
Attachment	Mutuality	.438	.236
Sensitive Responding	Attachment	.341	.116
Sensitive Responding	Mutuality	.706	.499
Mutuality	Attachment	.438	.236
Mutuality	Sensitive Responding	.706	.499

Attachment was entered as the dependent variable, with group entered in the first step. This was followed by language and attached-related variables.

Group accounted for 48.1% of the variance in attachment scores. This was increased to 51.2% with the inclusion of language and 53.9% with sensitive responding and mutuality.

Table 26: Summary of the multivariate analysis predicting T1 attachment scores

Model	Variables Entered	R	R ²
1	Group	.693	.481
2	Language	.716	.512
3	Sensitive Responding Mutuality	.734	.539

As reported in table 27, group was a significant predictor of attachment scores in all models (1: $t = 9.12$, $p < .01$; 2: $t = 8.00$, $p < .01$; 3: $t = 7.15$, $p < .01$).

Sensitive responding and mutuality were not individually significant and language was significant only in model two ($t = 2.41$, $p = .018$).

Table 27: Coefficients for multiple regression analysis predicting T1 attachment scores

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.84	.11		42.52	.000
	Group (autism or controls)	1.50	.16	.70	9.13	.000
2	(Constant)	4.52	.17		26.09	.000
	Group (autism or controls)	1.36	.17	.63	8.00	.000
	Language	.02	.01	.19	2.41	.018
3	(Constant)	3.88	.37		10.56	.000
	Group (autism or controls)	1.25	.17	.58	7.15	.000
	Language	.01	.01	.11	1.35	.181
	Sensitive Responding	.06	.11	.06	.59	.55
	Mutuality	.12	.10	.14	1.19	.27

To summarise, differences were found in ratings of attachment, sensitive responding and mutuality all in the direction of the neurotypical controls. Attachment related positively to sensitive responding, mutuality and language, however only group predicted attachment differences accounting for nearly 50% of the variance.

8.4. PLAY AND ATTACHMENT AT T1

The relationship between play differences, attachment and attachment-related variables, was explored in section 8.1 and 8.2. Findings indicated that only mutuality scores associated with child play; forming a negative association with simple exploratory behaviours ($r = -.28$, $p = .01$) and a positive one with advanced functional play ($r = .34$, $p < .01$). These relationships did not predict child play differences.

Only caregiver cause and effect play associated with any of the attachment variables, relating negatively to sensitive responding ($r = -.28$, $p < .01$). This variable was the only predictor in the multivariate analysis reported in section 8.2.3.2.

8.5. SUMMARY OF T1 RESULTS

This chapter firstly explored group differences between the autism and control group on child play complexity. Two differences were found; simple exploratory play was higher in children with autism and advanced functional play was reduced in this group.

Analysis then focused on the variables that predicted these differences. Univariate analysis found that simple exploratory play associated with mutuality but not attachment or sensitive responding. Language, non-verbal development and chronological age also associated with simple exploratory play. Multivariate analysis indicated that whilst group differences were found, these only accounted for 1.5% of the total variance in simple exploratory play. Group, age, non-verbal development, language, advanced functional play and mutuality together accounted for 29.5% of the variance but no variable was individually significant.

Child advanced functional play associated with language, non-verbal development and chronological age. Mutuality also correlated with this form of play; however, attachment and sensitive responding did not. Multivariate analysis revealed that language and age were the most significant predictors of advanced functional play at T1, irrespective of group.

Differences in caregiver play behaviours were explored. Three between group differences were found; cause and effect, simple functional and symbolic.

Caregiver cause and effect play associated negatively with all child developmental variables. Sensitive responding related negatively to cause and effect play. In the regression analysis a combination of group, chronological age, non-verbal development, child simple exploratory play, child simple functional play, caregiver advanced functional play and sensitive responding accounted for 21.5% of the variance. Sensitive responding was the only individual predictor.

Caregiver simple functional and symbolic play did not associate with any of the child developmental or attachment-related variables. Simple functional play associated with child cause and effect play, but caregiver symbolic play did not

relate to any of the child play variables. Caregiver simple functional play was explored using a multivariate analysis. Group accounted for nearly 28% of the total variance. Child cause and effect play accounted for an additional 10%. These variables were both individually significant. Group only accounted for 9.3% of the variance in caregiver symbolic play at T1.

Differences between the autism and control groups on attachment and attachment related variables were evident. All variables produced significant group differences, with the control group scoring higher. Univariate analysis confirmed the inter-relation between the attachment variables and child language. Attachment scores were strongly predicted by clinical group; accounting for 48.1% of the variance. Attachment did not relate to any child or caregiver play variables.

Chapter nine will examine the play complexity of caregivers and children at T2 in the same way as this present chapter.

CHAPTER 9: TIME TWO RESULTS

Both child and caregiver play complexity differences were examined in the same way as in chapter eight. Any group differences were then analysed in relation to possible predicting variables.

9.1 CHILD PLAY COMPLEXITY

Child play behaviours were explored at T2. As in section 8.1, the six levels of play complexity were explored as well as the time children spent not actively engaged in play. These behaviours were analysed for between group differences before exploring what variables predicted any differences found.

9.1.1. Descriptive Statistics

Table 28 displays the mean percentage of time the children in both groups spent engaged in the different play complexities at T2.

Table 28: Mean percentage of time children with and without autism spent engaged in different play complexities at T2

Percentage of time	Autism Group (n = 49)	Control Group (n = 44)
Simple Exploratory	8.77 (9.44)	4.24 (8.00)
Cause and Effect	22.61 (20.66)	31.96 (26.13)
Game and Bubble	7.74 (14.08)	.58 (2.69)
Simple Functional	20.09 (21.03)	23.84 (20.50)
Advanced Functional	11.04 (25.25)	19.28 (24.14)
Symbolic	1.46 (4.31)	1.28 (3.47)
No Play	28.44 (17.15)	18.75 (12.99)

The control group spent more time engaged in cause and effect play (31.96% compared to 22.61%) and advanced functional play (19.28% compared to 11.04%). The autism group spent more time not actively playing (28.44% compared to 18.75%) and engaged in game and bubble play at T2 (7.74% compared to 0.58%).

9.1.2 Analysis of Between-Group Differences

The child play T2 data was prepared in the same way as T1. A series of ANCOVAs were conducted to explore any group differences between the autism and control groups controlling for chronological age and IMD scores at T1. Four significant differences were found; simple exploratory play ($F = 5.87$, $p = .01$), game and bubble play ($F = 6.22$, $p = .01$) and the time spent not playing ($F = 9.05$, $p < .01$) all in the direction of the autism group. Advanced functional play was higher in the controls ($F = 16.19$, $p < .01$); however, age significant effect on the difference found ($F = 15.79$, $p < .01$). The difference remained after controlling for this variable. Cause and effect, simple functional and symbolic play were grouped together as the T2 child play reference point.

The four variables were then entered into paired sample t-tests with the T2 reference point to ensure they were significantly different. These are reported in table 29.

Table 29: Paired sample t-tests between T2 child play complexity and T2 reference point

	Mean	Std. deviation	t	df	Sig (2-tailed)
T2 Simple Exploratory - T2 Reference	6.63 50.28	9.04 25.55	-14.52	92	.00
T2 Game & Bubble - T2 Reference	4.35 50.28	10.94 25.55	-14.32	92	.00
T2 Advanced Functional - T2 Reference	14.94 50.28	24.94 25.55	-7.57	92	.00
T2 No Play - T2 Reference	23.83 50.28	16.00 25.55	-7.41	92	.00

All the variables were considered statistically different to the reference point; therefore these variables were transformed using the transformation detailed in section 7.5.1 and Appendix D and utilised throughout the T1 analysis. Further ANCOVAs were conducted to ensure the transformed variables produced the same group differences. All variables remained significantly different following the transformation.

9.1.3 Predicting T2 Child Play Complexity Differences

The factors which contribute to the between group differences found in section 9.1.2 were explored. The associations between all T2 play variables and T1 language were explored first.

9.1.3.1. Play and Language Associations

Partial correlations were conducted to see how play and language related at T2, controlling for group. Similar findings were evident as at T1; simple exploratory play related negatively to language ($r = -.23$, $p = .025$). This was not specific to receptive or expressive abilities. Simple functional play also negatively related to language ($r = -.33$, $p < .01$). Again the association was not specific to expressive or receptive abilities. This was the same for advanced functional play; however, this association was positive and lower than the T1 association ($r = .34$, $p < .01$). Symbolic produced a much higher association with language at T2 than T1 and was no longer specific to receptive language ($r = .34$, $p < .01$). The time children spent not playing also related to language ($r = -.34$, $p < .01$). This association was negative and, unlike T1, was no longer specific to expressive abilities.

9.1.3.2. Univariate Analysis

Partial correlations were conducted between the play variables that produced a between group difference at T2 and possible predictors; controlling for group. Possible predictors were based on the hypotheses outlined in chapter five.

Only associations were significant to at least 0.01 were accepted and used in the multivariate analysis in order to maintain statistical power and avoid the acceptance of false positives.

Simple exploratory play associated negatively with T1 non-verbal development ($r = -.26$, $p = .01$), receptive ($r = -.26$, $p = .01$) and expressive language ($r = -.27$, $p < .01$). Game and bubble play approached significance with both T1 receptive ($r = -.23$, $p = .02$) and expressive language ($r = -.22$, $p = .03$).

Advanced functional play was positively associated with child chronological age ($r = .36, p < .01$), T1 non-verbal development ($r = .51, p < .01$), T1 expressive ($r = .61, p < .01$) and T1 receptive language ($r = .59, p < .01$).

Mutuality was positively related to the time spent engaged in advanced functional play ($r = .36, p < .01$).

The time children spent not engaged in play was negatively associated to T1 non-verbal development ($r = -.37, p < .01$), expressive ($r = -.39, p < .01$) and receptive language ($r = -.36, p < .01$). ADOS scores approached significance with the time children with autism spent not playing at T2 ($r = .33, p = .02$).

The associations between child and caregiver play were then explored; looking at both current and longitudinal relationships. Child simple exploratory play did not relate to any caregiver play variables. Child game and bubble play was associated with both T1 ($r = .28, p < .01$) and T2 caregiver game and bubble play ($r = .75, p < .01$). In addition, caregiver advanced functional play at T1 was inversely related to child game and bubble play ($r = .27, p = .01$).

Child advanced functional play was related to both T2 ($r = .56, p < .01$) and T1 ($r = .29, p < .01$) caregiver advanced functional play. T2 caregiver cause and effect was inversely related to child advanced functional play ($r = -.28, p < .01$) whereas T2 caregiver symbolic play was positively related ($r = .26, p = .01$).

The time child spent not engaged in play associated with both T1 caregiver game and bubble play ($r = .27, p = .01$) and advanced functional play ($r = -.35, p < .01$).

The predictive significance of these associations was explored using multivariate analysis. Language was combined as the relationships found were not specific to either expressive or receptive abilities.

9.1.3.3 Multivariate Analysis

Four separate multivariate analyses were conducted based on the variables which associated either positively or negatively with T2 group differences.

Simple exploratory play was entered as the first dependent variable. Group was entered in model one, followed by T1 non-verbal development and language.

Table 30: Summary of the multivariate analysis predicting T2 simple exploratory play

Model	R	R ²
Group	.328	.108
Non-verbal development	.418	.172
Language		

Group accounted for 10.8% of the variance in the time child spent engaged in simple exploratory play. This increased to 17.2% with the inclusion of non-verbal scores and language. The coefficients of the regression analysis are reported in table 31.

Table 31: Coefficients for multiple regression analysis predicting T2 simple exploratory play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.78	.15		11.58	.000
	Group (autism or controls)	-.74	.22	-.33	-3.31	.001
2	(Constant)	2.50	.51		4.90	.000
	Group (autism or controls)	-.58	.24	-.26	-2.44	.017
	Non-verbal development	-.01	.03	-.09	-.56	.577
	Language	-.02	.02	-.18	-.99	.322

Group was the only significant predictor of T2 simple exploratory play. However its significance reduced with the inclusion of additional variables in model two ($t = -2.43$, $p = .017$).

Game and bubble play at T2 was then entered into a multivariate analysis. Group was entered in model one, followed by T1 and T2 caregiver game and bubble play and T1 caregiver advanced functional play.

Group accounted for 21.3% of the variance in T2 game and bubble play; this increased to 66.7% with the inclusion of caregiver play variables.

Table 32: Summary of the multivariate analysis predicting T2 game and bubble play

Model	R	R ²
Group	.462	.213
T1 Caregiver Game & Bubble	.817	.667
T1 Caregiver Ad. Functional		
T2 Caregiver Game & Bubble		

As reported in table 33, group was a significant individual predictor in the model one ($t = -4.97$, $p < .01$). Its significance was reduced but still to the 0.01 level in model two ($t = -2.56$, $p = .01$). Caregiver game and bubble play at T2 was the strongest individual predictor ($t = 9.69$, $p < .01$).

Table 33: Coefficients for multiple regression analysis predicting T2 game and bubble play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.24	.15		8.29	.000
	Group (autism or controls)	-1.08	.22	-.46	-4.97	.000
2	(Constant)	.52	.15		3.47	.001
	Group (autism or controls)	-.41	.16	-.17	-2.57	.012
	T1 Caregiver Game & Bubble	.03	.07	.03	.497	.620
	T1 Caregiver Ad. Functional	-.01	.01	-.09	-1.50	.137
	T2 Caregiver Game & Bubble	.74	.07	.69	9.69	.000

Next, child advanced functional play was entered into a multivariate analysis. Group was entered first; followed by T1 child developmental variables. Mutuality was entered in model three followed by T1 and T2 caregiver advanced functional play and T2 cause and effect and symbolic play. Due to the number of variables in the regression analysis, only those with a p value of at least 0.01 were accepted.

Group only accounted for 8.3% of the variance. The inclusion of T1 developmental variables increased this to 43.8%. Mutuality increased the predictive value of the model to 44.3%. The inclusion of the caregiver play variables increased this to 58.5%.

Table 34: Summary of the multivariate analysis predicting T2 advanced functional play

Model	R	R ²
Group	.288	.083
Chronological age	.662	.438
Non-verbal development		
Language		
Mutuality	.665	.443
T1 Caregiver Ad. Functional	.765	.585
T2 Caregiver C & E		
T2 Caregiver Ad. Functional		
T2 Caregiver Symbolic		

Table 35: Coefficients for multiple regression analysis predicting T2 advanced functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.87	.23		3.78	.000
	Group (autism or controls)	.96	.34	.29	2.87	.005
2	(Constant)	-.77	.82		-.93	.352
	Group (autism or controls)	.24	.52	.07	.46	.643
	Chronological age at T1	.00	.02	-.01	-.07	.942
	Non verbal score	.00	.03	.00	.03	.976
	Language	.10	.02	.63	4.20	.000
3	(Constant)	-1.21	.98		-1.24	.22
	Group (autism or controls)	.19	.53	.06	.36	.719
	Chronological age at T1	.00	.02	-.00	-.04	.968
	Non verbal score	.01	.04	.03	.18	.858
	Language	.09	.03	.57	3.51	.001
	Mutuality	.11	.13	.08	.84	.40
4	(Constant)	-1.84	.93		-1.97	.052
	Group (autism or controls)	.59	.48	.17	1.21	.227
	Chronological age at T1	.02	.02	.14	.99	.325
	Non verbal score	-.01	.03	-.03	-.23	.819
	Language	.07	.02	.42	2.75	.007
	Mutuality	.12	.12	.09	1.00	.318
	T1 Caregiver Ad. Functional	-.00	.01	-.01	-.09	.931
	T2 Caregiver Cause & Effect	-.04	.02	-.16	-2.11	.038
	T2 Caregiver Ad. Functional	.40	.11	.30	3.56	.001
	T2 Caregiver Symbolic	.27	.23	.09	1.16	.250

As reported in table 35, group was significant when entered alone ($t = 3.78$, $p < .01$). However, when the additional variables were entered; this was no longer significant and the only individual predictor was language both in model two ($t = 4.20$, $p < .01$) and model three ($t = 3.51$, $p < .01$). In model three, a combination of child language ($t = 2.75$, $p < .01$) and T2 caregiver advanced functional play ($t = 3.56$, $p < .01$) contributed to the variance.

The time children spent not engaged in play was entered into a regression analysis. Group was entered first; followed by language and non-verbal development. In model three caregiver game and bubble and advanced functional play were included.

Group explained 5.7% of the variance. This increased to 20.2% with the inclusion of language and non-verbal development. T1 caregiver play variables increased this to 28%.

Table 36: Summary of the multivariate analysis predicting T2 no play

Model	R	R ²
Group	.239	.057
Non-verbal development	.450	.202
Language		
T1 Caregiver Game & Bubble	.530	.280
T1 Caregiver Ad. Functional		

Group was only significant in model one ($t = -2.35$, $p = .02$). The combination of variables in model two accounted for the variance explained collectively, but no variable accounted individually. In model three, only T1 caregiver game and bubble play individually accounted for variance ($t = 2.24$, $p = .03$).

Table 37: Coefficients for multiple regression analysis predicting T2 no play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.13	.12		25.95	.000
	Group (autism or controls)	-.41	.17	-.24	-2.35	.021
2	(Constant)	4.02	.38		10.49	.000
	Group (autism or controls)	-.24	.18	-.14	-1.36	.178
	Non verbal score	-.02	.02	-.17	-1.04	.302
	Language	-.02	.01	-.24	-1.34	.182
3	(Constant)	3.65	.39		9.43	.000
	Group (autism or controls)	-.17	.18	-.10	-.96	.341
	Non verbal score	-.01	.02	-.10	-.62	.533
	Language	-.02	.01	-.20	-1.20	.234
	T1 Caregiver Game & Bubble	.15	.07	.21	2.24	.028
	T1 Caregiver Ad. Functional	-.01	.01	-.18	-1.72	.088

To summarise, child play variables produced four group differences at T2; simple exploratory and game and bubble play were higher in the children with

autism, as was the time spent not playing. Neurotypical controls engaged in more advanced functional play.

The difference in simple exploratory play was predicted by a combination of developmental variables and group, but did not associate with any caregiver play variables. Game and bubble play associated with language abilities however T2 caregiver game and bubble play predicted the group differences found. Advanced functional play associated with T1 child developmental variables and T2 caregiver advanced functional play. This variable predicted the differences found. The time children spent not playing was explained by a combination of group and developmental factors.

9.2. CAREGIVER PLAY COMPLEXITY

The percentage of time caregivers in both groups spent engaged in the different play behaviours was explored at T2. The aim was to see if any group differences were present and what variables predicted any differences found.

9.2.1 Descriptive Statistics

The percentage of time caregivers engaged in the different play complexities is reported in table 38.

Table 38: Mean percentage of time caregivers spent engaged in different play complexities at T2

Percentage of time	Autism Group (n = 49)	Control Group (n = 44)
Simple Exploratory	.14 (.87)	.05 (.32)
Cause and Effect	4.21 (5.38)	3.21 (7.19)
Game and Bubble	6.33 (11.60)	.38 (1.61)
Simple Functional	2.78 (3.97)	.82 (2.54)
Advanced Functional	10.76 (15.35)	11.85 (15.04)
Symbolic	.14 (.55)	1.22 (3.89)
Facilitating Play	34.52 (15.44)	47.46 (18.41)
No Play	41.10 (14.00)	34.94 (16.14)

The distribution of scores was relatively similar between the two groups. Caregivers of a child with autism spent more time engaged in game and bubble play (6.33% compared to 0.38%). Caregivers of the neurotypical

controls spent more time facilitating (47.46% compared to 34.52%) and less time not playing (34.94% compared to 41.10%).

9.2.2. Analysis of Between-Group Differences

The data at T2 was prepared in the same way as T1. Group differences were established. Following this insignificant variables were grouped together to create a reference point.

ANCOVAs were conducted; controlling for child chronological age and IMD score. Four differences were found; caregivers in the autism group spent more time engaged in game and bubble play at T2 ($F = 11.48$, $p < .01$). They also spent more time playing to a simple functional level ($F = 5.62$, $p = .02$). Control caregivers engaged in more advanced functional play ($F = 4.64$, $p = .03$); however age also had a significant effect on the difference ($F = 5.69$, $p = .02$). The difference remained when controlling for this variable. They also spent more time engaged in symbolic play ($F = 5.72$, $p = .02$). A T2 reference point was created using the scores obtained for simple exploratory play, cause and effect play, facilitating play and the time spent not playing.

Table 39: Paired sample T-tests between T2 caregiver play complexity and T2 reference point

	Mean	Std. deviation	t	df	Sig (2- tailed)
T2 Game & Bubble - T2 Caregiver Reference	3.51 82.66	8.93 16.61	-34.88	92	.000
T2 Simple Func. - T2 Caregiver Reference	1.85 82.66	3.49 16.61	-45.28	92	.000
T2 Advanced Func. - T2 Caregiver Reference	11.27 82.66	15.13 16.61	-22.79	92	.000
T2 Symbolic - T2 Caregiver Reference	.65 82.66	2.74 16.61	-45.82	92	.000

Caregiver game and bubble play, simple functional play, advanced functional play and symbolic play were entered into a series of paired sample t-tests against the reference point to ensure they were all significantly different before they were transformed.

All variables were significantly different to the reference point therefore they were transformed based on the technique implemented throughout the analysis and reported on section 7.5.1 and Appendix D. Between group differences were re-tested to ensure the transformed variables still produced significant differences.

Game and bubble play, simple functional play and symbolic play all remained highly significant (all greater than .01). However caregiver advanced functional play no longer produced between group differences therefore this was not included further in the analysis.

9.2.3 Predicting T2 Caregiver Play Complexity Differences

The following analysis was conducted to derive what variables predicted caregiver play differences at T2.

9.2.3.1 Univariate Analysis

Caregiver game and bubble play, simple functional play and symbolic play were entered into a correlation analysis; controlling for group. IMD score and child chronological age were excluded from the analysis as did not associate the three caregiver variables of interest. All accepted associations reached significance to at least 0.01.

Caregiver game and bubble play associated negatively with T1 child non-verbal development ($r = -.25$, $p = .01$), receptive ($r = -.33$, $p < .01$) and expressive language ($r = -.29$, $p < .01$). In the autism group, ADOS scores did not associate with caregiver game and bubble play. Attachment, sensitive responding and mutuality also failed to associate.

Simple functional play did not associate to the .01 level with any of the developmental variables measures at T1. Caregiver symbolic play significantly associated with T1 child non-verbal development ($r = .26$, $p = .01$).

Further partial correlations were then conducted to explore the association between T2 caregiver and child play; caregiver game and bubble play associated with concurrent child game and bubble play ($r = .75$, $p < .01$). Caregiver simple functional play associated negatively with child advanced

functional play ($r = -.25$, $p = .01$). Caregiver symbolic play associated with child symbolic play ($r = .36$, $p < .01$) and child advanced functional play ($r = .26$, $p < .01$). The predictive value of these associations will be explored in the following multivariate analysis.

9.2.3.2 Multivariate Analysis

Multivariate analyses were conducted for the caregiver play variables that produced between group differences at T2. Caregiver game and bubble play was explored first. Group was entered in model one; followed by child non-verbal development and language. Concurrent child game and bubble play was entered in model two.

Group accounted for 15.9% of the total variance in caregiver game and bubble play at T2. This was increased to 24.8% with the inclusion of T1 child non-verbal and language scores. The inclusion of T2 child game and bubble play increased this further to 65.8%.

Table 40: Summary of the multivariate analysis predicting T2 caregiver game and bubble play

Model	R	R ²
Group	.398	.159
Non-verbal development	.498	.248
Language		
T2 Child Game & Bubble	.811	.658

As reported in table 41, group was a significant individual predictor of caregiver game and bubble play in the first two models (model one: $t = -4.14$, $p < .01$; model two: $t = -2.86$, $p < .01$). Language and non-verbal development were not significant predictors. T2 child game and bubble play was a significant predictor in model three ($t = 10.29$, $p < .01$).

Table 41: Coefficients for multiple regression analysis predicting T2 caregiver game and bubble play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.02	.14		7.00	.000
	Group (autism or controls)	-.88	.21	-.40	-4.14	.000
2	(Constant)	1.50	.47		3.16	.002
	Group (autism or controls)	-.64	.22	-.30	-2.87	.005
	Non verbal score	.00	.02	.03	.17	.867
	Language	-.04	.02	-.34	-1.97	.051
3	(Constant)	.67	.33		2.01	.047
	Group (autism or controls)	-.04	.16	-.02	-.23	.815
	Non verbal score	-.01	.02	-.09	-.83	.410
	Language	-.01	.01	-.08	-.69	.494
	T2 Child Game & Bubble	.70	.07	.74	10.28	.000

Caregiver simple functional play at T2 was entered into a regression analysis; group was entered as a predictor, followed by T2 child advanced functional play.

Table 42: Summary of the multivariate analysis predicting T2 caregiver simple functional play

Model	R	R ²
Group	.412	.170
T2 Child Ad. Functional	.471	.222

Group predicted 17% of the variance in caregiver simple functional play at T2. The inclusion of child advanced functional play at T2 increased this to 22.2%.

Table 43: Coefficients for multiple regression analysis predicting T2 caregiver simple functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.94	.11		8.79	.000
	Group (autism or controls)	-.67	.15	-.41	-4.31	.000
2	(Constant)	1.05	.11		9.31	.000
	Group (autism or controls)	-.56	.16	-.34	-3.53	.001
	T2 Child Ad. Functional	-.12	.05	-.24	-2.47	.016

Group was a significant predictor in both models (1: $t = -4.31$, $p < .01$; 2: $t = -3.53$, $p < .01$). Child advanced functional play at T2 also predicted caregiver simple functional play ($t = -2.46$, $p = .016$).

Finally, caregiver symbolic play was explored. Group was entered first; followed by T1 child non-verbal development. Child advanced functional and symbolic play were entered in model three.

Table 44: Summary of the multivariate analysis predicting T2 caregiver symbolic play

Model	R	R ²
Group	.221	.049
Non-verbal development	.338	.114
T2 Child Ad. Functional	.462	.213
T2 Child Symbolic		

Group accounted for 4.9% of the variance in caregiver symbolic play at T2. Child non-verbal development increased this to 11.4%. All four variables accounted for 21.3% of the total variance.

Table 45: Coefficients for multiple regression analysis predicting T2 caregiver symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.08	.08		1.08	.282
	Group (autism or controls)	.25	.11	.22	2.16	.033
2	(Constant)	-.45	.22		-2.03	.045
	Group (autism or controls)	.21	.11	.19	1.92	.057
	Non verbal score	.02	.01	.26	2.58	.012
3	(Constant)	-.31	.23		-1.39	.169
	Group (autism or controls)	.20	.11	.18	1.82	.071
	Non verbal score	.01	.01	.15	1.34	.184
	T2 Child Ad. Functional	.03	.04	.10	.88	.383
	T2 Child Symbolic	.04	.01	.29	2.94	.004

Group status was only a significant predictor in model one ($t = 2.16$, $p = .03$). In model two, non-verbal development accounted for the variance in caregiver symbolic play ($t = 2.58$, $p = .01$). In the final model, only concurrent child symbolic play was an individual predictor of caregiver play ($t = 2.94$, $p < .01$).

Caregivers varied in three ways between the groups; caregivers of a child with autism spent more time engaged in game and bubble and simple functional play but less time in symbolic play. Game and bubble differences were predicted by the time children engaged in this form of play concurrently. Simple functional differences were explained by a combination of the presence

of autism in the children and the time children engaged in advanced functional play. Symbolic play associated with T1 non-verbal development and T2 child advanced functional and symbolic play. Only child symbolic play accounted for the variance.

9.3. PLAY AND ATTACHMENT AT T2

Throughout the T2 analysis, the relationships between child and caregiver play and attachment, sensitive responding and mutuality were explored. Of the four child play variables that produced a group difference, only advanced functional play associated with any of the attachment related variables; mutuality scores positively associated with the percentage of time children engaged in this form of play; however, did not predict the difference found.

9.4. SUMMARY OF T2 RESULTS

This chapter explored whether the play of children autism still differed at T2. Similar differences were found; children with autism spent more time engaged in simple exploratory play and game and bubble play. They also spent more time not actively engaged in play. Children in the control group spent more time playing to an advanced functional level.

Simple exploratory play related to T1 developmental variables; the combination of these variables accounted for 17.2% of the variance. Game and bubble play did not associate with any developmental or attachment variables. Previous and concurrent caregiver game and bubble play related to child play of this kind at T2. Group and T2 caregiver game and bubble play uniquely contributed to the variance. Advanced functional play related to the T1 developmental variables as well as mutuality. Language and concurrent caregiver advanced functional play together accounted for the variance.

Three caregiver play differences were found; caregivers in the autism group spent more time engaged in game and bubble and simple functional play, whereas caregivers in the control group demonstrated more symbolic play.

Caregiver game and bubble play differences were best predicted by the time the child spent engaged in this form of play concurrently. Simple functional

differences were predicted by group and the time the child spent engaged in advanced functional play at T2; this association was negative. The time children engaged in symbolic play at T2 accounted for the variance in caregiver play of this kind.

CHAPTER 10: TIME THREE RESULTS

Child and caregiver play complexity differences were examined in the same way as in chapters eight and nine; child group differences in play complexity were explored first in order to see whether play impairments in autism found in the previous chapters persisted. The factors that contribute to any differences were explored. Caregiver play differences were also examined at T3 to see if the pattern of differences found in previous chapters remained. Attachment at T3 was explored to see if the between group differences found at T1 persisted.

10.1 CHILD PLAY COMPLEXITY

As in chapters eight and nine, the six levels of play complexity were explored. Group differences were analysed and the variables that contributed to the differences found were explored.

10.1.2 Descriptive Statistics

Table 46 displays the mean percentage of time children in the autism and control group spent playing in the different play complexities at T3.

Table 46: Mean percentage of time children with and without autism spent engaged in different play complexities at T3

Percentage of time	Autism Group (n = 49)	Control group (n = 44)
Simple Exploratory	9.04 (12.59)	1.00 (2.55)
Cause and Effect	26.13 (24.34)	26.49 (27.37)
Game and Bubble	4.66 (9.21)	2.61 (7.59)
Simple Functional	20.83 (22.72)	20.43 (21.21)
Advanced Functional	12.43 (25.78)	30.58 (7.62)
Symbolic	0.28 (1.21)	3.34 (7.62)
No Play	26.60 (18.28)	15.64 (11.18)

The children with autism spent more time engaged in simple exploratory play (9.04% compared to 1.00%). They also spent less time engaged in both advanced functional (12.43% compared to 30.58%) and symbolic play (0.28%

compared to 3.34%) at T3. The children with autism time spent more time not actively engaged in play (15.64% compared to 26.60%).

10.1.2 Analysis of Between-Group Differences

Group differences were analysed in a series of ANCOVAs; controlling for chronological age and IMD score. Simple exploratory play at T3 was significantly higher in the autism group ($F= 8.83$, $p < .01$). Despite similar mean percentages, the autism group spent more time engaged in simple functional play at T3 ($F= 12.99$, $p < .01$). Age also made a significant contribution to the group difference ($F= 21.12$, $p < .01$); however the difference held after controlling for this. The children in the control group spent more time engaged in advanced functional play ($F= 14.33$, $p < .01$); again age made a significant contribution to this difference but the group difference remained after controlling for this ($F= 4.56$, $p = .03$). The control children also engaged in more symbolic play ($F= 4.60$, $P = .03$) and less time not playing ($F= 5.57$, $p = .02$).

Cause and effect and game and bubble play were group together to create a T3 reference point (see section 7.5.1 for description). The five variables that produced between-group differences were then compared to the reference point.

Table 47: Paired sample t-tests between T3 play complexities and T3 reference point

	Mean	Std. Deviation	t	df	Sig (2-tailed)
T3 Simple Exploratory – T3 Reference	5.24 29.99	10.10 25.72	-8.26	92	.00
T3 Simple Functional – T3 Reference	20.64 29.99	21.90 25.72	-2.23	92	.02
T3 Advanced Functional – T3 Reference	21.02 29.99	26.91 25.72	-1.93	92	.05
T3 Symbolic – T3 Reference	1.73 29.99	5.50 25.72	-10.15	92	.00
T3 No Play – T3 Reference	21.41 29.99	16.22 25.72	-2.56	92	.01

All the variables were significantly different from the reference point; however, the difference between advanced functional play and the reference point was marginal therefore this will be approached with caution. The variables were transformed and used in the subsequent analysis.

Further ANCOVAs were conducted to ensure the transformed variables produced the between group differences originally found; the children with autism still produced more simple exploratory play ($F = 13.14$, $p < .01$) and simple functional play ($F = 16.75$, $p < .01$), however, age continued to make a contribution ($F = 21.90$, $p < .01$). The contribution of age will be explored in the univariate and multivariate analysis. The control group spent more time engaged in advanced functional play ($F = 15.73$, $p < .01$) and symbolic play ($F = 5.28$, $p = .02$) as well as less not actively engaged in play at T3 ($F = 5.59$, $p = .02$).

10.1.3. Predicting T3 Child Play Complexity Differences

The associations between the play variables that produced between group differences at T3 (simple exploratory, simple functional, advanced functional and symbolic) were analysed in relation to developmental variables, child play and caregiver play. Univariate analysis was conducted initially to see what variables associated with child play at T3. Associations that reached at least a significance of 0.01 level were entered into the multivariate analysis.

10.1.3.1 Play and Language Associations

The relationship between play and language was explored before looking specifically at variables that predicted the group differences found at T3. Simple exploratory play behaviours were negatively associated with language ($r = -.31$, $p < .01$). Simple functional also related negatively with language ($r = -.28$, $p < .01$). The time children spent not playing associated with language ($r = -.37$, $p < .01$). This association was also negative. Advanced functional play related positively with language abilities ($r = .59$, $p < .01$). All these associations were for language as a whole, not specific to expressive or receptive abilities.

10.1.3.2. Univariate Analysis

Partial correlations were conducted between the five play variables and possible predicting factors, controlling for group. These included T1 and T3 child developmental variables, previous child play and T2 and T3 caregiver play.

Firstly the associations between play at T3 and developmental variables were considered. These included T1 and T3 language, T1 non-verbal development and chronological age.

Simple exploratory play associated negatively with both expressive and receptive language at T1 and T3; all associations were negative and ranged between $-.31$ and $-.38$.

Simple functional play at T3 associated with both categories of language at both time points; these associations were negative and ranged from $-.27$ and $-.36$. Child age also correlated with simple functional play ($r = -.44$, $p < .01$). Advanced functional play was positively related to expressive and receptive language at T1 and T3; correlations ranged from $.29$ to $.42$. T1 non-verbal development also associated with this form of play ($r = .26$, $p = .01$).

Symbolic play at T3 did not relate to any of the developmental variables. The time children spent not playing at T3 was related negatively to both measures of language at T1 and T3 ($r = -.26$ to $-.36$). Expressive and receptive language were grouped together during the multivariate analysis as the associations were not specific to receptive or expressive abilities.

In the autism group, ADOS scores failed to associate with any of the play variables. T1 and T3 attachment did not correlate with any play variables. Sensitive responding and mutuality also failed to associate.

The analysis then explored the association with T1 and T2 child play; T3 simple exploratory play was positively associated with T1 ($r = .38$, $p < .01$) and T2 simple exploratory play ($r = .44$, $p < .01$). T2 advanced functional play negatively related to this form of play ($r = -.27$, $p = .01$).

T3 simple functional play was negatively related to T1 game and bubble play ($r = -.26$, $p = .01$) and positively related T2 simple functional play ($r = .39$, $p < .01$). Simple functional play also negatively related to T1 and T2 advanced functional play (T1: $r = -.29$, $p < .01$; T2: $r = -.40$, $p < .01$).

T3 advanced functional play was positively associated with its T1 and T2 equivalents (T1: $r = .37$, $p < .01$; T2: $r = .26$, $p = .01$). In addition T2 and T3 symbolic play associated with this form of play (T2: $r = .28$, $p < .01$; T3: $r = .36$, $p < .01$). T3 symbolic play only associated with T2 and T3 advanced functional play (T2: $r = .28$, $p < .01$; T3 : $r = .36$, $p < .01$).

The time children did not engage in play at T3 only associated with T3 simple exploratory ($r = .29$, $p < .01$) and simple functional play ($r = .29$, $p < .01$).

The analysis then explored how caregiver play at the three time points associated with child play at T3 exploring both concurrent and longitudinal associations; T3 simple exploratory play positively associated with T1 caregiver simple functional play ($r = .27$, $p = .01$) and the time caregivers spent not playing at T3 ($r = .31$, $p < .01$). T3 simple functional play inversely related to caregiver symbolic play at T2 ($r = -.26$, $p = .01$).

Child advanced functional play was positively associated with concurrent caregiver play of this kind ($r = .35$, $p < .01$) but inversely related to the time caregivers did not actively spend in play ($r = -.29$, $p < .01$).

T3 symbolic play positively related to caregivers symbolic play at both T2 ($r = .29$, $p < .01$) and T3 ($r = .64$, $p < .01$). The time children did not engage in play at T3 was negatively related to the time caregivers spent in advanced functional play at T3 ($r = -.40$, $p < .01$).

10.1.3.3 Multivariate Analysis

The associations reported in 10.1.3.2 were analysed to see how these relationships contributed to predicting the variance of the between group differences found. Only predictions that reached the level of 0.01 were accepted in the regression analysis. When both expressive and receptive language associated with play, mean language scores were used.

T3 simple exploratory play was explored first. Group was entered in model one; followed by T1 and T3 language. In model three, T1 and T3 child simple exploratory play were entered as well as T2 advanced functional play. In model four, T1 caregiver simple functional play and concurrent caregiver no play were entered. The models produced are reported in table 48.

Table 48: Summary of the multivariate analysis predicting T3 simple exploratory play

Model	R	R ²
Group	.469	.220
T1 Language	.567	.322
T3 Language		
T1 Child Simple Exploratory	.664	.441
T2 Child Simple Exploratory		
T2 Child Advanced Functional		
T1 Caregiver Simple Functional	.723	.523
T3 Caregiver No Play		

Group accounted for 22% of the variance in simple exploratory play. With language, this increased to 32.2%. Child play variables further contributed to the variance, increasing the total explained to 44.1% and caregiver play increased this to 52.3%.

Table 49: Coefficients for multiple regression analysis predicting T3 simple exploratory play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.49	.15		10.02	.000
	Group (autism or controls)	-1.10	.22	-.47	-5.07	.000
2	(Constant)	2.31	.27		8.36	.000
	Group (autism or controls)	-.48	.33	-.21	-1.46	.148
	T1 Language	.00	.03	.02	.09	.929
	T3 Language	-.04	.03	-.43	-1.50	.138
3	(Constant)	.51	.51		1.00	.321
	Group (autism or controls)	-.42	.30	-.18	-1.40	.168
	T1 Language	.01	.02	.09	.41	.679
	T3 Language	-.02	.02	-.27	-1.00	.317
	T1 Child Simple Exploratory	.14	.09	.15	1.57	.120
	T2 Child Simple Exploratory	.30	.09	.29	3.17	.002
	T2 Child Advanced Functional	-.05	.08	-.07	-.66	.508
4	(Constant)	-.04	.51		-.08	.936
	Group (autism or controls)	-.17	.32	-.07	-.54	.592
	T1 Language	.02	.02	.20	.93	.354
	T3 Language	-.03	.02	-.31	-1.67	.247
	T1 Child Simple Exploratory	.13	.08	.14	1.50	.137
	T2 Child Simple Exploratory	.33	.09	.32	3.51	.001

T2 Child Advanced Functional	-.01	.07	-.02	-.19	.844
T1 Caregiver Simple Functional	.27	.11	.23	2.47	.015
T3 Caregiver No Play	.01	.00	.17	2.05	.044

As reported in table 49, group was a significant predictor ($t = -5.07$, $p < .01$) in model one. In model three, T2 simple exploratory play accounted for the variance explained ($t=3.16$, $p < .01$). In the final model, both T2 child simple exploratory play ($t = 3.49$, $p < .01$) and T1 caregiver simple functional play jointly explained the variance ($t = 2.46$, $p = .01$).

Simple functional play was explored next; group was entered in model one. This accounted for 0.9% of the variance. Chronological age and T1 and T3 language increased this to 21.8%. 38.4% of the variance was explained with the inclusion of child play variables. T2 caregiver symbolic play was entered in the final model, increasing the variance to 39.4%.

Table 50: Summary of the multivariate analysis predicting T3 simple functional play

Model	R	R ²
Group	.095	.009
Age	.467	.218
T1 Language		
T3 Language		
T1 Child Game and Bubble	.619	.384
T2 Child Simple Functional		
T1 Child Advanced Functional		
T2 Child Advanced Functional		
T2 Caregiver Symbolic	.628	.394

Table 51: Coefficients for multiple regression analysis predicting T3 simple functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.25	.21		10.63	.000
	Group (autism or controls)	-.28	.31	-.09	-.91	.364
2	(Constant)	5.33	.85		6.29	.000
	Group (autism or controls)	-1.37	.60	-.47	-2.27	.025
	T1 Language	-.03	.04	-.17	-.63	.531
	T3 Language	.00	.04	.03	.11	.912
	Chronological Age	-.06	.02	-.54	-3.09	.003
3	(Constant)	5.07	.88		5.73	.000
	Group (autism or controls)	-1.59	.56	-.54	-2.83	.006

	T1 Language	.01	.04	.04	.16	.868
	T3 Language	.00	.04	.02	.05	.956
	Chronological Age	-.06	.02	-.57	-3.50	.001
	T1 Child Game & Bubble	-.04	.02	-.20	-2.14	.035
	T2 Child Simple Functional	.01	.01	.21	2.19	.031
	T1 Child Advanced Functional	.10	.15	.09	.70	.488
	T2 Child Advanced Functional	-.26	.11	-.30	-2.33	.022
4	(Constant)	4.88	.89		5.45	.000
	Group (autism or controls)	-1.49	.56	-.50	-2.63	.010
	T1 Language	.01	.04	.04	.15	.879
	T3 Language	.00	.04	.03	.11	.915
	Chronological Age	-.06	.02	-.55	-3.34	.001
	T1 Child Game & Bubble	-.03	.02	-.18	-1.88	.064
	T2 Child Simple Functional	.01	.01	.28	2.30	.024
	T1 Child Advanced Functional	.09	.15	.08	.62	.538
	T2 Child Advanced Functional	-.24	.11	-.27	-2.12	.037
	T2 Caregiver Symbolic	-.30	.24	-.11	-1.21	.230

As shown in table 51, in model one, group was not a significant predictor. With the inclusion of age and language, group approached significance ($t = -2.27$, $p = .02$). In model two, chronological age was the only significant predictor ($t = -3.09$, $p < .01$). In the remaining models, both group and age accounted for the variance in simple functional play (model three: group: $t = -2.80$, $p < .01$; age: $t = -3.50$, $p < .01$; model four: group: $t = -2.63$, $p = .01$; age: $t = -3.32$, $p < .01$)

Advanced functional play was then explored; group, T1 non-verbal development, T1 and T3 language, T1 and T2 advanced functional and T2 and T3 symbolic play and T3 caregiver play were all entered into the analysis.

Table 52: Summary of the multivariate analysis predicting T3 advanced functional play

Model	R	R ²
Group	.499	.249
T1 Non-Verbal Development	.617	.381
T1 Language		
T3 Language		
T1 Child Advanced Functional	.693	.480
T2 Child Advanced Functional		
T2 Child Symbolic		
T3 Child Symbolic		
T3 Caregiver Advanced Functional	.721	.519
T3 Caregiver No Play		

Group alone accounted for 24.9% of the variance in advanced functional play. This was a significant predictor in model one ($t = -5.49$, $p < .01$). The inclusion

of the various developmental variables increased this to 38.1%; however, no one individual variable accounted for the variance. Child play variables increased this further to 48%. However only T3 child symbolic play was individually significant ($t = 3.27$, $p < .01$). In model four, the inclusion of caregiver variables at T3 increased the variance accounted for to 51.9%. Again only T3 child symbolic play remained significant ($t = 3.24$, $p < .01$). The individual contributions and coefficients are reported in table 53.

Table 53: Coefficients for multiple regression analysis predicting T3 advanced functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.87	.21		4.06	.000
	Group (autism or controls)	1.72	.31	.50	5.49	.000
2	(Constant)	-.43	.73		-.59	.555
	Group (autism or controls)	.51	.47	.19	1.07	.286
	T1 Language	-.03	.05	-.14	-.53	.597
	T3 Language	.09	.04	.64	2.32	.023
	Non verbal score	-.01	.04	-.03	-.19	.849
3	(Constant)	.12	.72		.17	.866
	Group (autism or controls)	.44	.48	.13	.92	.359
	T1 Language	-.02	.05	-.12	-.44	.658
	T3 Language	.07	.04	-.49	1.73	.088
	Non verbal score	-.02	.03	-.08	-.55	.580
	T1 Child Advanced Functional	.33	.15	.26	2.15	.034
	T2 Child Advanced Functional	-.17	.12	-.16	-1.41	.162
	T2 Child Symbolic	.03	.04	.06	.71	.479
	T3 Child Symbolic	.63	.19	.30	3.27	.002
4	(Constant)	.87	.82		1.06	.291
	Group (autism or controls)	.71	.49	.21	1.46	.147
	T1 Language	-.03	.04	-.18	-.69	.492
	T3 Language	.05	.04	.37	1.30	.198
	Non verbal score	-.02	.03	-.08	-.57	.570
	T1 Child Advanced Functional	.41	.16	.32	2.61	.011
	T2 Child Advanced Functional	-.20	.12	-.20	-1.72	.089
	T2 Child Symbolic	.02	.04	.07	.86	.393
	T3 Child Symbolic	.61	.19	.29	3.24	.002
	T3 Caregiver Ad. Functional	.01	.01	.16	.165	.102
	T3 Caregiver No Play	-.01	.01	-.12	-1.40	.164

Symbolic play was explored to see which factors contributed to the variance. Group was entered first; this accounted for 10.3% of the variance. T2 and T3 advanced functional play increased the variance to 24.6%. The inclusion of T2 and T3 caregiver symbolic play accounted for 54.6% of the total variance.

Table 54: Summary of the multivariate analysis predicting T3 symbolic play

Model	R	R ²
Group	.322	.103
T2 Child Advanced Functional	.496	.246
T3 Child Advanced Functional		
T2 Caregiver Symbolic	.736	.542
T3 Caregiver Symbolic		

Group was a significant predictor ($t = 3.24$, $p < .01$) in model one. The time children spent engaged in advanced functional play at T3 contributed to the variance in both model two ($t = 3.05$, $p < .01$) and three ($t = 2.96$, $p < .01$). T3 caregiver symbolic play was a significant predictor in model three alongside T3 child advanced functional play ($t = 6.96$, $p < .01$). The individual contributions of variables are reported in table 55.

Table 55: Coefficients for multiple regression analysis predicting T3 symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.16	.11		1.44	.152
	Group (autism or controls)	.52	.16	.32	3.24	.002
2	(Constant)	-.05	.11		-.49	.627
	Group (autism or controls)	.16	.17	.10	.94	.351
	T2 Child Advanced Functional	.09	.05	.18	1.85	.067
	T3 Child Advanced Functional	.16	.05	.33	3.05	.003
3	(Constant)	.01	.09		.10	.914
	Group (autism or controls)	-.03	.14	-.02	-.23	.820
	T2 Child Advanced Functional	.02	.04	.05	.67	.503
	T3 Child Advanced Functional	.12	.04	.26	2.96	.004
	T2 Caregiver Symbolic	.12	.11	.08	1.06	.291
	T3 Caregiver Symbolic	.93	.13	.56	6.96	.000

To summarise five between group differences were found; children with autism demonstrated more simple exploratory play and simple functional play. They also spent more time not actively engaged in play. The neurotypical controls spent more time playing to an advanced functional and symbolic level.

Simple exploratory differences were explained by previous child simple exploratory play and caregiver simple functional play at T1. Simple functional play was explained by a combination of variables, but chronological age and language were significant predictors.

Advanced functional play related to a range of variables, including developmental and child and caregiver play; however, only concurrent child symbolic play were predictive. Symbolic play was predicted by concurrent child advanced functional and caregiver symbolic play.

10.2 CAREGIVER PLAY COMPLEXITY

Caregiver play complexity was explored at T3. Between group differences were analysed and the factors that contribute to these differences explored.

10.2.1 Descriptive Statistics

Table 56 reports the mean percentage of time caregivers spent playing as well as the time they spent facilitating play and not actively playing.

Table 56: Mean percentage of time caregivers spent engaged in different play complexities at T3

Percentage of time	Autism Group (n = 49)	Control group (n = 44)
Simple Exploratory	0.26 (1.83)	0.06 (0.40)
Cause and Effect	6.74 (10.56)	3.65 (8.39)
Game and Bubble	5.24 (9.90)	1.01 (5.06)
Simple Functional	3.75 (11.31)	1.24 (4.84)
Advanced Functional	13.19 (18.99)	13.67 (15.02)
Symbolic	0.00 (0.00)	0.90 (2.27)
Facilitating	35.44 (18.74)	47.67 (17.63)
No Play	35.34 (18.89)	31.88 (14.01)

Very little simple exploratory and symbolic play was shown by caregivers in either group. Caregivers spent the majority of their time facilitating play. This was higher for the control group (47.67% compared to 35.44%).

10.2.2 Analysis of Between-Group Differences

Between group differences were analysed in the same way as at T1 and T2; controlling for child chronological age and IMD score. Only two significant group differences were found; caregivers of a child with autism spent more time engaged in game and bubble play ($F = 3.76$, $p = .05$). Caregivers in the control group displayed more symbolic play ($F = 4.53$, $p = .03$); however, this

difference will be treated with caution as the expression of symbolic play was relatively absent in both groups.

Simple exploratory, cause and effect, simple functional, advanced functional, facilitating and no play were grouped together as a T3 reference point (see section 7.5.1 for description). Paired-sample t-tests were then conducted between the reference point and game and bubble and symbolic play.

Table 57: Paired sample t-tests between T3 caregiver play complexities and T3 reference point

	Mean	Std. deviation	t	df	Sig (2-tailed)
T3 Game & Bubble – T3 Reference	5.28	9.67	-70.28	92	.000
T3 Symbolic – T3 Reference	.42	1.62	-104.76	92	.000

Both caregiver game and bubble and symbolic play were considered significantly different from the T3 reference point. Therefore these were transformed using the method implemented throughout the analysis. Further ANCOVAs revealed group differences in game and bubble play ($F = 9.38$, $p < .01$) and symbolic play ($F = 5.81$, $p = .02$) remained.

10.2.3 Predicting T3 Caregiver Play Complexity Differences

Analysis turned to investigating the factors that associated concurrently with caregiver game and bubble and symbolic play at T3.

10.2.3.1 Univariate Analysis

Partial correlations were conducted for caregiver game and bubble and symbolic play at T3. Firstly child developmental variables were studied. Following this attachment and attachment-related variables were explored. Child and caregiver play variables were then inputted into the analysis.

Only caregiver game and bubble play associated with any of the child developmental variables; negative associations were found between this form of play and child receptive language assessed at T3 ($r = -.27$, $p = .01$). ADOS

score and all other developmental variables failed to associate with game and bubble play and symbolic play. Attachment and attachment-related variables also failed to associate with caregiver play at T3.

T3 child game and bubble play was positively correlated with caregiver play of this kind ($r = .66$, $p < .01$). Concurrent child symbolic play also associated with caregiver symbolic play ($r = .64$, $p < .01$).

Caregiver play at T2 was then explored to see how prior caregiver behaviours relate to later play; the time caregivers spent engaged in game and bubble play at T2 was positively associated with the time they spent at T3 ($r = .31$, $p < .01$). The time caregivers spent engaged in symbolic play at T2 was also related to symbolic play at T3 ($r = .28$, $p < .01$).

10.2.3.2 Multivariate analysis

The associations reported in section 10.2.3.1 were entered into a regression analysis for caregiver game and bubble and symbolic play.

Caregiver game and bubble play was explored first; group was entered in model one, followed by T3 receptive language. Child game and bubble play at T3 was entered in the third model, and T2 caregiver game and bubble play was entered in the final model.

Table 58: Summary of the multivariate analysis predicting caregiver T3 game and bubble play

Model	R	R ²
Group	.434	.188
T3 Receptive Language	.497	.247
T3 Child Game & Bubble	.759	.576
T2 Caregiver Game & Bubble	.765	.585

Group accounted for 18.8% of the total variance in caregiver game and bubble play at T3. This increased to 24.7% with the inclusion of the child's receptive language abilities. Concurrent child game and bubble play further increased this to 57.6% and the inclusion of previous caregiver game and bubble play accounted for 58.5% in total.

In model one, group was a significant predictor ($t = -4.59, p < .01$); however, in model two only receptive language accounted for the variance explained ($t = -2.65, p = .01$). Interestingly the inclusion of the time child spent engaged in game and bubble play restored group as a significant predictor ($t = -2.41, p = .02$). Receptive language remained significant ($t = -2.47, p = .015$) and child game and bubble play was highly significant ($t = 8.30, p < .01$). In the final model, child game and bubble play was the only significant predictor of caregiver game and bubble play at T3 ($t = 7.91, p < .01$).

Table 59: Coefficients for multiple regression analysis predicting T3 caregiver game and bubble play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.10	.13		8.22	.000
	Group (autism or controls)	-.89	.19	-.43	-4.59	.000
2	(Constant)	1.63	.24		6.88	.000
	Group (autism or controls)	-.47	.25	-.23	-1.91	.059
	T3 Receptive Language	-.02	.01	-.32	-2.65	.009
3	(Constant)	1.14	.19		6.09	.000
	Group (autism or controls)	-.45	.19	-.22	-2.41	.018
	T3 Receptive Language	-.02	.01	-.22	-2.47	.015
	T3 Child Game and Bubble	.07	.01	.58	8.31	.000
4	(Constant)	.97	.22		4.31	.000
	Group (autism or controls)	-.42	.19	-.20	-2.27	.026
	T3 Receptive Language	-.01	.01	-.18	-1.85	.068
	T3 Child Game and Bubble	.07	.01	.56	7.91	.000
	T2 Caregiver Game and Bubble	.10	.08	.11	1.36	.177

Caregiver symbolic play was entered as the dependent variable in the multivariate analysis; group was entered in the first stage, followed by T3 child symbolic play and T2 caregiver symbolic play.

Table 60: Summary of the multivariate analysis predicting caregiver T3 symbolic play

Model	R	R ²
Group	.314	.099
T3 Child Symbolic Play	.687	.472
T2 Caregiver Symbolic Play	.694	.481

Group alone accounted for 9.9% of the variance in caregiver symbolic play. This increased to 47.2% with the input of concurrent child symbolic play.

Caregiver symbolic play at T2 combined with the other variables accounted for 48.1% of the total variance.

When entered alone, group was a significant predictor ($t=3.15$, $p < .01$); however, with the inclusion of child symbolic play, it was no longer individually predictive. In both model two and three only concurrent child symbolic play was predictive (model one: $t = 7.97$, $p < .01$; model two: $t = 7.27$, $p < .01$).

Table 61: Coefficients for multiple regression analysis predicting T3 caregiver symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.01	.07		.16	.873
	Group (autism or controls)	.30	.10	.31	3.15	.002
2	(Constant)	-.05	.05		-.99	.326
	Group (autism or controls)	.10	.08	.11	1.32	.191
	T3 Child Symbolic	.39	.05	.64	7.97	.000
3	(Constant)	-.05	.05		-1.08	.283
	Group (autism or controls)	.10	.08	.09	1.15	.252
	T3 Child Symbolic	.37	.05	.61	7.27	.000
	T2 Caregiver Symbolic	.09	.07	.10	1.26	.209

To summarise, two differences were found between the two groups of caregivers at T3; caregivers of a child with autism spent more time engaged in game and bubble play but less time engaged in symbolic play.

The difference in game and bubble play was predicted by concurrent child game and bubble play. Symbolic play was also predicted by child symbolic play at T3.

10.3. ATTACHMENT

Attachment at T3 was analysed in the same way as T1. Between group differences were analysed, and the factors that contributed to these differences were explored.

10.3.1 Descriptive Statistics

Mean attachment scores were explored at T3. Mean scores were calculated, excluding item one from the analysis, in order to maintain consistency of measurement between T1 and T3.

Table 62: Descriptive statistics for attachment scores at T1 and T3

	T1		T3	
	Mean	SD	Mean	SD
Autism (n = 49)	4.84	.95	5.06	.73
Controls (n = 44)	6.34	.95	6.31	.54

Control children received higher attachment scores than the autism group. The attachment ratings remained consistent in the control group but increased slightly in the autism.

10.3.2 Analysis of Between-Group Differences

An ANCOVA revealed that the control group score significantly higher on the BASQ at T3 ($F = 63.30$, $P < .01$). This effect was not independent of chronological age ($F = 5.24$, $p = .02$).

10.3.3 Predicting T3 Attachment

The factors that predicted attachment ratings at T3 were analysed; univariate analysis was conducted to see what factors associated with attachment scores. Following this the variables that correlated were entered into a multivariate analysis to see if these predict over and above the group status of the child.

10.3.3.1 Univariate Analysis

Partial correlations were conducted controlling for the group status of the child. Variables entered included T1 and T3 language, chronological age, T1 non-verbal development, T1 attachment and attachment-related variables.

Receptive and expressive language at both T1 (receptive: $r = .41$, $p < .01$; expressive: $r = .38$, $p < .01$) and T3 (receptive: $r = .44$, $p < .01$; expressive: $r = .39$, $p < .01$) correlated with attachment ratings. Non-verbal development also positively associated with attachment ($r = .36$, $p < .01$). Interestingly attachment at T1 did not associate with attachment at T3, but sensitive responding ($r = .27$, $p = .02$) and mutuality ($r = .35$, $p < .01$) did relate.

10.3.3.2 Multivariate Analysis

A linear regression was conducted using group and the variables found to associate with T3 attachment; expressive and receptive language were grouped together as a mean language composite score. Group was entered first. This was followed in model two by non-verbal development and language. T1 sensitive responding and mutuality were entered last.

Table 63: Summary of the multivariate analysis predicting attachment at T3

Model	R	R ²
Group	.698	.488
Non-verbal Development	.763	.582
T1 Language		
T3 Language		
T1 Sensitive Responding	.779	.607
T1 Mutuality		

Group accounted for 48.8% of the variance in attachment at T3. This was increased to 58.2% with non-verbal development and language. Sensitive responding and mutuality increased this further to 60.7%.

Table 64: Coefficients for multiple regression analysis predicting T3 attachment

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.06	.09		54.50	.000
	Group (autism or controls)	1.25	.13	.70	9.30	.000
2	(Constant)	4.3	.31		13.65	.000
	Group (autism or controls)	.88	.20	.49	4.35	.000
	Non verbal score	.01	.01	.09	.71	.480
	T1 Language	-.00	.02	-.02	-.09	.928
	T3 Language	.02	.02	.32	1.43	.156
3	(Constant)	3.66	.42		8.65	.000
	Group (autism or controls)	.83	.20	.46	4.16	.000
	Non verbal score	.02	.01	.14	1.16	.249
	T1 Language	-.01	.02	-.11	-.49	.627
	T3 Language	.02	.01	.29	1.28	.203
	T1 Sensitive Responding	.06	.08	.07	.73	.469
	T1 Mutuality	.10	.08	.13	1.22	.226

In model one, group was a significant predictor ($t = 9.30$, $p < .01$). With the inclusion of the developmental variables, it remained the only individual predictor ($t = 4.35$, $p < .01$). Again in model three, group accounted individually for the variance in attachment ($t = 4.161$, $p < .01$).

In summary, the control group children received higher attachment scores at T3. Attachment at T3 correlated with non-verbal development and language at both T1 and T3. Attachment also associated with ratings of sensitive responding and mutuality, but not T1 attachment. Group of the children was the only significant predictor of attachment, individually accounting for 48.8% of the variance.

10.4. PLAY AND ATTACHMENT AT T3

Throughout the analysis, the relationship between attachment and child and caregiver play was explored. Attachment, mutuality or sensitive responding failed to associate with any of the child play behaviours that produced a between group difference at T3.

10.5. SUMMARY OF T3 RESULTS

Five between group differences were found in child play at T3; children with autism spent more time engaged in simple exploratory and simple functional play, and less time actively playing. The control group spent more time engaged in advanced functional and symbolic play.

The group differences found on the CAMPP were further explored to see which variables predicted the differences; simple exploratory play associated negatively with non-verbal development and language. In addition, child simple exploratory play at both previous timepoints positively associated with this form of play at T3. T1 caregiver simple exploratory play and the time spent not playing at T3 were also positively correlated to simple functional child play. Only T2 child simple exploratory play and T1 caregiver simple functional play predicted this play type.

Simple functional play differences associated with chronological and language abilities. A variety of child play variables correlated with this form of play, as did caregiver symbolic play at T2. Only group and chronological age significantly predicted this form of play at T3.

Advanced functional play associated positively with the developmental variables. Previous advanced functional play correlated as did T2 and T3 symbolic play. Caregiver advanced functional play also related to this form of

play. Only the time children spent engaged in symbolic play at T3 predicted advanced functional play, irrespective of group.

Symbolic play at T3 associated with a range of child and caregiver play behaviours, specifically advanced functional in the children and symbolic in the caregivers. T3 caregiver symbolic play and child advanced functional play accounted for the variance in symbolic play.

Caregiver play differences were then examined; only two differences were found; caregivers in the autism group spent more time engaged in game and bubble play, but less time engaged in symbolic play. The difference in game and bubble play was predicted by the time children spent engaged in game and bubble play concurrently. This was the same for symbolic play with T3 child symbolic play predicting caregiver symbolic play.

Attachment ratings were analysed at T3. The controls scored higher indicating more secure attachments. Attachment correlated positively with non-verbal development, language, sensitive responding and mutuality. Group was the only individual predictor of attachment, mirroring the results found at T1.

CHAPTER 11: CHANGE ANALYSIS RESULTS

The previous results chapters investigated how play differed at the three timepoints and what predicted these differences. This chapter presents play change over time; firstly between successive timepoints, then across the whole 13 month time frame. The variables that contributed to change over time will be explored for the two samples.

11.1 PLAY CHANGE BETWEEN T1 AND T2

Changes in child play complexity between T1 and T2 were explored. The variables that contribute to any increase or decrease in play behaviours were analysed. This analysis was conducted separately for the children with autism and the neurotypical controls.

11.1.1 Data Preparation

Changes over time will be explored using the method described in section 7.5.1 and Appendix D. This method was implemented separately for the two samples in order to explore what factors contribute to change over time and if change and predicting factors differ between the groups.

11.1.2. Change Between T1 and T2: Children with Autism

Initial paired sample t-tests are reported in table 65. Simple exploratory play reduced from T1 to T2 ($t = -4.65$, $p < .01$). Advanced functional play significantly increased between T1 and T2 ($t = 2.95$, $p < .01$). The increase in symbolic play approached significance. Both simple exploratory play and advanced functional play were transformed (see section 7.5.1 for description) and all additional analysis was conducted using the new values.

11.1.3 Change Between T1 and T2: Neurotypical Controls

Paired sample t-tests were conducted between the six levels of play complexity at T1 and T2 in the neurotypical controls. These are reported in table 66. Three significant changes were found. Simple exploratory play

reduced at T2 ($t = -4.15, p < .01$). Advanced functional play ($t = 2.31, p = .025$) and symbolic play ($t = 2.22, p = .032$) both increased.

*Table 65: Paired sample t-tests between T1 and T2 play complexities:
Children with Autism*

	Mean	Std. Deviation	t	df	Sig (2- tailed)
T2 Simple Exploratory – T1 Simple Exploratory	8.77 21.48	9.44 20.56	-4.65	48	.000
T2 Cause & Effect – T1 Cause & Effect	22.61 21.76	20.66 16.33	.31	48	.755
T2 Game & Bubble – T1 Game & Bubble	7.74 4.83	14.08 9.12	1.47	48	.148
T2 Simple Functional – T1 Simple Functional	20.09 16.80	21.03 15.73	1.14	48	.261
T2 Advanced Functional – T1 Advanced Functional	11.04 5.12	25.25 12.91	2.95	48	.005
T2 Symbolic – T1 Symbolic	1.46 .31	4.21 1.22	1.99	48	.052
T2 No Play – T1 No Play	28.44 29.60	17.15 16.86	-.42	48	.673

*Table 66: Paired Sample T-tests Between T1 and T2 Play Complexities:
Neurotypical Controls*

	Mean	Std. deviation	t	df	Sig (2- tailed)
T2 Simple Exploratory – T1 Simple Exploratory	4.24 13.75	8.00 15.00	-4.15	43	.000
T2 Cause & Effect – T1 Cause & Effect	31.96 25.68	26.13 20.33	1.29	43	.204
T2 Game & Bubble – T1 Game & Bubble	.58 2.52	2.67 6.49	-1.93	43	.060
T2 Simple Functional – T1 Simple Functional	23.84 28.15	20.50 21.18	-1.00	43	.322
T2 Advanced Functional – T1 Advanced Functional	19.28 10.91	24.14 19.79	2.31	43	.025
T2 Symbolic – T1 Symbolic	1.28 .14	3.44 .57	2.22	43	.032
T2 No Play – T1 No Play	18.75 18.88	12.99 10.08	-.04	43	.968

11.1.4 Predicting Play Change Between T1 and T2

The factors that contribute to play change between T1 and T2 were explored. Analysis included child developmental variables, attachment and attachment-related variables. The input of previous child play and T1 and T2 caregiver play were also explored.

11.1.4.1 Children with Autism

Correlations were run to see if the change in simple exploratory play and advanced functional play were related to other variables. Due to the number of correlations run, significance levels were set to at least 0.01 to ensure false positive were not accepted.

11.1.4.1.1 Univariate Analysis

In the autism group, change in simple exploratory play did not associate with any of T1 developmental variables; the associations between non-verbal development and expressive language were significant to the 0.02 level. Change in simple exploratory play only associated with the time children with autism spent engaged in simple exploratory at T1 ($r = .37, p < .01$). Change in exploratory play failed to associate with any caregiver variables or attachment variables.

The increase in advanced functional play associated with T1 non-verbal developmental ($r = .70, p < .01$), receptive ($r = .90, p < .01$) and expressive language ($r = .83, p < .01$). The time children with autism engaged in advanced functional play at T1 was highly correlated with change scores ($r = .75, p < .01$). The time children spent engaged in simple exploratory play at T1 was also related ($r = -.42, p < .01$). Attachment ($r = .37, p < .01$), sensitive responding ($r = .35, p < .01$) and mutuality ($r = .55, p < .01$) all correlated positively with advanced functional play change.

T1 caregiver advanced functional play positively associated with the increase in child advanced functional ($r = .61, p < .01$) as was current caregiver advanced functional play ($r = .52, p < .01$). The time caregivers spent engaged in game and bubble play negatively associated with advanced functional play

change ($r = -.38$, $p < .01$). These variables were entered into a multivariate analysis to see what factors predict child play change.

11.1.4.1.2 Multivariate Analysis

The predictive value of the variables found to associate with play change in the previous section was explored; simple exploratory change was entered as the dependent variable. T1 non-verbal development and expressive language were entered in model one. T1 simple exploratory play was entered in model two.

Table 67: Summary of the multivariate analysis predicting simple exploratory play change between T1 and T2: Children with autism

Model	R	R ²
Non-verbal development	.339	.115
Expressive language		
T1 Child Simple Exploratory	.418	.175

Developmental variables accounted for 11.5% of the variance in simple exploratory play change. This increased to 17.5% with the inclusion of the time children with autism spent engaged in simple exploratory play at T1. As reported in table 68, no individual variable was predictive of simple exploratory play change.

Table 68: Coefficients for multiple regression analysis predicting T2 change in simple exploratory play: Children with autism

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.93	.72		4.04	.000
	T1 Expressive Language	-.03	.04	-.19	-.84	.406
	Non verbal score	-.02	.03	-.17	-.77	.444
2	(Constant)	1.86	.92		2.02	.049
	T1 Expressive Language	-.02	.04	.10	-.44	.660
	Non verbal score	-.01	.02	-.12	-.54	.589
	T1 Child Simple Exploratory	.23	.13	.28	1.81	.076

Advanced functional play change was entered into a multivariate analysis; language and non-verbal development scores were entered in model one.

This was followed by attachment, sensitive responding and mutuality. T1 child simple exploratory and advanced functional play were then entered followed by T1 and T2 caregiver advanced functional play and T2 game and bubble play. Due to the number of variables entered into the analysis, only significance values of at least 0.01 were accepted.

Non-verbal developmental and language accounted for 79.8% of the total variance in advanced functional change in the children with autism. The inclusion of attachment and attachment related variables increased this to 80.5%. Child play variables at T1 further increased this to 85% and caregiver play variables to 85.5%.

Table 69: Summary of the multivariate analysis predicting advanced functional play change between T1 and T2: children with autism

Model	R	R ²
Non-verbal development	.893	.789
Expressive language		
Attachment	.897	.805
Sensitive Responding		
Mutuality		
T1 Child Simple Exploratory	.922	.850
T1 Child Ad. Functional		
T1 Caregiver Ad. Functional	.941	.885
T2 Caregiver Game & Bubble		
T2 Caregiver Ad. Functional		

Language measured at T1 was the only significant predictor of advanced functional play change in model one ($t = 8.32$, $p < .01$) and two ($t = 6.11$, $p < .01$). In model three, both language ($t = 4.60$, $p < .01$) and T1 child advanced functional play ($t = 3.21$, $p < .01$) were significant. With the inclusion of caregiver play variables, T1 child advanced functional play was no longer significant. In model four, child language ($t = 5.08$, $p < .01$) and T1 caregiver advanced functional play ($t = 3.04$, $p < .01$) significantly predicted advanced functional change.

Table 70: Coefficients for multiple regression analysis predicting T2 change in advanced functional play: Children with autism

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.16	.48		-2.41	.020
	T1 Language	.14	.02	.94	8.33	.000
	Non verbal score	-.01	.02	-.06	-.58	.565
2	(Constant)	-1.82	.86		-2.11	.041
	T1 Language	.13	.02	.87	6.11	.000
	Non verbal score	-.01	.03	-.03	-.29	.776
	T1 Attachment	.11	.12	.07	.97	.339
	T1 Sensitive responding	-.04	.12	-.03	-.36	.722
	T1 Mutuality	.08	.12	.06	.62	.540
3	(Constant)	-1.32	.79		-1.67	.103
	T1 Language	.10	.02	.65	4.60	.000
	Non verbal score	-.00	.02	-.01	-.07	.948
	T1 Attachment	.17	.12	.10	1.40	.169
	T1 Sensitive responding	-.04	.11	-.03	-.39	.694
	T1 Mutuality	-.01	.11	-.01	-.06	.953
	T1 Child Simple Exploratory	-.10	.09	-.09	-1.18	.246
	T1 Child Advanced Functional	.38	.12	.27	3.21	.003
4	(Constant)	-.44	.82		-.53	.595
	T1 Language	.11	.02	.75	5.08	.000
	Non verbal score	-.03	.02	-.13	-1.20	.236
	T1 Attachment	-.00	.12	-.00	-.02	.984
	T1 Sensitive responding	-.01	.10	-.00	-.05	.959
	T1 Mutuality	-.03	.10	-.03	-.31	.757
	T1 Child Simple Exploratory	-.04	.09	-.03	-.43	.670
	T1 Child Advanced Functional	.26	.12	.18	2.21	.033
	T1 Caregiver Ad. Functional	.04	.01	.26	3.04	.004
	T2 Caregiver Game & Bubble	.01	.07	.01	.18	.860
	T2 Caregiver Ad. Functional	-.00	.09	-.00	-.03	.974

11.1.4.2 Neurotypical Controls

As with the autism group, correlations were run to see if the change in simple exploratory, advanced functional and symbolic play related to other variables. Due to the number of correlations run, only significance levels of least 0.01 were accepted.

11.1.4.2.1 Univariate Analysis

Change in simple exploratory play was associated with T1 receptive language ($r = -.36$, $p = .01$). No other developmental variables associated. Attachment variables and caregiver play did not with simple exploratory change. T1 child simple exploratory ($r = .44$, $p < .01$) and advanced functional play ($r = -.41$, $p < .01$) associated with simple exploratory play change as was the time spent not engaged in play ($r = .44$, $p < .01$).

Advanced functional play change associated with T1 non-verbal development ($r = .45$, $p < .01$), expressive ($r = .58$, $p < .01$) and receptive language ($r = .61$, $p < .01$). T1 simple exploratory play ($r = -.46$, $p < .01$) and advanced functional play ($r = .73$, $p < .01$) were also associated with this change. Concurrent caregiver advanced functional play ($r = .50$, $p < .01$) and facilitating ($r = -.38$, $p < .01$) associated as well.

Finally change in symbolic play in the controls was associated with the time children engaged in symbolic play at T1 ($r = .87$, $p < .01$). Caregiver symbolic play at both T1 ($r = .42$, $p < .01$) and T2 ($r = .42$, $p < .01$) associated with this change.

11.1.4.2.2. Multivariate Analysis

The associations found in the previous section were explored in the multivariate analysis. Change in simple exploratory play between T1 and T2 was explored first.

Table 71: Summary of the multivariate analysis predicting simple exploratory play change between T1 and T2: Neurotypical controls

Model	R	R ²
Receptive Language	.360	.129
Time1 Child Simple Exploratory	.557	.311
T1 Child Ad. Functional		
T1 Child No Play		

Receptive language was entered first; this accounted for 12.9% of the variance in simple exploratory play change. The addition of T1 simple exploratory play, advanced functional play and no play increased this to 31.1%.

As reported in table 72, in model one, T1 receptive language was a significant predictor of simple exploratory change ($t = -2.50$, $p < .01$). However, in model two it was no longer significant. The time children did not engage in play at T1 was the only individually significant variable ($t = 2.10$, $p = .04$) in the second model.

Table 72: Coefficients for multiple regression analysis predicting T2 change in simple exploratory play: Neurotypical controls

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.99	.37		5.37	.000
	T1 Receptive language	-.04	.01	-.36	-2.50	.016
2	(Constant)	.62	.57		1.07	.289
	T1 Receptive language	-.02	.02	-.21	-.97	.339
	T1 Child No Play	.03	.01	.32	2.10	.042
	T1 Child Simple Exploratory	.19	.14	.23	1.38	.175
	T1 Child Advanced Functional	.10	.16	.01	.06	.951

Advanced functional play change was entered into the regression analysis. Language and non-verbal development were entered first, accounting for 37.3% of the variance in change scores. This increased to 54.5% with the time children spent engaged in simple exploratory and advanced functional play at T1. T1 Caregivers advanced functional play and facilitating further increased this to 64.3%.

Table 73: Summary of the multivariate analysis predicting advanced functional play change between T1 and T2: Neurotypical controls

Model	R	R ²
Non-verbal development	.610	.373
Expressive language		
T1 Child Simple Exploratory	.738	.545
T1 Child Ad. Functional		
T2 Caregiver Ad. Functional	.802	.643
T2 Caregiver Facilitating		

As reported in table 74, in model one, language at T1 accounted for the majority variance explained ($t = 3.28$, $p < .01$). However in model two, the time control children spent engaged in advanced functional at T1 solely accounted for the variance in advanced functional change scores ($t = 3.32$, $p < .01$). In the final model, both child advanced functional play at T1 and caregiver advanced functional play at T2 were individually significant predictors.

Table 74: Coefficients for multiple regression analysis predicting T2 change in advanced functional play: Neurotypical controls

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.75	.91		-.83	.412
	Non verbal score	-.05	.06	-.19	-.81	.424
	T1 Language	.15	.04	.76	3.28	.002
2	(Constant)	.46	1.01		.45	.653
	Non verbal score	-.02	.05	-.09	-.45	.654
	T1 Language	.03	.05	.17	.66	.513
	T1 Child Simple Exploratory	-.07	.20	-.05	-.37	.711
	T1 Child Advanced Functional	.74	.22	.63	3.32	.002
3	(Constant)	-.41	1.27		-.32	.748
	Non verbal score	-.01	.04	-.06	-.33	.743
	T1 Language	.02	.05	.12	.52	.606
	T1 Child Simple Exploratory	-.11	.18	-.07	-.59	.561
	T1 Child Advanced Functional	.65	.20	.55	3.16	.003
	T2 Caregiver Ad. Functional	.47	.15	.33	3.17	.003
	T2 Caregiver Facilitating	.00	.01	.03	.28	.782

Symbolic play change was entered into a regression analysis. T1 child symbolic play was entered as an independent variable; this accounted for 75.5% of the total variance in change scores. The inclusion of caregiver symbolic play at T1 and T2 further increased this to 82.9%.

Table 75: Summary of the multivariate analysis predicting symbolic play change between T1 and T2: Neurotypical controls

Model	R	R ²
T1 Child Symbolic Play	.869	.755
T1 Caregiver Symbolic	.911	.829
T2 Caregiver Symbolic		

Table 76: Coefficients for multiple regression analysis predicting T2 change in symbolic play: Neurotypical controls

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.02	.03		-.29	.772
	T1 Child Symbolic	.56	.05	.87	11.37	.000
2	(Constant)	-.07	.03		-2.39	.022
	T1 Child Symbolic	.48	.04	.76	10.71	.000
	T1 Caregiver Symbolic	.09	.03	.20	2.99	.005
	T2 Caregiver Symbolic	.10	.03	.20	2.95	.005

All the variables were individually significant, however child T1 symbolic play was the strongest predictor ($t = 10.71$, $p < .01$).

To summarise T1 to T2 play change, the autism group displayed less simple exploratory play over time and more advanced functional play. Simple exploratory play changes associated with T1 developmental factors and simple exploratory play, however no individual variable was significant in predicting change. Advanced functional differences were accounted for by T1 language and caregiver advanced functional play.

Three changes were found at T2; child without autism displayed fewer incidences of simple exploratory play and higher rates of advanced functional and symbolic play. Simple exploratory reduction was accounted for by the time children did not engage in play at T1. Advanced functional increases were explained by a combination of previous child and caregiver play of this kind. Symbolic play changes were solely explained by the association with T1 child symbolic play.

11.2 PLAY CHANGE BETWEEN T2 AND T3

Play change between T2 and T3 was explored in the same way as in section 11.1. The two samples were analysed separately.

11.2.1 Change Between T2 and T3: Children with Autism

Changes overtime were analysed using a series of paired sample t-tests as in section 11.1. The statistics are reported in table 77.

Only symbolic play changed between T2 and T3; this form of play reduced in expression ($t = -2.22$, $p = .03$). This was transformed (see section 7.5.1 and Appendix D for description and formula) and all subsequent analysis conducted on the new variable.

11.2.2 Change Between T2 and T3: Neurotypical Controls

Between timepoint differences were analysed in the same way as in section 11.1.2 for the control group. Two differences were found; simple exploratory play continued to reduce ($t = -2.89$, $p < .01$) whereas advanced functional play

continued to increase from T2 to T3 ($t = -2.57$, $p = .01$). These variables were transformed (see section 7.5.1 for description and formula) and used in all subsequent analysis.

*Table 77: Paired sample t-tests between T2 and T3 play complexities:
Children with autism*

	Mean	Std. deviation	t	df	Sig (2- tailed)
T3 Simple Exploratory – T2 Simple Exploratory	9.04 8.77	12.59 9.44	.162	48	.872
T3 Cause & Effect – T2 Cause & Effect	26.13 22.61	24.34 20.66	-.895	48	.375
T3 Game & Bubble – T2 Game & Bubble	4.66 7.74	9.21 14.08	-1.605	48	.115
T3 Simple Functional – T2 Simple Functional	20.83 20.09	22.72 21.03	.254	48	.800
T3 Advanced Functional – T2 Advanced Functional	12.43 11.04	25.78 25.24	.564	48	.575
T3 Symbolic – T2 Symbolic	.28 1.46	1.21 4.31	-2.221	48	.031
T3 No Play – T2 No Play	26.60 28.44	18.28 17.15	-.692	48	.492

*Table 78: Paired-sample t-tests between T2 and T3 play complexities:
Neurotypical Controls*

	Mean	Std. deviation	t	df	Sig (2- tailed)
T3 Simple Exploratory – T2 Simple Exploratory	1.00 4.23	2.55 8.00	-2.888	43	.006
T3 Cause & Effect – T2 Cause & Effect	26.49 31.96	27.33 26.13	-.947	43	.349
T3 Game & Bubble – T2 Game & Bubble	2.61 .58	7.59 2.67	1.752	43	.087
T3 Simple Functional – T2 Simple Functional	20.43 23.84	21.22 20.50	-1.040	43	.304
T3 Advanced Functional – T2 Advanced Functional	30.58 19.28	25.10 24.14	2.574	43	.014
T3 Symbolic – T2 Symbolic	3.34 1.28	7.62 3.47	1.714	43	.094
T3 No Play – T2 No Play	15.64 18.75	11.18 12.99	-1.113	43	.272

11.2.3. Predicting Play Change between T2 and T3

A series of univariate and multivariate analysis were then conducted to see what factors associated with and predicted change in play behaviours.

11.2.3.1 Children with Autism

In the autism group, univariate analysis was conducted to see which factors associated concurrently and longitudinally with the reduction in symbolic play; these included T1 and T3 developmental variables, attachment and attachment-related variables and T2 child play. Associations with caregiver play at T2 and T3 were also explored. Any variables that were significant to at least 0.01 were included in the multivariate analysis.

11.2.3.1.1 Univariate Analysis

The only developmental variable to associate with symbolic play reduction was T3 receptive language ($r = .35$, $p = .01$). ADOS scores failed to associate as did attachment, sensitive responding and mutuality. T2 symbolic play was significantly related to the decrease in symbolic play at T3 ($r = .62$, $p < .01$) as was T2 caregiver symbolic play ($r = .82$, $p < .01$).

11.2.3.1.2 Multivariate Analysis

The predictive significance of the associations found in section 11.2.3.1.1 were explored. T3 receptive language was entered first; this accounted for 12.4% of the variance in the reduction of symbolic play. T2 child symbolic play further increased this to 39.4% and T2 caregiver symbolic play accounted for 71.2%.

Table 79: Summary of the multivariate analysis predicting symbolic play change between T2 and T3: Children with autism

Model	R	R ²
T3 Receptive Language	.352	.124
T2 Child Symbolic Play	.628	.394
T2 Caregiver Symbolic Play	.844	.712

In model one, T3 receptive language was individually significant ($t = 2.57$, $p = .01$); however, with the inclusion of child symbolic play only this variable was

significant ($t = 4.53$, $p < .01$). In model three, T2 caregiver symbolic play was the only variable that accounted for the variance in symbolic play change ($t = 7.03$, $p < .01$).

Table 80: Coefficients for multiple regression analysis predicting T3 change in symbolic play: Children with autism

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.14	.11		-1.27	.21
	T3 Receptive Language	.01	.00	.35	2.57	.013
2	(Constant)	-.00	.09		-.04	.965
	T3 Receptive Language	.00	.00	.04	.28	.783
	T2 Child Symbolic	.05	.01	.61	4.54	.000
3	(Constant)	-.10	.07		-1.44	.157
	T3 Receptive Language	.00	.00	.15	1.57	.122
	T2 Child Symbolic	.01	.01	.08	.64	.525
	T2 Caregiver Symbolic	1.03	.15	.74	7.03	.000

11.2.3.2. Neurotypical Controls

Associations were explored between play change and the same variables included in the autism analysis, excluding ADOS score.

11.2.3.2.1 Univariate Analysis

Only T2 child simple exploratory play associated with the change in simple exploratory play. Change in advanced functional play was associated with both T3 receptive ($r = .40$, $p < .01$) and expressive language ($r = .39$, $p = .01$). These were combined in the subsequent analysis.

T2 child advanced functional play positively related to the increase in advanced functional play ($r = .72$, $p < .01$). Previous and concurrent caregiver advanced functional also associated with advanced functional play change play (T2: $r = .45$, $p < .01$; T2: $r = .45$, $p < .01$). In addition caregiver symbolic play at T3 was related to the change in advanced functional play ($r = .42$, $p < .01$).

11.2.3.2.2 Multivariate Analysis

The predictive significance of the associations found in section 11.2.3.2.1 was explored using multivariate regression analysis.

Simple exploratory play was explored first; only previous child simple exploratory play was entered into the regression analysis. This accounted for 26.2% of the total variance in change scores and was a significant predictor ($t = 3.86, p < .01$).

Table 81: Summary of the multivariate analysis predicting simple exploratory play change between T2 and T3: Neurotypical controls

Model	R	R ²
T2 Child Simple Exploratory	.512	.262

Table 82: Coefficients for multiple regression analysis predicting T3 change in simple exploratory play: Neurotypical controls

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.07	.12		.63	.534
	T2 Child Simple Exploratory	.31	.08	.51	3.86	.000

Advanced functional play was then explored; T3 language was entered in model one, followed by previous child advanced functional play in model two. In the final model, previous and concurrent caregiver advanced functional play were entered as well as T3 caregiver symbolic play.

Table 83: Summary of the multivariate analysis predicting advanced functional play change between T2 and T3: Neurotypical controls

Model	R	R ²
T3 Language	.404	.163
T2 Child Advanced Functional	.719	.516
T2 Caregiver Advanced Functional	.790	.624
T3 Caregiver Advanced Functional		
T3 Caregiver Symbolic Play		

Child language accounted for 16.3% of the variance in advanced functional play change; this was a significant predictor ($t = 2.86, p < .01$) in model one only. In model two, the combination of the two variables accounted for 51.6% of the total variance.

Table 84: Coefficients for multiple regression analysis predicting T3 change in advanced functional play: Neurotypical controls

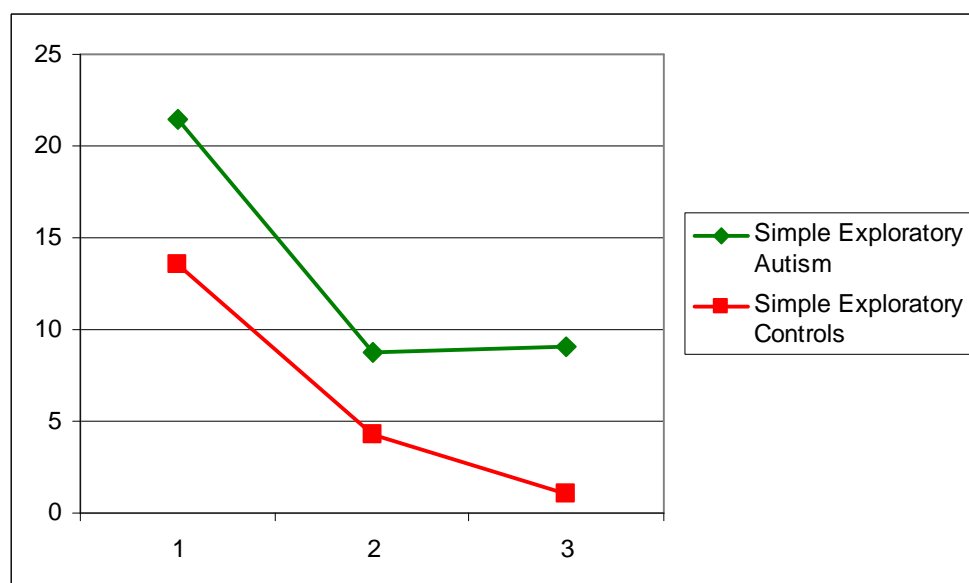
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.04	1.31		-1.55	.129
	T3 Language	.10	.03	.40	2.86	.007
2	(Constant)	.61	1.12		.54	.589
	T3 Language	-.01	.03	-.04	-.32	.751
	T2 Child Advanced Functional	.78	.14	.74	5.47	.000
3	(Constant)	.59	1.08		.54	.590
	T3 Language	-.01	.03	-.06	-.50	.622
	T2 Child Advanced Functional	.76	.17	.72	4.35	.000
	T2 Caregiver Ad. Functional	-.18	.20	-.12	-.87	.389
	T3 Caregiver Ad. Functional	.03	.01	.25	2.33	.025
	T3 Caregiver Symbolic	.47	.30	.17	1.57	.125

Previous child advanced functional play was a significant predictor in this model ($t = 5.47$, $p < .01$). In the final model, the combination of child and caregiver variables accounted for 62.4% of the variance in advanced functional play change. Again advanced functional play shown by the child at T2 was a significant predictor ($t = 4.35$, $p < .01$).

11.3 PLAY CHANGE ACROSS THE THREE TIMEPOINTS

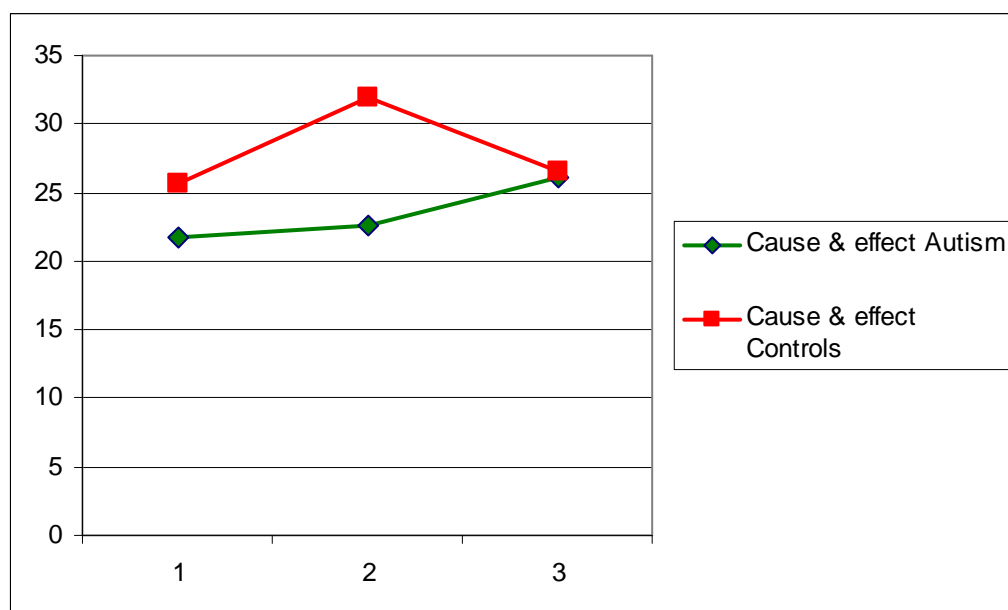
Play change over the course of the study was explored in the autism group and controls. Rather than simply focus on significant differences, the developmental progression of all play complexities was explored.

Figure 6: Simple exploratory play change between T1 and T3



Starting with simple exploratory play, both the children with autism and neurotypical controls reduced their expression of this form of play by T2. As shown in figure six simple exploratory play continued to decrease at T3 in the children without autism, but remained at a constant level in the children with autism with a non-significant increase evident.

Figure 7: Cause and effect play change between T1 and T3



Cause and effect play change was examined next; in the neurotypical controls this form of play increased between T1 and T2, but reduced to the same rate as at T1 at T3. These changes were non-significant. Cause and effect play increased slightly over the three timepoints in the children with autism. These changes are shown in figure seven.

Game and bubble play, increased between T1 and T2, but reduced to again at T3 in the children with autism. These changes are shown in figure eight. The reverse was shown in the neurotypical controls, with a reduction in game and bubble play at T2, but an increase at T3.

Simple functional play reduced overtime in the neurotypicals. This form of play increased in the children with autism at all 3 timepoints; however, the increase at T3 was not as steep at T2. These changes are shown in figure nine.

Figure 8: Game and bubble play change between T1 and T3

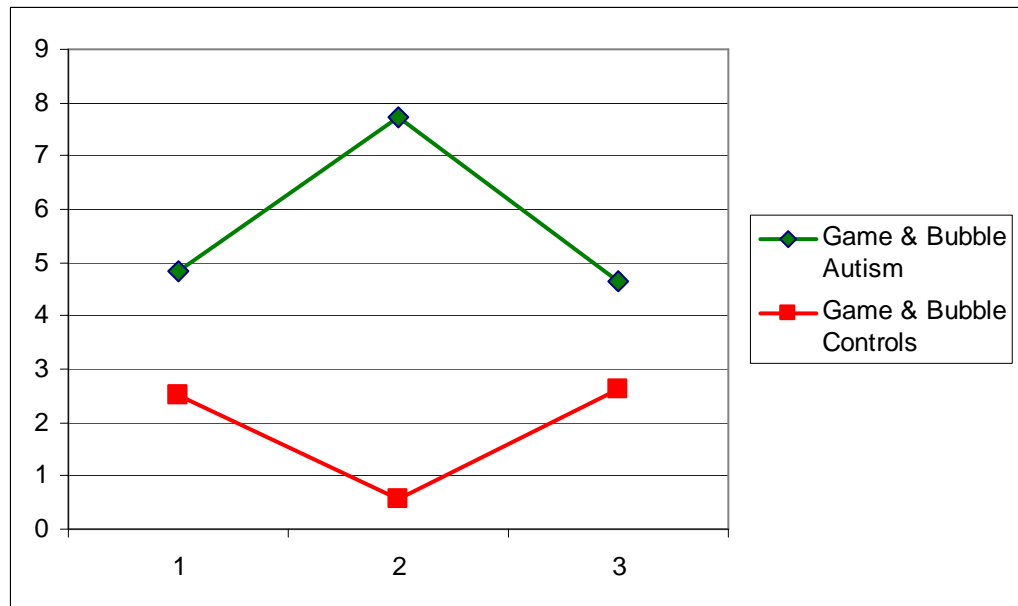
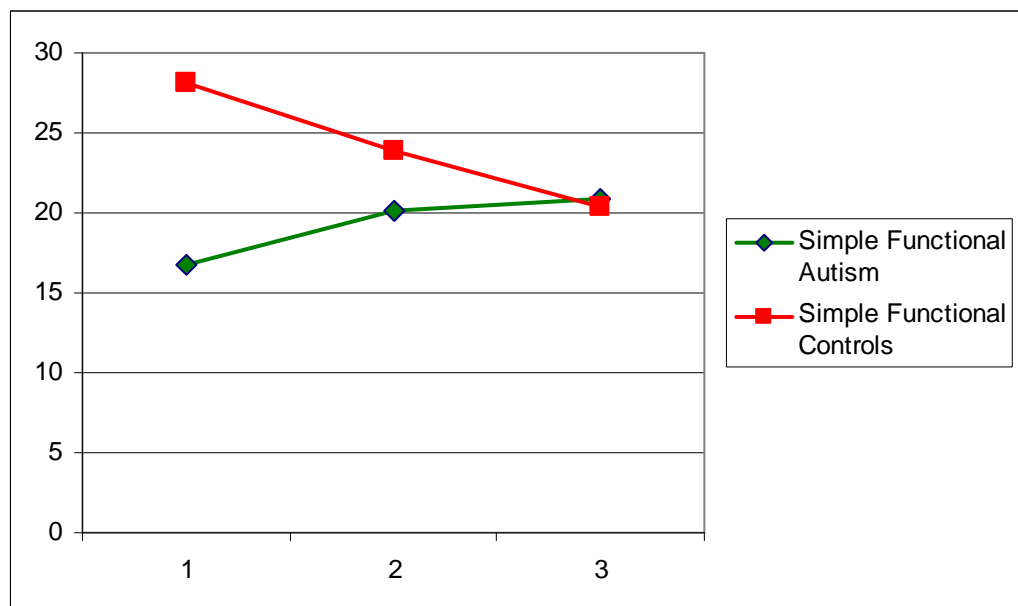


Figure 9: Simple functional play change between T1 and T3



Both children with and without autism increased in their expression of advanced functional play from T1 to T2. This increase continued in the neurotypical controls at T3, however reached a plateau in children with autism at T3.

Figure 10: Advanced functional play change between T1 and T3

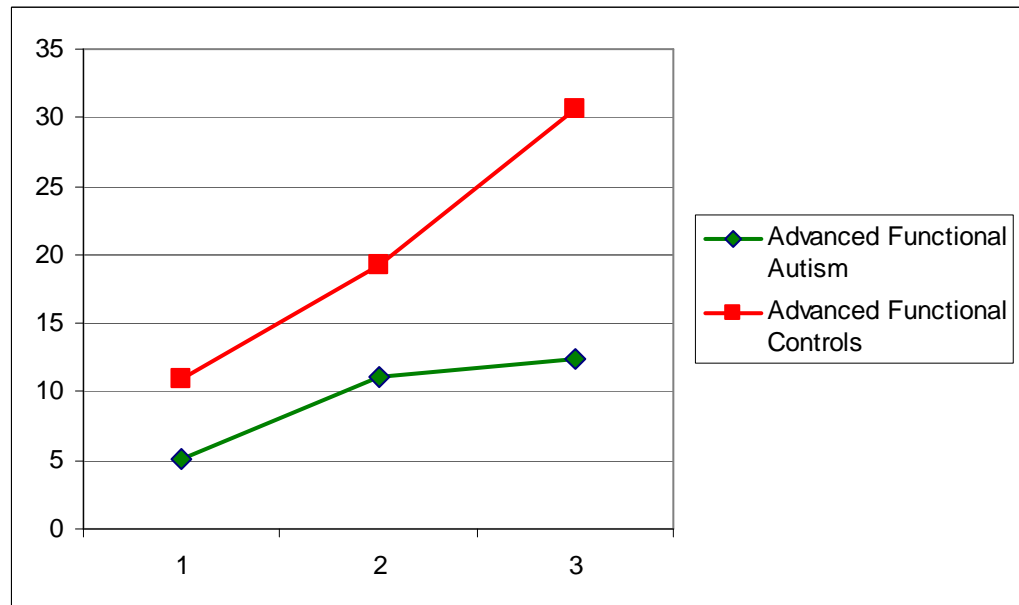
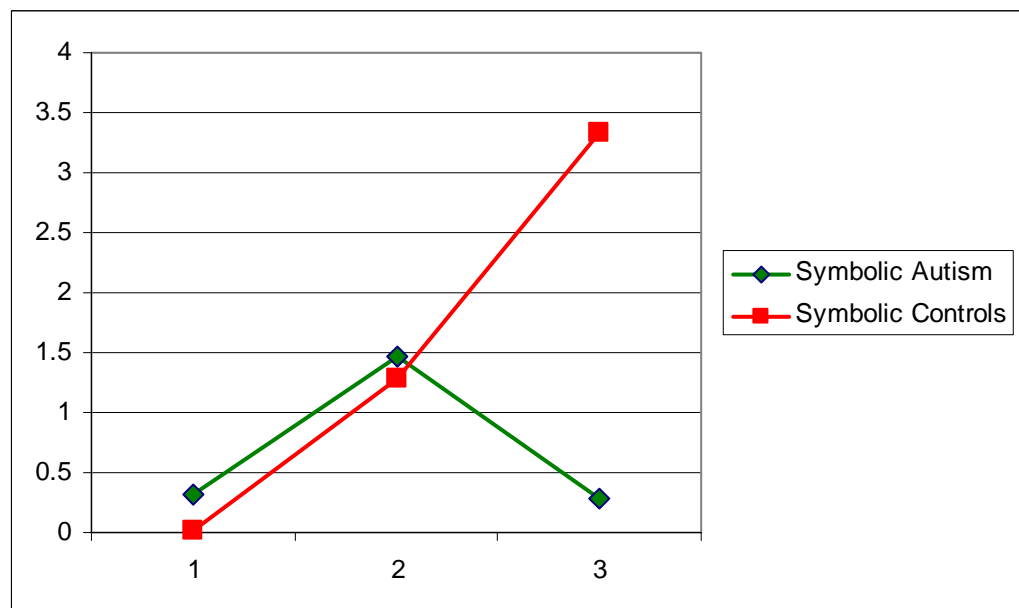


Figure 11: Symbolic play change between T1 and T3



Symbolic play increased throughout in the controls. In the children with autism, symbolic play increased at T2 but decreased by T3. This reduction was significant.

11.3.1. Between group differences: T1 to T2 change

The analysis then explored whether the changes found previously in section 11.1 were significantly different between the two groups. This analysis was completed for the change in simple exploratory play, advanced functional play and symbolic play. As symbolic play did not change in the autism group between T1 and T2, this variable was transformed using the method utilised throughout this chapter to ensure the statistics are performed using the same scale of measure. Regression analyses were used as these provide clear conceptualisations of the contribution of both group and age to any differences in play change over time.

Simple exploratory play was explored first. Both groups showed a significant reduction in this form of play, therefore the analysis was interested in whether group predicted any differences in this change or whether the change was equivocal in both groups. Age was included in the analysis as this varied between the samples.

Table 85: Summary of the regression analysis predicting simple exploratory play change between T1 and T2

Model	R	R ²
Chronological age	.304	.092
Group		

A combination of group and age accounted for 9.2% of the variance in the change between T1 and T2 in simple exploratory play. This form of play reduced in both groups, however the reduction was greater in the autism group ($t = -2.79$, $p < .01$).

Table 86: Coefficients for regression analysis predicting T1 to T2 change in simple exploratory play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.45	.60		4.12	.000
	Group	-.92	.37	-.41	-2.79	.007
	Chronological age	-.01	.01	-.18	-1.21	.227

Advanced functional play was then explored. Both groups showed a significant increase in this form of play, therefore the analysis was interested in whether group predicted any differences in this change or whether the change was equivocal in both groups. Age was included in the analysis as this varied between the samples.

Table 87: Summary of the regression analysis predicting advanced functional play change between T1 and T2

Model	R	R ²
Chronological age	.489	.210
Group		

A combination of group and age accounted for 21% of the variance in the change between T1 and T2 in advanced functional play. This form of play increased in both groups, however the increased was greater in the control group ($t = 4.59$, $p < .01$). Age also contributed to this change however with older children increasing more in the expression of advanced functional play at T2.

Table 88: Coefficients for regression analysis predicting T1 to T2 change in advanced functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.93	.84		-3.48	.001
	Group	2.17	.47	.65	4.59	.000
	Chronological age	.08	.02	.64	4.57	.000

Symbolic play was explored next. Only the controls changed in their expression of symbolic play therefore the autism group scores were transformed using the formula utilised throughout this chapter. Despite the significant change between T1 and T2 with the controls, there was no difference across the two groups. There is evidence that the distribution of scores is not normal due to the extremely low levels of children performing this form of play.

Table 89: Summary of the regression analysis predicting symbolic play change between T1 and T2

Model	R	R ²
Chronological age	.125	.016
Group		

Table 90: Coefficients for regression analysis predicting T1 to T2 change in symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.09	.15		-.58	.561
	Group	.20	.08	.18	1.18	.242
	Chronological age	.00	.00	.12	.74	.457

11.3.2. Between group differences: T2 to T3 change

The changes found in section 11.2 were explored in this section to test whether there were any between group differences. This analysis was completed for the change in simple exploratory play, advanced functional play and symbolic play. Simple exploratory and advanced functional play did not change at T3 in the controls, therefore this variable was transformed using the method utilised throughout this chapter to ensure the statistics are performed using the same scale of measure. The same method applies for symbolic play which showed a significant reduction in the autism group, but did not change in the controls.

Simple exploratory play was explored first. Only the controls showed a within group reduction in this form of play, therefore the analysis was interested in whether group predicted this change and whether it was different to the autism group. Age was included in the analysis as this varied between the samples.

A combination of group and age accounted for 10.5% of the variance in the change between T2 and T3 in simple exploratory play. Whilst this form of play appeared to plateau in the children with autism and continue to reduce significantly in the controls, this changed between the groups was insignificant.

Table 91: Summary of the regression analysis predicting simple exploratory play change between T2 and T3

Model	R	R ²
Chronological age	.325	.105
Group		

Table 92: Coefficients for regression analysis predicting T2 to T3 change in simple exploratory play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.35	.49		.72	.474
	Group	.34	.28	.18	1.22	.226
	Chronological age	-.01	.01	-.16	-1.09	.278

Advanced functional play was then explored. This form of play increased significantly between the timepoints within the controls, but did not change in the children with autism. Age was included in the analysis as this varied between the samples.

Table 93: Summary of the regression analysis predicting advanced functional play change between T2 and T3

Model	R	R ²
Chronological age	.548	.301
Group		

Table 94: Coefficients for regression analysis predicting T2 to T3 change in advanced functional play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.23	.74		-1.66	.099
	Group	2.19	.41	.70	5.26	.000
	Chronological age	.03	.01	.23	1.73	.086

A combination of group and age accounted for 30.1% of the variance in the change between T2 and T3 advanced functional play. This form of play only increased in the controls ($t = 5.26$, $p < .01$). Age did not contribute to this change.

Symbolic play explored. This changed within the autism group, with a reduction shown at T3. However no change was shown in the controls.

Table 95: Summary of the regression analysis predicting symbolic play change between T2 and T3

Model	R	R ²
Chronological age	.110	.012
Group		

Group and age accounted for only 1.2% of any change shown in symbolic play between T2 and T3. No group difference was shown and there was evidence that this form of play was not normally distributed due to the low numbers of children performing this form of play.

Table 96: Coefficients for regression analysis predicting T2 to T3 change in symbolic play

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.10	.25		-.39	.695
	Group	.03	.14	.03	.19	.848
	Chronological age	.00	.00	.13	.83	.410

11.4. SUMMARY OF CHANGE ANALYSIS RESULTS

Between T1 and T2, the children with autism displayed less simple exploratory play and more advanced functional play. Simple exploratory play reduction was not predicted by any one individual variable, whereas advanced functional play increase was predicted by T1 language and caregiver advanced functional play.

In the neurotypical controls, the same changes were found; however, were predicted by different factors. Simple exploratory reduction was predicted by the time spent not engaged in play at T1. Advanced functional play growth was predicted by both caregiver advanced functional play at T1 and T2 as well

as T1 child advanced functional play. In addition symbolic play increased at T2 and was predicted by caregiver and child symbolic behaviours.

Between T2 and T3, only symbolic play reduced in the children with autism; this was predicted by the time caregivers engaged in this form of play previously. In the neurotypical controls, simple exploratory play and advanced functional play continued the trends demonstrated at T2. Simple exploratory reduction was predicted by T2 simple exploratory play. Advanced functional increase associated with a variety of variables, but was predicted by child advanced functional play at T2.

Over the three timepoints, simple exploratory play reduced in both groups from T1 to T2. This change was greater in the autism group. This continued in the controls but plateaued in the children with autism. Despite the within group difference at T3, there was no difference in the change across the two groups at T3. Cause and effect play demonstrated reverse patterns across the two samples; in the children with autism this decreased at T2, but then increased again at T3 to its original level. In the controls an increase was evident at T2, before reducing to its original point at T3.

A similar pattern of change was evident for game and bubble play, with children with autism increasing in their expression at T2, before returning to their original expression at T3. The reverse was shown in the neurotypical controls, with a decrease at T2, before similar time spent at T3 as at T1.

Simple functional play reduced consistently overtime in the neurotypical controls, whereas increased steadily in the children with autism. Advanced functional play demonstrated a steady increase over the three timepoints in the control group. This increase was shown in the children with autism between T1 and T2 but did not continue at T3. The change between T1 and T2 was greater in the controls. The controls also increased significantly comparative to the autism group in this form of play at T3.

Symbolic play increased in the controls throughout the analysis; however, whilst an increase was evident between T1 and T2 in the children with autism,

a significant decrease was shown by T3. The differences in these changes between the two groups was not significant.

The implications of all the results gained throughout the analysis chapters are discussed in chapter 12 in relation to the research hypothesis, previous literature and possible clinical implications.

CHAPTER 12. DISCUSSION

The introductory chapters of this thesis discussed the literature surrounding play and attachment in typical development and autism. This led to the hypotheses outlined in chapter five. In this chapter, the findings of the research will be discussed in relation to each of the research hypotheses proposed in section 5.2 (page 91), and discussed in relation to previous literature and their clinical significance. The unique contributions of this research and identifiable caveats are also acknowledged.

12.1 REVIEW OF THE RESEARCH FINDINGS IN RELATION TO THE HYPOTHESES

Hypothesis One: Patterns of play behaviour in autism. Compared to matched neurotypical controls, children with autism will show:

- a. More simple exploratory play and less advanced functional and symbolic play.*
- b. Slower developmental trajectories in play.*
- c. The level of play will be related to language ability as well as to presence of autism.*

Hypothesis 1a: The study found that children with autism demonstrated more simple exploratory and less advanced functional play at all time points (see pages 144, 163 and 175). Only at T3 did a difference emerge in symbolic play, however this was still accompanied by advanced functional play differences (see page 175). These findings, therefore, partially supports hypothesis 1a.

Further, they are also suggestive of an overall delay in play behaviours, rather than a domain-specific impairment; addressing a key point of divergence in the literature. The majority of relevant literature suggests a specific impairment in symbolic play, with other play behaviours spared by the presence of autism (Baron-Cohen, 1987, Ungerer and Sigman, 1981). These findings, however, are suggestive of an alternative theory; that, in autism, play as a whole may suffer from a delay or immaturity. Such a finding is similar to that of Jarrold et

al (1996) and Lewis and Boucher (1988) who found impairments in both functional and symbolic play when playing spontaneously.

These results are also strikingly similar to those of Williams et al (2001) who found a wider impairment in elaborate functional play, with simple functional behaviours spared by the presence of autism. As predicted in hypothesis 1a, an impairment was evident throughout in advanced functional play. In support of Libby et al (1998), symbolic play impairments were only evident at time three, with early impairments characterised by heightened levels of simple exploratory play and reduced instances of advanced functional play.

In addition to the reduced levels of advanced functional play, heightened incidences of simple exploratory play were evident throughout the study (see pages 144, 163 and 175), supporting the findings of van Berckelaer-Onnes (2003), Libby et al (1998) and Rutherford et al (2007). Taken together these results are suggestive of a delay in autism that spans both simple and advanced forms of play behaviours.

The findings re-open the debate surrounding the specificity of the play impairment in autism. The non-replication of Baron-Cohen's (1987) seminal research may be attributable to the meticulousness of the method. Firstly, the study does not rely upon cross-sectional methodology, instead exploring play behaviours over time providing a dynamic rather than static picture of play behaviours in autism. Single timepoint methodology may fail to capture the dynamic aspects of development in the disorder and may only become evident when development is studied over time.

Added to the longitudinal method, the play definitions used strengthen the findings gained here. As discussed throughout this thesis (particularly in section 7.2.1.1), the inconsistency between studies in the definitions of both functional and symbolic play does not allow for cross-study comparison; with research often grouping the two behaviours as one. The definition of symbolic play within the current research was much stricter than that used in much of the relevant research in the field; what has been classified as symbolic play

previously may have been assigned the category of advanced functional play. This distinction could explain the consistently low levels of symbolic play in both groups as such a pure conceptualisation may not detect differences until both the samples are developmentally more advanced.

Further to this, the use of a spontaneous free play session is assumed to capture play abilities in naturalistic light. As much of the previous research has studied play during structured play sessions (Baron-Cohen, 1987; Charman et al, 1997), functional play impairments may be masked using this method.

The finding that simple functional play was heightened in children with autism could in part be attributable to the severity of autism symptomatology and age of the children studied. Most of the relevant literature has not included children as young as two. As this study captures play development in its early stages, different impairments may be present at this stage. Similarly the inclusion of just children with core autism strengthens the research findings and more severe autistic impairments may extend the play impairment, encompassing a wider proportion of the play continuum that cross sectional research with a range of children with ASD conditions may not reveal.

Hypothesis 1b: Children with autism demonstrated a comparatively slow trajectory of decrease of simple exploratory and increase in advanced functional play relative to neurotypicals between T1 and T2 (see pages 203 and 206). A more complex picture was evident between T2 and T3. Whilst neurotypical controls continued to demonstrate the expected developmental trajectories, the children with autism showed evidence of a slowing or loss of progression; symbolic play reduced (albeit a small percentage of this form of play was evident throughout), improvement in advanced functional play slowed and simple exploratory play increased slightly in expression (see page 191).

The differences in play change between the two groups were explored. The reduction in simple exploratory play was greater in the children with autism at T2, however no difference was shown in the change between T2 and T3. At both T2 and T3 the increase in advanced functional play was greater in the

controls. Whilst symbolic play differences were found within the groups, between the two samples no statistically significant differences were found, possibly due to the consistency low levels of symbolic play shown.

Although there has been some anecdotal reports of such developmental slowing and regression (Davidovitch, Glick, Holtzman, Tirosh and Safir, 2000; Tuchman and Rapin, 1997), this is the first time such a skill loss over time has been shown in a structured empirical study. Tuchman and Rapin (1997) found mothers reported regression in play, language and social skills in a sample of children later diagnosed with autism. This was further supported by Davidovitch et al (2000) who found evidence of 'late regression' in imaginative play around the age of three. This finding is similar to that found here, with a reduction at T3. The findings gained here and by Davidovitch et al (2000) indicate a skill loss specific to symbolic and imaginative play, with other forms spared, meriting further empirical investigation.

The results gained in support of hypothesis 1b compliment those gained for hypothesis 1a; an overall delay in play development was found compared to neurotypical progression. This contradicts much of the relevant literature that is suggestive of a domain specific impairment in symbolic play. The apparent overall delay in play is further supported by the similar developmental trajectories between gained across the two samples, albeit at a reduced rate in the children with autism.

Hypothesis 1c: In both children with and without autism, language abilities associated negatively with simple exploratory play and positively with advanced functional play (see pages 145, 164 and 177). Language did not predict symbolic differences, but did associate concurrently (see pages 164, 178 and 181). Language did not consistently independently predict play differences or change, with the exception of advanced functional play (see pages 148, 167 and 181). Advanced functional play differences at T1 and change between T1 and T2 were predicted by a combination of variables, including language abilities. The results suggest that play is not simply a mirror of language.

The presence of autism also failed to consistently predict the entirety of the play differences found throughout the study. Simple exploratory differences at T2 were predicted by group as were simple functional differences at T3 (in combination with chronological age); however all other differences were not predicted by the group of the children. This finding was unexpected, given the group differences found in support of hypothesis 1a and suggest autism symptomatology did not account for the majority of the differences gained in this thesis.

It was assumed, based on previous literature reporting play impairments in autism (e.g. Baron-Cohen, 1987; Jarrold et al, 1996), that the differences found would be accounted for by the presence of autism symptoms. However other factors in addition emerged as more important.

In support of the predictions of hypothesis 1c, the finding that simple exploratory play associated negatively with language provides further verification for the findings of Warreyn et al (2005) and Sigman and Ungerer (1984). The research of Ungerer and Sigman (1981) and Spencer and Meadow-Orlans (1996) was also supported by the associations found between advanced functional play and language. However, the failure to find a predictive association between symbolic play and language contradicts the theory that symbolic play and language stem from the same underlying ability to metarepresent (Piaget, 1962; Meins, 1997; Charman et al, 2000; Rutherford et al, 2007).

Simple functional play behaviours associated negatively with language (see pages 167 and 181) contradicting the findings of Ungerer and Sigman (1981) who found that functional play as a whole related positively to language development, before the association became specific to symbolic behaviours. Possible reasons for the failure to replicate a universal association between all functional play behaviours and language may be attributable to the division of functional play behaviours into simple and advanced.

Unexpectedly symbolic play differences and change over time were not predicted by language, failing to replicate the research of Meins (1997),

Charman et al (2000) and Mundy et al (1987). The specificity of the definitions used within this research may have strengthened the association between advanced functional play and language and many of the behaviours previously classified by other research as symbolic play therefore may have been reclassified as advanced functional. In addition the age range of the children studied was younger than usually included in autism-play research (e.g. Ungerer and Sigman, 1981). This, coupled with the stricter definition of symbolic play, may have reduced the expression of symbolic play across the cohort. It could be that with time the association with advanced functional play may change and become specific to symbolic behaviours when these are more common, as found by Ungerer and Sigman (1981).

Based on the research of Belsky and Most (1981), it was assumed at that chronological age would be a poor predictor of play behaviours. However at T1 group differences were not independent of age. Chronological age jointly predicted group differences in T1 advanced functional play. This association was only present at T1 suggesting that later in development variables other than chronological age exerted a greater influence on play behaviours.

12.1.1. Summary of hypothesis one results and contributions

In summary, the findings in relation to hypothesis one add to the literature in three ways. Firstly, I did not find the specific symbolic play impairment in autism that is often assumed (and indeed part of the phenotypic definition of the disorder). Children with autism instead displayed a developmental delay in many aspects of play with fewer examples of advanced functional play and more simple exploratory play. Only at T3 was symbolic play specifically impaired relative to neurotypical controls, with a loss of symbolic skill emerging from the data. Secondly, children with autism demonstrated an overall slowing of development throughout the play spectrum rather than a domain specific impairment in symbolising behaviours. Finally differences were not consistently explained by language abilities. Only advanced functional play related to language, whereas symbolic play differences and change

(previously assumed to form a specific association with language) were not predicted by expressive or receptive abilities.

Hypothesis Two: Relationship between caregiver play and child play.

Compared to matched controls:

- a. Caregivers of a child with autism will show less advanced play behaviours*
- b. Group differences in caregiver play behaviour will be predicted by child autism, child language and child play.*
- c. Caregiver play behaviours will predict future child play, in line with the theory of the 'Zone of Proximal Development (ZPD)'.*

Hypothesis 2a: At all timepoints, caregivers in the autism group demonstrated less complex play behaviours (see pages 150, 169 and 183) providing support for hypothesis 2a. Overtime the differences became more specific to symbolic play. Caregivers in the autism group demonstrated more game and bubble play throughout.

This study is the first in the field of autism to explore caregivers provision of play during a naturalistic session with their child. The results demonstrate how parental behaviours maybe influenced by the presence of a child with autism; with the differences found in the caregivers similar to the differences found in children with autism. This is suggestive that caregivers as a whole are responsive to their child's current competence.

The differences found throughout in caregiver game and bubble play were not predicted. These differences maybe a reflection of the provision of sensory play behaviours which maybe more effective than other play strategies to stimulate dyadic and enjoyable play in children with autism. These behaviours may traditionally be seen as insensitive or intrusive, but may be more compatible for children with autism.

Only one study to date has explored caregiver play in autism; grouping mothers, fathers and siblings play into broad categories of involvement. The results of hypothesis 2a provide support those gained previously by EI-

Ghoroury and Romanczyk (1999) who found that caregivers play with children with autism differed in strategic ways from that displayed by siblings. The authors found results indicative of over-compensation for the child's disability in caregivers and taken together this present research and that of El-Ghoroury and Romanczyk (1999) highlight the need to explore the context surrounding the child and the impact this may in turn have on development.

Hypothesis 2b: Child autism symptomatology and language did not consistently predict the entirety of differences found in hypothesis 2a (see pages 153, 172 and 185). Only T2 caregiver game and bubble and simple functional play differences were predicted by autism symptomatology in the child, in combination with other variables. These findings do not support those predicted by hypothesis 2b. Instead child play emerged as the most consistent predictor of caregiver play differences (see pages 153, 172 and 185).

Positive associations were found with child play that was one level behind caregiver play. Negative associations were found with child play that was one level ahead of caregiver play. These relationships were with concurrent child play. Caregiver play was often predicted by concurrent child play of the same kind. Specifically caregiver game and bubble play related to and was predicted by child game and bubble play at concurrent timepoints.

The findings of hypothesis 2b provide a direct example of Vygotsky's theory of social-development in everyday life, with caregiver behaviours influenced by child behaviours. This is the first direct observation of his concepts and influence in a sample of children with autism and their caregivers, despite the wide acceptance of Vygotsky's theory within developmental psychology.

Direct examples of a ZPD are also evident in this thesis, providing empirical support for this development concept in everyday life. These were evident irrespective of clinical symptomatology; therefore highlight the caregiver's ability to recognise and respond to their child's abilities and interests. This provides support for the sole study prior to this exploring caregiver play in children with autism, with caregivers, as opposed to siblings, demonstrating more 'scene setting' play (El-Ghoroury and Romanczyk, 1999).

Hypothesis 2c: This hypothesis was supported. Child play behaviours associated and were predicted by caregiver play in combination with other variables (see pages 166, 167, 181, 186 and 197). However, this relationship was not universal to all play development and was specific to more advanced play behaviours. Simple exploratory play reduction was not predicted by any caregiver play behaviours (see page 194 and 195), suggesting that this form of play did not require parental input to reduce and in both children with and without autism naturally decreased overtime.

The results of hypothesis 2c support the research of Fiese (1990) who observed that caregiver behaviours were not uniformly associated with all child play behaviours; but differ to those of Slade (1987b) who found that only simple play behaviours were susceptible to the influence of caregiver input.

In line with Piaget's theory of play development, simple exploratory play appeared to develop and reduce naturally over time, irrespective of external influences. In both children with and without autism, the reduction of this form of play did not require caregiver input, suggesting natural developmental progression. Within this form of play, children appear to be 'lone scientists' as described by Piaget (1962).

Conversely, more advanced forms of play required input from the caregiver; suggestive of Vygotskian theories of development. Advanced functional play increase was related to previous caregiver play of this kind, providing direct support for a ZPD and Tamis-LeMonda and Bornstein's (1994) findings that caregiver play exerted a concurrent and longitudinal influence on child development.

Whilst associations were present throughout the concurrent and longitudinal analysis, these did not consistently predict play change between T1 and T2 and T2 and T3. Therefore, it is important to recognise that, whilst the input and impact of the caregiver as assumed to be pervasive, additional factors play a role in play development.

As predicted by hypothesis 2c, previous caregiver symbolic play predicted symbolic growth in neurotypical controls (in combination with previous child

symbolic play; see page 198), providing support for Vygotskian theories. However, in the children with autism this was not found (see page 201). Instead the loss of symbolic skill at T3 was inversely related to and predicted by caregiver symbolic play at T2. This apparent 'sensory overload' replicates what has been shown previously by Tamis-LeMonda and Bornstein (1994) and Venuti et al (2008) who found that caregivers' behaviours can result in a reduction in child play; with behaviours classified as too complex having an inverse effect on child play. One possible explanation for this is that caregivers in the autism sample may be aware of the importance of symbolic play in the disorder and wider development and, therefore, may overcompensate, leading to an intrusiveness that hinders the child's development rather than supporting it.

12.1.2. Summary of hypothesis two results and contributions

Hypothesis two makes three unique contributions to the literature. Firstly, that caregiver play in those with a child with autism was different to caregivers of a neurotypical child. These differences mirrored those found in children. Secondly, these differences were predicted largely by child play behaviours demonstrating the focus of caregivers' behaviours in relation to child abilities. Thirdly, advanced child play behaviours were largely dependent on caregiver play behaviours, providing empirical support for the notion of a ZPD in play.

Hypothesis Three: Attachment ratings will be lower in children with autism:

- a. Mutuality will be lower in children with autism, however sensitive responding will not vary between the caregivers*
- b. Attachment will be predicted by higher ratings of mutuality and sensitive responding*
- c. Attachment and mutuality will relate positively to advanced play behaviours*

Hypothesis 3: At T1 and T3, attachment scores were lower in children with autism indicating a less secure attachment relationship (see pages 156 and 187). Previous literature indicates less secure attachments in children with

autism (Shapiro et al, 1987; Rogers et al, 1993; Capps et al, 1994).

Attachment was not absent in children with autism, suggesting that children with autism were capable of forming attachments with their primary caregiver.

The replication of attachment differences within these two samples validates the use of the BASQ within the research, replicating many of the findings that have used either the SSP or AQS.

Hypothesis 3a: Mutuality scores were also lower in children with autism (see page 157), as predicted by hypothesis 3a. This supports the research of Blazey (2007) and Siller and Sigman (2003) who found impaired ratings of mutuality in this sample.

Ratings of sensitive responding were lower in caregivers of a child with autism (see page 157); a finding not predicted by hypothesis 3a. Impaired ratings of sensitive responding were not expected. This was based on the findings of Kasari et al 1998 (also Dawson et al, 1990; Doussard-Roosevelt et al, 2003) who found that differences in sensitivity were masked when using global measures. These findings are, however, consistent with those of Blazey (2007) and Capps et al (1994).

The day to day challenges faced by caregivers of a child with autism are thought to impair the sensitivity expressed during a free play session. Added to this, the play impairments displayed by children with autism may contribute to a caregiver's ability to interact sensitively with their child further adding to the lower ratings of this construct within the sample.

Hypothesis 3b: Attachment ratings did associate with sensitive responding and mutuality scores (see pages 159 and 188), providing support for hypothesis 3b. However, these associations did not predict attachment in children with or without autism. Instead the presence of autism predicted mean attachment scores and accounted for the majority of the variance in attachment ratings (see pages 159 and 188). This finding, whilst providing support for the traditional assumptions of attachment theory, also deconstructs vital aspects of the theory as attachment formation was not dependent on caregiver

behaviours (Bowlby, 1969; Ainsworth et al 1978) but was primarily explained by the presence of clinical symptomatology.

Mutuality was the stronger predictor of the two attachment-related variables, accounting for more of the total variance; supporting the research of de Wolff and van Ijzendoorn (1997), Harriot and Waugh (2002) and Blazey (2007) whilst questioning the importance of solely caregiver behaviours in the formation of attachment assumed vital within attachment theory (Bowlby, 1969; Ainsworth et al, 1978).

Hypothesis 3c: Central to this thesis was the hypothesis that attachment and attachment related variables would predict child play behaviours concurrently and longitudinally. This was not found, failing to replicate both neurotypical and autism research (Slade, 1987a and b; Belsky et al, 1984; Naber et al, 2008; Marcu et al, 2009). At all timepoints, sensitive responding and attachment failed to associate with any of the variables that produced a group difference (see pages 160, 179 and 189). Mutuality did associate with simple exploratory and advanced functional play in the expected directions, however these associations did not predict play (see page 146). Attachment, mutuality and sensitive responding related to advanced functional play growth in the children with autism between T1 and T2, however did not predict this change (see page 195). Instead, caregiver play behaviours and developmental variables emerged as the strongest predictors of child play differences and development.

Possible explanations for the lack of associations are twofold. Firstly, the sample of children with autism included only children with a diagnosis of core autism within the preschool period. Due to severity of the autism symptoms in the sample, attachment behaviours may fail to exert an influence in these conditions. Previous research has generally included a range of ASD diagnoses (Naber et al 2008; Marcu et al, 2009) and the severity of the autism may impact the attachment relationship and play behaviours. The children in the sample were also in the preschool period; therefore, attachment may start

to lose its influence on development with other factors playing a more important role.

The measurement of attachment also differed from previous investigations. The BASQ may fail to capture attachment in the same way as other validated measures, and therefore attachment and play may fail to relate.

However, it could be that when other variables, such as language and caregiver play are accounted for, attachment is no longer significant. As discussed by Belsky and Cassidy (1994) there is no shortage of developmental phenomena that attachment has been hypothesised to predict, and maybe child play is too abstract and distal concept to be influenced by the caregiver-child relationship.

12.1.3. Summary of hypothesis three results and contributions

To summarise, children with autism received consistently lower ratings of attachment at T1 and T3. This was accompanied by lower ratings of mutuality as well as lower ratings of sensitive responding in the caregivers. Providing an alternative to traditional attachment theory, the results gained suggest that the clinical symptoms and implications of autism override the influence of both caregiver and dyadic constructs assumed to be vital for attachment formation. Contrary to what was predicted, attachment and its related constructs did not associate or predict child play behaviours concurrently or longitudinally, with both child abilities and caregiver play exerting a stronger influence.

12.1.4. Overall summary of research findings

Overall, findings indicated impairments across the play spectrum in children with autism, rather than a symbolic specific deficit. Only at T3 did symbolic play demonstrate a delay relative to neurotypical controls. However, impairments in simple exploratory and advanced functional play were still evident. Children with autism developed in all play behaviours at delayed rate and a slowing of behaviours was evident. Differences were not consistently independently predicted by language or autism symptomatology.

Caregiver play in autism mirrored the differences found in children; less complex play was evident throughout the study. More sensory forms of play were evident in caregivers of a child with autism. Child autism and language did not consistently predict caregiver play. Child play was the most reliable predictor of caregiver behaviours - generally either the same level demonstrating a mirroring of behaviours or child play that was one level behind that of the caregiver, suggestive of a ZPD in play.

Caregiver play emerged as one of the strongest predictors of child play and change over time. These associations were specific to more advanced forms of child play, with simple exploratory play unrelated to caregiver actions. Symbolic play growth in neurotypicals was positively related to caregiver play of this kind (and previous child symbolic play). However, in children with autism, symbolic play reduction was related to caregiver symbolic play at the previous timepoint.

Attachment security was consistently reduced in children with autism. These differences were accompanied by reduced ratings of mutuality and sensitive responding. Whilst these constructs associated with attachment, they did not predict scores over and above the presence of autism symptomatology. Attachment and its related constructs did not consistently relate to or predict child play concurrently or over time.

The clinical implications of this research, and its unique strengths as well as its caveats, will be discussed in the following sections.

12.2. CLINICAL IMPLICATIONS OF THE RESEARCH

The findings of this research have many clinical implications. Firstly, despite the wide acceptance of Vygotsky's theories of development and parent-mediated interventions and training programmes, there is little empirical support for the theories constructs within everyday life. Only a handful of studies have tested the concept of the ZPD and its occurrence in naturalistic settings; therefore garnering support for a concept that has been widely applied clinically and in educational settings (e.g. Skibbe, Behnke and Justice, 2004; Holtzmann, 1995; Justice and Ezell, 1999)

Very few studies have explored the validity of psychological theories of development in samples of children with autism (see Morgan, 1986; Morgan, Cutrer, Coplin and Rodrique, 1989). However, what is evident from the findings gained here is that children with autism do develop in their play sequentially as described by Piaget (1962). Vygotskian theories of play development were also generally supported despite the play and social impairments experienced by children with autism.

The findings that children with autism were still able to benefit from caregiver input in play is clinically encouraging and supports the validity of Vygotsky's notions in this sample. Despite the vast social impairments experienced by children with autism, especially in the pre-school period in children with a diagnosis of core autism, children were still able to learn from their caregiver. The children within this sample had impaired language and social skills, yet were able to learn within the dyadic environment of play.

It is also encouraging that, in the majority of instances, caregivers of a child with autism are receptive to their child's current competence and play. This provides support for the use of caregivers as a vehicle for change both in typical development and children with autism. In both samples, caregiver behaviours exerted a strong influence on child play which may in turn influence wider development.

The data revealed that not all play was reliant upon caregiver input. Simple exploratory play naturally reduced over time; it did not depend upon high level play from the caregivers, language abilities or attachment. This finding, in both the samples, provides support for aspects of Piaget's theory of play development in that for this form of simple play, children were 'lone scientists.'

The finding that attachment and its related constructs did not consistently relate to or predict play concurrently and over time casts doubt over the importance of attachment in play development. The results have clinical implications with regards to the use of the attachment relationship through interventions as in this study children were resilient to its affects. It is also important to recognise that, whilst attachment was lower and coupled with

lower mutuality and sensitive responding in children with autism, this did not impact on their play abilities; these abilities were dependent on other factors.

The most significant clinical implication is how to use caregivers during interventions. In this study not all caregiver behaviours had an impact on child play; simple forms of play did not require caregiver input and some forms of caregiver play were too advanced for children. It is therefore vital that interventions have a specific focus especially when using the notion of a ZPD, ensuring both quality and specificity of behaviours rather than simply focusing on quantity. Intervention utilising caregivers as a vehicle for change need to be sensitive to the child's current and potential development, facilitating growth whilst reducing intrusiveness.

This research can be applied clinically for children with and without autism. It highlights factors additional to the attachment relationship that may impact more significantly on play development. In addition the finding that caregiver play has to be in tune with the child's current and potential learning has implications for the growing field of parent-led interventions in autism and other development conditions.

The following sections will discuss the strengths and contributions to the field this research has made as well as recognising future directions and possible weaknesses in the methodology and data.

12.3. STRENGTHS AND UNIQUE CONTRIBUTIONS

This research has a number of strengths and unique aspects contributing to the literature base surrounding play and attachment in children with autism. These strengths can be grouped into two broad categories: unique contributions to the literature, specifically providing empirical support for developmental theories of play, and the vigour of methodology and statistics.

This study has made a number of unique contributions to the literature surrounding play and attachment in autism. These include shedding new light on the nature and extent of the play impairment in autism, exploring the association between play and attachment over time, studying caregiver play in

autism, providing empirical evidence of possible regression in play and developmental theories of play and the contribution of a new play measure for pre-school samples.

Clear differences emerged throughout the study in the group's ability to play to an advanced functional level. Unlike many previous studies, symbolic play did not show the expected differences throughout and, when evident, were still accompanied by advanced functional differences. The results are indicative of a delay rather than domain specific impairment, perhaps attributable to the methodology and definitions employed.

This thesis built on the small literature base exploring the association between play and attachment in children with autism (Sigman and Ungerer, 1984; Naber et al, 2008; Marcu et al, 2009), extending these studies into a longitudinal repeated measures design. However, unlike the studies which preceded it, no associations were found between attachment security and play behaviours. Other factors emerged as more influential on play behaviours concurrently and in their development

Reasons for failing to replicate earlier literature are discussed throughout this chapter and are largely assumed to be to the methodological rigour of the study, the statistical methods implemented and the inclusion of other factors known to associate with play development; therefore not studying play and attachment in isolation.

This study is the first to explore directly how caregivers of a child with autism play during a dyadic free play session. Rather than focus on caregiver's use of language or sensitivity, it was decided to explore caregiver play and the influence this had on child play behaviours. By adopting this method, exciting and clinically important results were gained. Firstly, caregivers demonstrated strategic differences between the two groups, mirroring the differences found in their children. These differences were largely predicted by the child's play behaviours, indicating that across the two groups caregivers were recognising and adapting to the abilities of their child.

The finding, that caregiver play irrespective of type did not automatically influence child behaviours, reaffirms the assumption that it is not simply the quantity of caregiver behaviours instead quality, sensitivity to development and relevance all appear to be important.

The first empirical evidence of play regression also adds to the literature surrounding play in autism. This study is the first of its kind to directly observe this apparent skill loss, often reported anecdotally by caregivers. This finding represents an interesting phenomenon previously unexplored in children with autism and meriting further investigation. Whilst the time samples of symbolic play were very small across the whole cohort, this slowing or loss of skill was unique to the children with autism.

The CAMPP adds to the literature base through its ability to measure play in both caregivers and children. This measure has shown its ability to measure play in both adults and children and was deemed easy to use in both neurotypical and developmentally delayed/deviant samples. The ease at which IRR was obtained also indicates further that the CAMPP is a valid, easy to use and reliable measure. However the need to validate the measure is discussed later in this chapter.

The use of an unstructured play session to explore caregiver-child play to directly examine the impact of caregiver play by instructing caregivers to play as they would at home. This allows the CAMPP to be utilised in other samples with minimal difficulty. The use of this method also builds on much of the previous literature that has instructed caregivers to only get involved when their child sought their help/involvement.

Many of the strengths of the CAMPP add to the overall methodological rigour of the study. These are discussed below and encompass coding technique, standardised measurement conditions, the repeated measures longitudinal design, the development of a new play measure, the clearly defined sample and the statistical method.

Continuous computer-based video coding was used; updating much of the early literature that explored play in autism that implemented time interval

coding approaches. Using this continuous method large samples of play can be coded and the use of a computer based program also allows for cross-study replication and IRR. The same method of coding was used to study caregiver play as was child play, therefore making the findings comparable and relevant to the field of parent-mediated interventions.

The implementation of a standardised method (as much as feasibly possible) across the two samples adds further merit to the investigation. Previous research has utilised varying methods between participants and samples, especially true when studying play behaviours. This was avoided by using the same method at all three timepoints and across the samples.

Adding to this, the repeated measures longitudinal design used builds on previous literature that has relied upon cross-sectional research. The implementation of this method allows development to be explored over time rather than simply concurrently and developmental theories of play can be studied.

One of the key findings to emerge from this thesis is the applicability of Vygotskian and Piagetian theories of development in both typical development and children with autism; a sample with known social impairments. Vygotsky's theory has not been studied to date in children with autism, presumably due to the social impairments experienced by this sample. In spite of these impairments, clear concurrent and longitudinal influences from the caregiver to the child were observed, suggesting that caregivers have an important role to play in their child's development within this domain, irrespective of their social abilities.

Whilst elements of Vygotsky's theory were evident, this study did not provide full support of his theory throughout the play spectrum. Simpler forms of play were not reliant on caregiver input to reduce over time, suggesting a natural developmental progression independent of social input and irrespective of group. For simple exploratory play, Piaget's description of children as 'lone scientists' seems to be apparent; regardless of the presence of autism symptomatology this form of play naturally decreases over time (albeit at a

slower rate in the autism sample). The results suggest an interplay between social and individual factors are important for play progression.

The CAMPP was designed specifically for this research, building on previous research but incorporating new elements based on pilot observations and shortcomings of previous studies. Its strengths lay in the depth and the scope of the measure, covering all play forms assumed to develop, the type of coding implemented and the strict definitions employed. Specifically, the definitions allowed coders to understand the strategic and quantifiable distinctions between different play complexities. Through strictly defining symbolic play, the research has revealed inconsistencies between studies through the over-inclusion of simpler behaviours. Further to this, the division of simple and advanced forms of functional play allowed the research to explore specific differences between the groups and split the play continuum further.

Various sample and methodological factors also strengthen the research and the ability to draw conclusions from its findings. Compared to other samples, large samples across the two groups increased the statistical power of the study and the confidence in accepting the results gained. The inclusion of just children with a diagnosis of core autism strengthens the findings to ensure that the results gains can be attributed to the presence of autism symptomatology. Added to the thoroughness of the sample selection, high retention rates allowed the samples to remain large throughout the research and the results gained at each timepoint can be accepted with confidence.

The statistical methods employed are seen as a key strength of the research; overcoming the issues of proportionality in data sets previous ignored by many other studies (Naber et al, 2008; Jarrold et al, 1996). The statistics used throughout the research allow for the non-independence of the variables produced by the CAMPP to be accounted for whilst not automatically assuming heterogeneity/normal distribution. Through using this method, systematic differences between the samples emerged and a key recommendation of this thesis is the continued use of this technique.

By incorporating the strengths and building on the weaknesses of other research, this study adds to the literature base surrounding play and attachment in autism. By framing the research within a developmental framework, theories of play development (attachment, cognitive and social-constructivist) were able to be explored providing the first direct observation of social-developmental theories of play development in children with autism and their caregivers.

12.4. CAVEATS OF THE CURRENT RESEARCH

Whilst this study was conducted with methodological rigour, there were a number of factors that were unable to be controlled or were not accounted for during the study design. These limitations fall into two broad categories: the sample studied and the method implemented. Whilst it is unlikely these factors provide alternative explanations for the findings, they are discussed to acknowledge the shortcomings of the study.

Despite a large control group, matched to a high standard using non-verbal development scores, alternative methods of recruitment and matching may have been more desirable. Unavoidable differences in chronological age and language ability were evident between the samples which may have contributed to the differences obtained between the groups. Whilst chronological age did influence the results gained in some of the analysis, it did not emerge as a consistent factor in the development of attachment or play. Based on Belsky and Most's (1981) finding that play was poorly predicted by chronological age, matching on this variable was not seen as imperative, however attempts could be made in the future to reduce the disparity between samples.

Language and play did relate throughout the analysis, however, these associations did not independently predict differences and symbolic play was not predicted by language throughout. The failure to replicate the findings of studies that have implemented language matching strategies suggests the original differences did not overly skew the results gained. The decision to recruit using non-verbal matching was based on the fact that if a language

match had been opted for, the controls would have been very young and the likelihood of comparable play behaviours being demonstrated reduced.

Likewise the failure to replicate the assumed specific relationship between symbolic play and language abilities raised doubt over the importance of language for the development of play behaviours (and visa versa).

Differences in socio-economic status were also evident. However, these were controlled for in the analysis and did not influence any of the findings, suggesting this difference was not significant. Given the time restraints of the research, the controls had to be recruited within a small window of time and, whilst various arenas of recruitment were trialled, including presenting the research at local Sure Start centres, these were not overly successful. It is also assumed that due to the nature of the families recruited to the control group, it was easier to retain participants when they were receiving no financial or therapeutic gain contributing to the low attrition rates. Therefore, whilst this difference may not have been ideal, it is seen as an unavoidable side effect allowing the sample to remain consistent over the three timepoints.

It is recognised that the caregivers in the control group may have skewed the findings by being more aware of the importance of play in development. It was highlighted that many of the caregivers had attended play courses or parent-training programmes, such as Webster Stratton (2006). This was not anticipated or controlled for in the research.

It was observed that the style of play encouraged by Webster Stratton is very different to that of Vygotskian theories, offering more direction with minimal play behaviours. Webster-Stratton promotes the use of declarations and commenting, adopting a 'hands off' approach to dyadic play (Webster-Stratton, 2006). Examples include when children are playing with stacking cups, caregivers commenting on colours and providing praise and support where appropriate. Many of the behaviours promoted by Webster-Stratton would be classified using the CAMPP as facilitating, yet may not be as constructive and supportive as the behaviours assumed to be captured by this category based on pilot observations. Whilst this difference was unexpected, it is worth noting

that the caregivers across the samples did not differ in the time they spent facilitating. It is acknowledged and seen as a future direction, that additional deconstruction of the category of facilitating may reveal interesting differences between the groups.

The majority of caregivers across the cohort were mothers. Whilst this represents the proportion of primary caregivers generally, it has been found that mothers and fathers play differently with their children (Kerns and Barth, 2005). Due to the small number of fathers in the sample it was not statistically possible to explore these differences, however, it is recognised that there may be slight differences between male and female caregivers; an area worth further investigation in the future. It is worth noting that trying to recruit equivocal numbers of male and female caregivers would have represented a difficult task within the given timeframe of the research and was seen out of scope of the current research.

The method implemented was very strong compared to other studies of play in autism, however, a few caveats are acknowledged. The setting of the research assessments varied between the two samples, with the majority of the autism assessments being conducted within a research lab and the controls all being conducted in their home environment. Based on previous research that suggests that the play of children at home and in research settings is comparable (Bornstein et al, 1997), it is assumed this disparity did not influence the results gained. It is also important to acknowledge that the number of control families within the research may have been reduced if they were required to attend a research lab to complete the assessment, as no financial or therapeutic gain was offered.

Whilst the findings gained by the BASQ replicate the findings gained using more validated measures of attachment, it is recognised that the BASQ requires further empirical validation. The lack of association between T1 and T3 attachment scores was unexpected, especially since research using the SSP and AQS reports considerable overlap and consistency between early and later attachment ratings (Waters et al, 1995). The failure of the BASQ to

consistently score on item one, whilst accounted for in the analysis, is recognised as a flaw in the measure and further work is needed to validate all the items in the BASQ. Similarly the overlap between some of the items and autism symptomatology is seen as problematic as the differences in attachment may be attributable to the presence of autistic impairments. Further work is needed to clarify the items within the measure and the overall validity of the measure within other samples.

The CARP-A is also a new measure requiring further validation. The mutuality scale may overlap with autism symptoms and the social impairments experienced by children with autism could interfere with their ability to interact dyadically. Ratings of mutuality may in fact merely represent a manifestation of autism. Blazey (2007) found that the social sub-scale of the ADOS approached significance with ratings of mutuality in a sample of pre-school children with a diagnosis of core autism therefore this needs to be considered in any future implementations of the measure.

The CARP-A construct of sensitive responding may be influenced by the day to day challenges experienced by caregivers of a child with autism, perhaps explaining the differences found. The age range of the children with autism was also significantly higher than the controls and sensitivity may no longer be as important in development or evident in caregivers as the age range of the children is above that where sensitivity is assumed to have a day to day influence (Vibbert and Bornstein, 1989).

CAMPP built on previous literature and integrated previously published items in a way that was needed to advance the field. This measure was piloted in development but was not subjected to a full validation on an independent sample prior to its implementation within this current research. Findings using the CAMPP on this current sample are convergent with those from previous research and have shown the additional findings presented in the thesis (Libby et al, 1998; Williams et al, 2001). Given the positive findings using this instrument, it is acknowledged that full validation of the CAMPP on an

independent sample in the future would be indicated – and act, in addition to the current results, to strengthen its use for future studies.

It could be argued that certain levels of play were hard to distinguish rendering the coding not as accurate as ideally possible. The distinction between simple and advanced functional play, whilst producing the expected differences, was operationalised by small differences and may be too subtle to be recognised by the untrained eye. It is acknowledged that future research will depend on accurate definitions and training to ensure reliability and consistency if the differences found here are to be replicated.

The definition of symbolic play could be argued to be too strict based on previous empirical investigations; although the justifications for this definition are discussed throughout this thesis. The low levels evident throughout the study could be attributed to the fact that the definition was one of purest in play research to date and caution must be drawn when concluding from the findings due to the statistical power of using such small percentages. However, whilst this may be a possibility, the strength and depth of this definition is also assumed to have aided in revealing strategic differences not found by previous research.

When designing the play measure, the toys included in the play kit were not considered. These were decided prior to the study for use within the larger PACT study (Green et al, 2010). It is acknowledged that the toys selected may not have encouraged symbolic activity and focused more on building dyadic interactions. This would be an area to improve in future research and the inclusion of toys or items with no obvious function may have increased the incidence of symbolic behaviours. However, given the age of the controls and the severity of the autistic impairments in the autism sample, it is assumed the frequency of symbolic play reflects what would be expected given the samples utilised. Added to this, coding just a ten minute time frame may have limited the expression of more advanced play behaviours as children may explore toys rather than play with them if they are novel. A greater exposure time to the toys may have elicited more advanced behaviours.

Taken together these caveats all represent areas that should be either amended or studied further in future research.

12.5. FUTURE DIRECTIONS

A number of future directions stem from this current research. Whilst the play measure used was one of the most extensive implemented in play research to date, it requires further validation in the samples used here and in other clinical groups. It is also acknowledged that whilst predictive associations were found between child and caregiver play, exploring these associations in more detail would further strengthen the findings. It is recommended that future studies employ a time sequential coding technique to explore the direct impact of child and caregiver play behaviours on one another. Whilst the multivariate analysis used in this study allows for causal inferences to be drawn from the results, a direct observation of whether caregiver behaviours led directly to child behaviours (and visa versa) during the play session would add further merit the implications for cognitive and social-developmental theories of play development.

This research studied play over three timepoints within a 13 month timeframe. However, it would be beneficial to follow the sample at additional timepoints, especially given the minimal symbolic play that was shown throughout the study. Through following the sample up further, the emergence of symbolic play could be studied in more depth. The age of the controls may have limited the expression of symbolic behaviours and further timepoints would help clarify whether the definition of symbolic play was too strict to capture behaviours or whether symbolic play emerges at a later date. Through following the sample up at additional time points, the validity of the CAMPP within different age ranges could also be established.

Further validation of the CAMPP on independent samples is seen as a priority of future work resulting from this thesis. This could be done in relation to other measures of play and the free play session included in the ADOS.

This thesis was part of the larger PACT study; a parent-led psychosocial intervention for children with autism (Green et al, 2010). This study only

studied children in the North West site of the trial, where there the parent-led intervention did not impact on the child's autism symptomatology (Green, 2010; informal communication). However, in the future it would be interesting to see how interventions impact on play and how these interventions lend themselves to theories of development.

The overlap between simple play and restricted and repetitive behaviours has been discussed in the literature (Honey et al, 2007) but was beyond the scope of this current research. It would be interesting to explore the presence of these behaviours during a free play session and the interaction with play. Exploring how different autism symptoms interact with one another will further intervention strategies and theoretical understanding of how behaviours influence one another and the assumptions behind the triad of impairments characteristic of autism.

Future research would benefit from large samples of mothers and fathers to explore any differences in play behaviours. If differences were apparent, these may have a differential impact on child play that may be influential in development or interventions. Whilst out of the scope of this current research, it is acknowledged that gender and cultural differences may be apparent between caregivers and represent an interesting field requiring further investigation.

Aforementioned in section 12.4, the impact of Webster-Stratton training programmes presents an unexpected caveat of the research. Whilst the exact percentage of control caregivers who were familiar with or had attended such training events was not obtained, anecdotally approximately one third of caregivers told the author about such training. Investigating the popularity and impact of these programmes should be a priority for future research and acknowledged by researchers sampling neurotypical families in similar ways.

Taken together, the future directions based on the current findings of this research present exciting developments within the field of autism and play development. The use of the CAMPP in future research will allow this research to be replicated and extended in the ways discussed.

12.6. SUMMARY

This thesis set out to explore three separate but inter-linking veins of research: child play in autism, caregiver play complexity and the association between child play and attachment.

Hypothesis one was concerned with clarification of the nature of play impairment experienced by children with autism. Results were indicative of an overall delay in play rather than a domain specific impairment in symbolic play. Heightened incidences of simple play behaviours were evident relative to neurotypical controls. Play also developed at a slower rate than children without autism; however, children did demonstrate similar patterns of development. One exception to this trend was the apparent loss of symbolic skill; a phenomenon reported anecdotally by caregivers but observed empirically for the first time.

The findings relating to hypothesis one add to and strengthen the literature base surrounding play in autism and are suggestive of a more complex pattern of deficits than previously assumed (e.g. Baron-Cohen, 1987; Jarrold et al, 1996).

Hypothesis two aimed to explore caregiver play in caregivers of a child with autism for the first time. Systematic differences were revealed; mirroring some of the differences observed in the children with autism. These differences were largely predicted by child play, in line with the notion of a ZPD (Vygotsky, 1978); caregiver play one level ahead that of the child associated positively, however, play that was one step behind the child's current competence associated negatively. These findings indicate that irrespective of child symptomatology, caregivers were able to follow child play and were receptive to current competence.

By focusing specifically on play behaviours rather than notions of sensitivity and the use of caregiver language, this thesis adds to the existing literature base in both typical development and children with autism. Despite the social learning impairment characteristic of autism, children were able to use their

caregiver through play, providing encouraging support for the use of parent led interventions.

The associations between caregiver and child play only held for more advanced forms of play behaviours; simple exploratory play reduced without caregiver input mirroring Piaget's notion of children as 'lone scientists.'

The importance of developmentally appropriate caregiver play emerged as a key recommendation of this thesis. Previous caregiver symbolic play had an inverse effect on child play of this kind in the autism group and contributed to its reduction at T3. It is assumed that this form of play was developmentally too advanced for the children with autism. One possible explanation for this unpredicted finding could be caregivers' awareness of the importance of symbolic play in child development and the known impairments experienced by children with autism.

Attachment was also reduced in children with autism. This difference was not predominantly predicted by caregiver or dyadic behaviours but by the presence or absence of autism symptomatology. The failure to replicate the findings of Naber et al (2008) and Marcu et al (2009) was unexpected; at all three timepoints attachment failed to associate with or predict play differences or change over time. It is assumed with the inclusion of other variables, such as caregiver play and previous child play, attachment fails to exert an influence on child play.

This research made a number of unique contributions to the field of play and attachment in autism. Firstly, play in autism was not characterised by a domain specific impairment in symbolic play. Additionally, attachment failed to exert an independent influence on child play. Caregiver play emerged as a key variable in child play and represents an exciting area to focus future research and intervention

The rigour to which this research was conducted and analysed further strengthen the findings and clinical implications. The CAMPP and statistical methodology add weight to the results and ability to draw conclusions from the data. Given the limitations and caveats that were identified, this thesis

represents one of the most comprehensive yet undertaken in autism and hopefully provides a good base for further research in the area.

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APPENDICES

APPENDIX A: RECRUITMENT AND RETENTION MATERIALS

A.1. Study Poster

The poster has a yellow background decorated with various handprints in white, red, and blue. At the top, it asks "Do you have a child between 1 and 5?" in red text. Below this is a cartoon illustration of a child with black hair, wearing a yellow shirt and blue shorts, sitting on the floor and playing with alphabet blocks (A, B, C). Under the illustration, it asks "Can you help us?" in red text. The main body of text describes the research project, its goals, and the time commitment. It includes a section for contact information with labels for Name, Address, Telephone, and Email. At the bottom right is the PACT logo, which features the word "PACT" in large red letters, a small cartoon character, and the full name of the trial below.

Do you have a child between 1 and 5?

Can you help us?

Researchers from the University of Manchester are investigating the way in which children's play and language develops as part of the Preschool Autism Communication Trial (PACT). We are looking for children without autism aged between 1 and 5 years to participate in our research. We would also like their parents to participate in the study. We are particularly keen to hear from parents of boys, although we would be pleased to hear from parents of both boys and girls.

The study has three parts over the space of one year. Overall it would take 5 hours of your time. We would arrange to see you at a time convenient for you at your home.

For further information please contact:

Name _____

Address _____

Telephone _____

Email _____

PACT
Pre-school Autism
Communication Trial

A.2. Study Leaflet

Do I have to take part?

There is no pressure to take part. We suggest that you read over this information sheet thoroughly and contact us if you are unsure about any of the details. We will then arrange a time that is convenient with you to come and discuss the ins and outs of the study.

If you do agree to take part there will be a consent form for you to sign, which enters you into the study and gives the immediate research team permission to view your recordings.

Parents are free to withdraw at any time without giving a reason and all information regarding you and your child will be destroyed.

Do we get anything for taking part?

Unfortunately, at present we cannot offer you anything for taking part.

* If the researcher has good reason to suspect that you and/or your child are in any immediate danger or risk, this will be discussed with a senior member of staff. If deemed necessary, we are obliged to report evidence to the relevant authority that we suspect you or your child is at risk.

Do I get feedback?

The researcher will provide parents will verbal feedback after the first assessment on their child's development and a written progress report after the study.

The DVDs will also be available if you wish to see them.

What happens next?

If you are interested in taking part in our study, we encourage you to contact Clare Holt (see below for details). The researcher will then arrange a home visit with you to discuss in depth the aims of the research project and the assessments your child will undertake. This will give you an opportunity to answer any questions you have regarding the study

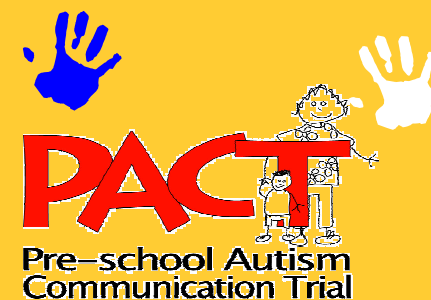
Contact Us:

Name

Addresss

Phone Number

Email




Play, Language and Parent Child Affect in Autism

Researchers at the University of Manchester are currently investigating the way in which parents and children play together and how this relates to language development as part of the Preschool Autism Communication Trial. We are currently looking for children **without** autism aged between 1 and 5 years and their parents to participate in our study.



What are we trying to discover?




Children with autism are known to suffer from impairments in language and social situations. We are currently studying how these language difficulties relate to the way in which children play and how they respond to their parents.

Research suggests that there are differences in the way in which children with and without autism relate to their parents. These differences appear to impact on children's language abilities.

In order to study this further, we need to recruit a sample of children without autism to compare to a group of children with autism.

What are you looking for?



The assessments you and your child undertake will be compared to the assessments of children with autism.

There are no right or wrong answers to what we are studying.



For more information see:

www.manchester.ac.uk/medicine/PACT



We are focusing on:

- Motor and visual skills
- Play
- Language
- How you and your child interact

What will my child and I be asked to do?

If you agree to take part in this study, you and your child will be seen on 3 occasions over the space of 1 year.

You and your child will be asked to play together for 15 minutes. A selection of toys will be provided and this session will be video recorded.

Your child will, in addition, complete a range of tasks, assessing your child's language, motor and visual skills and play.

How long will this take?


Three visits within a thirteen month time frame would be required. The first visit will last approximately 2 hours. The second (after 7 months) will only last 20 minutes. The final visit will last approximately 1 ½ hours




Where will these visits take place?

These visits will take place at your home at times convenient with you and your child.

What if you suspect something is wrong with my child's development?


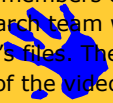


Whilst it is very unlikely, if your child receives extremely low scores for their age on the motor and visual skills and/or language assessments, the researcher will discuss this directly with you.



What will happen to the information collected?

All information and data collected will be strictly confidential*. No names or contact details will be kept with the data therefore you and your child will not be identified from the video files or assessments.



The data will be kept securely on site at the University of Manchester and only members of the immediate research team will have access to your child's files. There will be no further use of the video without gaining your additional consent.

A.3. Letter template for T2 and T3 assessments

Address

Address 2

City

Postcode

Telephone

Email

Date

Caregiver's address

xxxxxxxxxxxxxxxxxx

xxxxxxxxxxxxxxxxxx

xxxxxxxxxxxx

Dear xxxxxxxxxx

xxxxxxx's final assessment for the "Language and Parent-Child Play" study is due in the next 6 weeks. The predicted date of the follow up (**6 or 13** months after my first visit) is the **date**, but I can visit up to two weeks before or two weeks after this date.

This visit involves the two of you playing together as well as the language tasks I completed with xxxxxx when I first came to see you both. The whole assessment should take just under an hour.

I will ring you next week to try and arrange the follow-up visit with you, or feel free to contact me on the above number or email.

Looking forward to seeing you all again.

Yours Sincerely

Clare Holt

PhD Research Student



A.4. Consent form



Play, Language and Parent-Child Affect in Early Autism

Consent Form v.4. 25.03.2008

Please tick and initial box

1. I confirm that I have read and understood the information sheet for the Play, Language and Parent-Child Affect in Early Autism study. I have had the opportunity to ask questions and have had these answered satisfactorily.

☐

2. I understand that both my and my child's participation is voluntary and that I am free to withdraw at any time without reason.

☐

3. I consent to video recording during the assessment and understand that this will be confidential and kept securely. I understand that these videos will only be viewed by the immediate research team for research purposes. N.B. I understand that there is a confidentiality clause, whereby if the researcher suspects that myself and/or my child are in any immediate danger, this violates confidentiality and relevant action will be taken.

☐

4. I understand that data collected during the study may be looked at by authorised members of the PACT research team.

☐

5. I agree to participate in the above study and give my consent for my child to participate.

☐

Name of Child _____

Name of Parent _____

Signature _____ Date _____

Preschool Autism Communication Trial
www.manchester.ac.uk/medicine/PACT

Address
Telephone
Email

APPENDIX B: MEASURES

B.1. Coding and Measurement of Parent-Child Play

CODING SCHEME FOR THE CODING AND MEASUREMENT OF PARENT-CHILD PLAY (CAMPP)

CLARE HOLT (2008): UNIVERSITY OF MANCHESTER, UK.

CHILD PLAY

PLAY COMPLEXITY

Play behaviours are coded using The Observer 7.0 XT. Upon watching a 10-minute section (2 > 12 minutes ideally) of the parent-child free play session, the coder must decide upon the appropriate category of play. Scores will be recorded as time counts; when each behaviour begins the appropriate code is pressed and pressed again when the play behaviour stops or changes. Only one behavioural code can be assigned at any one time, therefore the rater must choose the dominant behaviour, e.g. if the child is mouthing a teacup, the coder must decide if they child is actually mimicking “drinking” from it or is merely mouthing it. For this reason it is recommended that the coder does not code this section on first viewing to avoid assigning inaccurate codes.

SIMPLE MANIPULATION/EXPLORATION — the child engages in sensory-guided manipulation that cannot be coded in any other category (e.g. turns over an object; touch and look at an object). Include in this category behaviours such as looking at toys, banging toys together and behaviours with the sole function of extracting sensory information, such as indiscriminately rolling a car back and forth with no apparent function. Repetitive behaviours of this kind should be coded using a 1.

CAUSE-EFFECT/CONSTRUCTION PLAY - The child plays with toys in a way that involves the intentional extraction of some unique piece of information rather than simple exploration. Behaviours such as stacking cups or pressing buttons on a pop up toy merit this classification.

GAME/DRAWING PLAY – the child alone or with their parent plays a game such as catch, peek-a-boo, drawing, bubbles, tickling or sing-along games.

SIMPLE FUNCTIONAL PLAY – The child displays functional play behaviour using toys or directed towards self, parent or doll. These events however are often short and not advanced enough to be assigned a classification of advanced functional play. There is a clear function to this play rather than simple exploration (E.g., raise cup to lip; turn dial on phone and raise phone receiver to ear; push car down a ramp; cut toy food with toy utensils, pretend to eat toy food). Exclude repetitive and sensory behaviours such as turning the dial on the toy phone in a sensory/repetitive way which may at first appear functional but become apparent that the function is purely sensory.

ADVANCED FUNCTIONAL PLAY – The child displays extended play episodes using toys or directed towards self, parent or doll. Pretence behaviours are made apparent and

episodes are often long and scripted. For example; the child plays with the phone and has a “conversation”; the child cuts up toy food and serves these on plates; the child role plays with the toy cars creating a scenario such as a crash. This extends beyond simple functional play as the child is using their knowledge to construct a scenario with a more complex and structured aim.

SYMBOLIC PLAY — The child uses a "meaningless" object in a creative or imaginative manner (e.g., brush hair with toy food utensils, use toy as a hammer) or uses an object in a pretence act in a way that differs from how it was previously used by the child (e.g., the child uses a knife to “brush teeth” when previously used in its correct form). If the child throws toys repeatedly, this is NOT coded as the child symbolising the object as a ball unless the parent and child are actively engaged in a game of “catch” with e.g. a teacup.

NON PLAY BEHAVIOURS – code as not playing if the child is not playing, e.g. looking at what parent is doing, walking round, rocking, etc. If the child is looking at their parent whilst playing, code the dominant behaviour.

TOY CHOICE

Toy choice is coded using The Observer 7.0 XT (Noldus, 1991). Durations of total toy play and individual toys are calculated during the 10 minute free-play assessments. The child must play with these toys on their own accord, e.g. pick up the toy or take from parent. Do not count toys which the parent “forces” the child to use; for example making them hold a crayon whilst moving their hand on paper is not coded as a frequency for both paper and crayons for the child, but is for the parent. Toy choices are not mutually exclusive therefore the coder is required to keep track of the codes they have assigned as a child can play with more than one toy at one time.

Garage; Teapot; Cups; Saucers; Cutlery; Toy food boxes; Shopping basket; 2 x telephones with pull along cords; Doll; Marble maze; marbles; Stacking cups; Till with money; Pop up toys; 6 x Cars; Plastic food; Plastic food utensils; Bubbles; Jigsaw; Crayons; Paper; Other.

REPETITIVE BEHAVIOURS

The repetitive and restrictive behaviours the child displays during the 10-minute play session are coded using The Observer 7.0 XT as frequency counts. To be counted as a new frequency, the child must stop their repetitive behaviour, change to another activity/behaviour then revert back to the same or new repetitive behaviour. If the child is continuously engaged in their repetitive action but does not change activities, only one frequency count is assigned.

- a. Child arranges toys in rows/patterns/stacks/groups.
- b. Child fiddles with toys or uses toys in an extremely repetitive manner which appears inflexible or lacking in any functional value – e.g. repeatedly spins wheels on car; pushes a car back and forth continuously but does not use functionally; presses button on toys
- c. Child spins/rocks or paces self
- d. Child performs unusual finger or hand mechanisms or flaps/kicks limbs
- e. Child touches parts of body repeatedly

- f. Child has unusual interest in smell, feel, or sounds e.g. routinely smells objects, mouths objects or brings objects very close to ear to hear sounds.
- g. Child is unusually sensitive to sounds or touch.
- h. Child looks at objects from unusual angles and brings/views objects close to their eyes/studies objects.
- i. Child bangs/taps/shakes objects repeatedly.
- j. Child throws/kicks objects.
- k. Child mouths/licks objects.
- l. Child talks with a strange prosody/intonation
- m. Child runs/climbs/jumps

PARENT PLAY

PLAY COMPLEXITY

Parent's level of play is coded in the same way as the child's play using The Observer 7.0 XT. A further category of facilitating play has been included.

SIMPLE MANIPULATION/EXPLORATION — the parent engages in sensory guided manipulation that cannot be coded in any other category (e.g. turns over an object; touch and look at an object). Include in this category behaviours such as looking at toys, banging toys together and behaviours with the sole function of extracting sensory information, such as indiscriminately rolling a car back and forth with no apparent function.

CAUSE-EFFECT/CONSTRUCTION PLAY - The parent plays with toys in a way that involves the intentional extraction of some unique piece of information rather than simple exploration. Behaviours such as stacking cups or pressing buttons on a pop up toy merits this classification.

GAME/DRAWING PLAY – the parent alone or with their child plays a game such as catch, peek-a-boo, drawing, bubbles, tickling or sing-along games. Bubble play is assigned this if the play is ongoing. If the parent is trying to get the child to blow bubbles by demonstrating then saying “you do it”, this is assigned the code of ‘facilitating.’

SIMPLE FUNCTIONAL PLAY – The parent displays functional play behaviour using toys or directed towards self, child or doll. There is a clear function to this play rather than simple exploration (E.g., raise cup to lip; turn dial on phone and raise phone receiver to ear; push car down a ramp; cut toy food with toy utensils). Exclude behaviours such as turning the dial on the toy phone in a sensory way.

ADVANCED FUNCTIONAL PLAY – The parent displays extended episodes of play using toys or directed towards self, child or doll. Pretence behaviours are made apparent and episodes are often long and scripted. For example; the parent plays with the phones and has a “conversation”; the parent cuts up toy food and serves these on plates; the parent role plays with the toy cars creating a scenario such as a crash.

SYMBOLIC PLAY — The parent using a "meaningless" object in a creative or imaginative manner (e.g., brush hair with toy food utensils, use toy as a hammer) or

using an object in a pretense act in a way that differs from how it was previously used (e.g., the child uses a knife to “brush teeth” when previously used in its correct form).

NON PLAY BEHAVIOURS – code if the parent is not playing, e.g. looking at what child is doing, walking round, rocking, etc. If the parent is looking at their child whilst play, code the dominant behaviour.

FACILITATING PLAY – if the parent is demonstrating or encouraging the child to play/play in a particular way, assign this code. These behaviours/actions extend beyond no play as they add something to the interaction by aiding or commenting on the child's actions. Behaviours include naming toys, asking the child questions or helping the child to complete a task/operate a toy. Facilitating behaviours are made apparent by phrases such as “look at this” or “you do it.” Encouraging the child to tidy up does not merit this classification as is not actually encouraging the child to play.

TOY CHOICE

Toy choice is coded using The Observer 7.0 XT. Durations of total toy play and individual toys are calculated during the 10 minute free-play assessments. Toy choices are not mutually exclusive therefore the coder is required to keep track of the codes they have assigned as a parent can play with more than one toy at one time.

Garage; Teapot; Cups; Saucers; Cutlery; Toy food boxes; Shopping basket; two telephones with pull along cords; Doll; Marble maze; marbles; Stacking cups; Till with money; Pop up toys; Cars; Plastic food; Plastic food utensils; Bubbles; Jigsaw; Crayons; Paper; Other.

B.2. Brief Attachment Screening Questionnaire

Encircle the alternative that fits the child best. (In parentheses the inverse is formulated explicitly).

1 = does not fit at all. 7 = fits very well.

1. If held in mother's arms, child stops crying and quickly recovers after being frightened or upset (the child is easily comforted by mother).

1 2 3 4 5 6 7

0 Not enough information

2. When mother says to follow her, child does so (do not count refusals or delays that are playful or part of a game unless they clearly become disobedient).

1 2 3 4 5 6 7

0 Not enough information

3. Child puts his arms around mother or puts his hand on her shoulder when she picks him up (the child is relaxed, feels at ease when he/she is on mother's lap or on her arm).

1 2 3 4 5 6 7

0 Not enough information

4. Child uses mother's facial expressions as good source of information when something looks risky or threatening (the child does not make up his mind without checking mother's expressions first).

1 2 3 4 5 6 7

0 Not enough information

5. Child easily becomes angry at mother (doesn't become angry at mother unless she is very intrusive or the child is very tired).

1 2 3 4 5 6 7

0 Not enough information

6. Child is demanding and impatient with mother. Fusses and persists unless she does what he wants right away,

1 2 3 4 5 6 7

0 Not enough information

7. When mother doesn't do what child wants right away, he behaves as if mom were not going to do it at all (fusses, gets angry, walks off to other activities, etc.). The child does not wait a reasonable time, as if he expects mother will shortly do what he asked.

1 2 3 4 5 6 7

0 Not enough information

8. Child is easily upset when mother makes him change from one activity (even if the new activity is something the child often enjoys).

1 2 3 4 5 6 7

0 Not enough information

B.3. Coding of Attachment-Related Parenting for use with children with Autism (CARP-A): Scheme and record sheet

Coding of Attachment-Related Parenting

- For use with children with autism

(CARP-A)

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1. Sensitive Responding

Responsiveness emphasises the parent's awareness of the child's needs and sensitivity to his/her signals.

Consider here *how* and *when* the parent responds to verbal (if applicable) and/or non-verbal cues elicited by the child during the course of the interaction.

Operationalisation

Examples:

a) Responsiveness to child's verbal (if applicable) or non-verbal seeking-behaviour – This category is used if the child gets “stuck” with the play (non-verbal behaviour), and doesn't know what to do with a certain toy/object, and sends clear behavioural or verbal cues/signals that he/she needs the parent's assistance. An example of these types of cues/signals might be holding out a toy towards the parent and waiting for their response, following the child's struggle to operate it. In these situations, a responsive parent will offer either verbal or instrumental help in a prompt, contingent, warm, supportive, empathic, and/or interested manner;

b) Responsiveness to “lost child's needing-behaviour” – This behaviour relates to situations where there is no clear agenda (e.g. child picks up playdough but doesn't start to play and appears to the observer to need guidance, encouragement or emotional support), and the child doesn't send signals seeking any help from his/her parent, either verbally or non-verbally. This category can be used for any apparent needing situation for the child and, in contrast to 1.a) above, is not immediately task related. In situations where it seems that a caring parent would spontaneously intervene but doesn't do it, the observer will therefore score low in this category, whereas in situations where a parent appears to spontaneously meet the child's needs (e.g. child is unhappy, frustrated, lost and/or hurt), the observer will score high. In these cases, a responsive parent, even without being provided with any signals from child as to how “lost” or needy he/she might be, will still be able to anticipate the child's need for help and will, therefore, offer assistance without being requested to do it.

c) Responsive Engagement - Responsive parents will make enthusiastic comments on child's achievements during play whether or not the child is responsive to the parent. Responsive parents will keep an attentive attitude towards child's activities (note: this attentiveness is more than just looking in child's direction).

d) This attitude on the part of the parent is basically a childfocused one (i.e. the parent focus her attention to what child is doing, “following” the child in his/her activity

because the parent's major motivation is to be immersed in his/her child's activity, thus, keeping a high level of engagement with what his/her child is doing).

e) Sensitive Child Mindedness - Sensitive parents are aware of the child's emotional/affective states and they recognise the child's internal mental state, by using mental state language such as assertions that the child is bored, worried, impressed, or excited. These assertions may also appear in the form of linkages the parent makes between a past event in the child's life that has an obvious relation to the child's current affective state.

f) Responsive Facilitation – responsive parents will perform behaviours and/or make verbalisations in order to respond to child's needs during the task (e.g. despite no signals from child). This is seen in situations where, although child has a clear agenda (i.e. wants to make white clouds with playdough), he/she seems stuck (e.g. doesn't know exactly how to make these clouds) but, nevertheless, will not provide his/her parent with any clear signals (verbal or non-verbal) as to how stuck and needing the parent's assistance he/she is. A responsive and facilitative parent will be able to "pick up" that his/her child is stuck in not knowing what to do in the task, and will provide assistance to child even if not requested to do it (e.g. he/she starts moulding playdough in order to model the white clouds and/or will provide practical advice to child on how to make clouds by himself/herself).

g) Encouraging/Promoting Autonomy – responsive parents will perform behaviours and/or make verbalisations in order to encourage their children to perform actions by themselves. As child manifests his/her efforts in order to achieve his/her aims regarding the task, his/her sense of competence and autonomy will be promoted by an encouraging parent (e.g. in the Lego task, child is trying to stick a piece in order to build the Lego man but it slips off, and parent says: "I know it's hard but I know you can do it!").

h) Warmth – refers to the affectionate style of the parent (i.e. how he/she affectionately acts with his/her child during the interaction). There must be signs of close proximity with the child, caring/loving looks towards the child and encouraging comments. These displays and expressions (physical or verbal) of positive emotion can be exemplified as:

- Parent makes enthusiastic comments and remarks to his/her child such as praise (e.g. Well done!) and encouraging remarks (e.g. I know you can do it!). Again, this is a parent that is affectionate by being alert to what child is doing and praising the child for his/her achievements. Besides these two types of positive verbalisations, we would suggest the integration of further codes such as:
 1. Positive descriptions of the child (e.g. "You are a clever girl");
 2. Parent overtly announces his/her positive feelings about his/her child (e.g. "I love you dear").
 3. Parent's verbalisations express the pleasure he/she has in playing together with her child and/or that he/she is taking pleasure in the child's company (e.g. parent says to child: "I enjoy playing this game with you, dear"; "It's so funny when we do this together"). In other words, this is a parent whose motivation is positive enough to allow him/her to be immersed in his/her child's world and taking pleasure from the experience.
 - Positive facial expressions (directed at child): laughter, smiling, funny faces, etc.
 - Positive bodily gestures (directed at child): hugs, strokes, affectionate squeezes, kissing, affectionate patting, etc.

Scores:

1 – *Unresponsive/Insensitive Parent.*

Note: There has to be: a) clear pervasiveness (i.e. presence for most of the time) of absence of responsive behaviours displayed by the parent as defined above; or b) one modest example of responsiveness against a background of pervasive and intense non-responsiveness. Specific examples are shown below:

a) Parent does not respond to the child's verbal (if applicable) or non-verbal seeking behaviours. Example: child picks up several pieces of Lego, looking at the parent frequently as if trying to make sense of what to do with the several pieces he has picked up and the parent does not make a responsive comment or does not offer responsive instrumental help attuned to the child's needs (e.g. in this case, there is lack of paternal/maternal responsive help so that child can understand what to do with the toys).

b) Disengaged parent. Example: during the play, parent is silent most of the time, is passive towards the play not taking the initiative to interact with the child and, if child chooses to play separately from the parent, the parent will accept this type of "arrangement" keeping himself/herself distanced and dismissed from what the child is doing. On the other hand, the parent can be very talkative but, nevertheless is still unresponsive to child.

c) Absence of Child Mindedness. Example: In a situation where the child shows obvious signs of frustration or boredom with regards to the task in hand, his/her parent does not comment on this emotional state.

d) No Facilitation. Example: The parent does not encourage the child to perform an activity if it's obvious to the observer that the child is able to do it alone. Also, if the child begins to move the play along, the parent will not provide support.

e) No warmth. The parent's affectionate style toward the child is completely neutral. Example: the child presents the parent with a "new" playdough toy that he/she built by his/her own, smiling at the parent at the same time and he/she ignores such warm/enthusiastic behaviour by the child.

2 – *Minimally Responsive/Sensitive Parent.*

Note: The degree of pervasiveness and the degree of intensity (e.g. clear/unambiguous signs of responsiveness) indicates predominantly nonresponsive behaviours toward the child; a '2' differs from a '1' in showing at least two modest examples of responsive behaviours amidst a general pattern of non-responsive behaviours. Example: even if all the above elements constitutive of this dimension of "Responsiveness/Sensitivity" are not present during the entire interaction, this is a parent that was responsively engaged (weak/modest example) at least twice at some point during the play.

3 – Fairly Responsive/Sensitive Parent.

Note: This parent will provide some scattered evidence of responsive behaviours but these won't constitute strong/obvious signs of a responsive attitude. Overall, he/she is more non-responsive than responsive; or he/she shows two strong examples of sensitive responsiveness (e.g. warmth) amidst a strong pattern of insensitive responsiveness.

4 – Somewhat Responsive/Sensitive Parent.

Note: The intensity/frequency in which responsive behaviours are displayed is balanced by the intensity/frequency in which non-responsive behaviours are displayed. Thus, several examples of responsive behaviours will be balanced with several examples of non-responsive behaviours. The overall impression would be that this is a parent that is partly responsive and partly non-responsive; neither style dominates. There is unpredictability and inconsistency in parental responsiveness; or, clear examples of responsive behaviours are offset by clear examples of nonresponsive behaviours. Example: A parent that, albeit showing several signs of warmth toward his/her child, provides several behavioural cues as to how disengaged he/she is regarding his/her child's activity.

5 – Good Responsive/Sensitive Parent.

Note: There is an overall pattern in which responsive behaviours are greater/more prominent than non-responsive behaviours. Thus, the general style is responsive. The examples of responsive behaviours are clear examples and unambiguous. These, however, are offset by modest or infrequent examples of non-responsive behaviours. Example: generally, parent provides child with assistance, facilitates his/her actions and is warm but, even if in fewer instances, he/she also seems disengaged and not child-focused.

6 – Very Good Responsive/Sensitive Parent.

Note: There has to be a consistent pattern where episodes of responsive behaviour are displayed. This is a parent that consistently shows signs of responsiveness as defined above. However, although consistently exhibiting signs of responsiveness, there may be at least one example where responsive behaviour might be expected but is not seen; or, there will be clearer examples of responsive behaviour, but mild evidence of non-responsive behaviour. Example: Parent consistently provides: a) assistance to child's verbal (if applicable) or non-verbal seeking behaviour, b) engagement, c) facilitation and d) warmth.

7 – Extremely Responsive/Sensitive Parent.

Note: This parent must either display all the above criteria or those that are displayed must be extreme manifestations of responsive behaviour. The various types of responsive behaviours are pervasive and completely unambiguous to the observer.

2. Parent's Positive Affect

Displays of positive affect refer to the parent's general positive mood. This is a trait of the parent himself/herself and not just the way in which he/she interacts with his/her child, although this will contribute to the assessment of mood.

Consider here *how* and *when*:

- a) The parent's mood is clearly positive. Thus, he/she seems to be happy. Examples: parent clearly smiles and keeps a "happy face" and seems to be enjoying himself/herself;
- b) Parent shows enthusiasm. The presence of enthusiasm is scored as positive affect where it is clear to the observer that there are signs of "happiness" (e.g. smiles). Therefore, a parent that is enthusiastically engaged in his/her "own" play, but shows flat mood and neglects or ignores his/her child's play, can still score high in positive affect.
- c) There is positive affect conveyed in the way the parent verbally responds to his/her child. Example: the parent will smile or laugh in response to the child's actions, and may make a positive comment about their actions.
- d) Parent's vocal quality/tone of voice conveys positive affect such as: happiness, pleasure, and enthusiasm.

Scores:

1 – No Positive Affect

Note: There has to be clear pervasiveness of absence of positive affect by the parent as defined above. Specific examples are shown below:

- a) Parent's mood is neutral. Example: this parent does not show signs of either being happy or unhappy throughout the interaction. He/she acts like if in an "automaton" type of mood where no signs of positive or negative mood can be picked up. Instead, his/her mood is just absent (e.g. he/she acts like a "robot", no feelings incorporated).
- b) Absence of enthusiasm.
- c) Absence of positive affect in parent's responses to child's overtures.
- d) Absence of parent's vocal quality/tone of voice that conveys positive affect such as: happiness, pleasure, and enthusiasm.

NOTE – The word "absence" is used in the above description as an equivalent to "neutral" affect and not as the equivalent of the opposite to positive affect, which will be negative affect. Thus, a 1 scored-parent in this category is not a parent who displays negative affect towards his/her child. Instead, this is a parent who does not show signs of ANY type of affect, either positive or negative. However, because this is a score incorporated in the "Parent's Positive Affect" dimension of this scale, "neutral affect" here means "absence of behavioural and/or verbal signs of positive affect by the parent".

2 – Minimal Positive Affect.

Note: The degree of pervasiveness and the degree of intensity (e.g. clear/unambiguous signs of positive affect) indicates predominantly lack of positive affect by the parent; a '2' differs from a '1' in showing one or two mild examples of positive affect amidst a general pattern of neutral affect. Example: even if all the above elements constitutive of this dimension of "Positive Affect" are not present during the entire interaction, this is a parent that smiled (weak/modest example) once or twice at some point during the play.

3 – Fairly Positive Affect.

Note: Generally, this parent can be considered as a little bit more neutral in affect rather than showing positive affect. Thus, this parent will provide some scattered evidence of some examples of positive affect but these won't constitute strong evidence of positive affect; or he/she shows two strong examples of positive affect (e.g. laughs) amidst a strong pattern of flat/neutral affect. Therefore, this parent displays positive affect in few instances but overall he/she wasn't providing clearer examples of positive affect.

4 – Somewhat Positive Affect

Note: The intensity/frequency in which positive affect is displayed is balanced by the intensity/frequency in which neutral affect is displayed. Thus, several examples of positive affect will be balanced with several examples of neutral affect. The overall impression would be that this is a parent that partly shows positive affect and partly shows neutral affect. Example: A parent that, albeit smiling several times in response to the child's actions, provides several examples of flat affect.

5 – Good Positive Affect.

Note: There is an overall pattern in which displays of positive affect are greater/more prominent than neutral affect. Generally, there is evidence of positive affect by the parent throughout the interaction. The examples of positive affect are clear examples and unambiguous. These, however, are offset by modest or infrequent examples of neutral affect. Example: generally, parent smiles, has a positive tone of voice and has a positive mood but, even if in fewer instances, he/she also seems to lack enthusiasm. A score of 5 is given when there is clear evidence of spontaneity in parent's positive mood. This is a parent that does not need to be driven in order to show signs of happiness throughout the play interaction. In addition, positive affect is still scored whether or not the parent's positive emotional state is directly related with the play itself.

6 – Very Good Positive Affect.

Note: There has to be a consistent pattern where episodes of positive affect are displayed.

This is a parent that consistently shows signs of positive affect as defined above. However, although consistently exhibiting signs of positive affect, there may be at least one example where positive affect might be expected but is not seen (e.g. child

successfully completes a task and parent doesn't respond with positive affect). Thus, parent consistently shows more intense examples of: a) positive mood, b) enthusiasm, and c) positive tone of voice.

7 – Extreme Positive Affect.

Note: This parent must either display all the above criteria or those that are displayed must be extreme manifestations of positive affect. The presence of positive affect is pervasive and completely unambiguous to the observer.

3. Parent's Negative Affect

Displays of negative affect refer to the parent's general negative mood. This is a trait of the parent himself/herself and not just the way in which he/she interacts with his/her child, although this will contribute to the assessment of mood.

Consider here *how* and *when*:

a) The parent's mood is clearly negative. This can be shown by either:

1. Negative facial expressions: seriousness, frowning, angry faces, etc; and/or:

2. Negative bodily gestures: pulling, slapping, smacking, shaking, keeping distance from child as in avoiding interaction with him/her, etc.

b) Parent shows lack of enthusiasm. This parent is lacking interest/detached/dismissive.

c) Parent is grumpy and/or there is negative affect in his/her overtures (i.e. either parent is critical and/or rejecting). Examples are illustrated below:

1. Parent's verbalisations express the lack of pleasure he/she feels (e.g. "This is boring").

2. Parent makes discouraging comments to child (e.g. I don't think you can do that).

3. Parent makes critical remarks (e.g. You're a silly girl!)

4. Parent overtly announces his/her negative feelings (e.g. "I am angry at you").

5. Threatening comments (e.g. "I'll smack you if you say that again!").

d) Parent's vocal quality/tone of voice conveys negative affect such as: mocking, sarcasm, irritation and hostility.

Scores:

1 – No Negative Affect

Note: There has to be clear pervasiveness of absence of negative affect by the parent as defined above. Specific examples are shown below:

a) Parent's mood is neutral. Example: this parent does not show signs of either being happy or unhappy throughout the interaction. He/she acts like if in an "automaton" type of mood where no signs of positive or negative mood can be picked up. Instead, his/her mood is just absent (e.g. he/she acts like a "robot", no feelings incorporated).

b) Absence of lack of enthusiasm.

c) Absence of negative affect in parent's responses to child (e.g. parent is not critical throughout interaction).

d) Absence of parent's vocal quality/tone of voice that conveys negative affect such as: mocking, sarcasm, irritation and hostility.

NOTE – The word "absence" is used in the above description as an equivalent to "neutral" affect and not as the equivalent of the opposite to negative affect, which will be positive affect. Thus, a 1 scored-parent in this category is not a parent who displays positive affect towards his/her child. Instead, this is a parent who does not show signs of ANY type of affect, either positive or negative. However, because this is a score incorporated in the "Parent's Negative Affect" dimension of this scale, "neutral affect" here means "absence of behavioural and/or verbal signs of negative affect by the parent"

2 – Minimal Negative Affect.

Note: The degree of pervasiveness and the degree of intensity (e.g. clear/unambiguous signs of negative affect) indicates predominantly lack of negative affect by the parent; a '2' differs from a '1' in showing one or two mild examples of negative affect amidst a general pattern of neutral affect. Example: even if all the above elements constitutive of this dimension of "Negative Affect" are not present during the entire interaction, this is a parent that was critical (weak/modest example) once or twice at some point during the play.

3 – Fairly Negative Affect

Note: Generally, this parent can be considered as a little bit more neutral in affect rather than showing negative affect. Thus, this parent will provide some scattered evidence of some examples of negative affect but these won't constitute strong evidence of negative affect; or he/she shows two strong examples of negative affect (e.g. shouts) amidst a strong pattern of neutral affect. Therefore, this parent displays negative affect in few instances but overall he/she wasn't providing clearer examples of negative affect.

4 – Somewhat Negative Affect

Note: The intensity/frequency in which negative affect is displayed is balanced by the intensity/frequency in which neutral affect is displayed. Thus, several examples of negative affect will be balanced with several examples of neutral affect. The overall impression would be that this is a parent that partly shows negative affect and partly shows neutral affect. Example: A parent that, albeit having a negative tone of voice several times when talking, provides several examples of flat affect.

5 – Fair Amount of Negative Affect.

Note: There is an overall pattern in which displays of negative affect are greater/more prominent than neutral affect. Generally, there is evidence of negative affect by the parent throughout the interaction. The examples of negative affect are clear examples and unambiguous. These, however, are offset by modest or infrequent examples of neutral affect. Example: generally, parent is critical, has a negative tone of voice and has negative mood but, even if in fewer instances, he/she also seems enthusiastic. A score of 5 is given when there is clear evidence of spontaneity in parent's negative mood. This is a parent that does not need to be driven in order to show signs of irritability, detachment throughout the play interaction. In addition, negative affect is still scored whether or not the parent's negative emotional state is directly related with the play itself.

6 – Very Negative Affect

Note: There has to be a consistent pattern where episodes of negative affect are displayed. This is a parent that consistently shows signs of negative affect as defined above. However, although consistently exhibiting signs of negative affect, there may be at least one example where negative affect might be expected but is not seen. Example: Parent consistently shows: a) negative mood, b) lack of enthusiasm, c) negative tone of voice but will not exhibit signs of criticism/rejection during the interaction.

7 – Intense Negative Affect

Note: This parent must either display all the above criteria or those that are displayed must be extreme manifestations of negative affect. The presence of negative affect is pervasive and completely unambiguous to the observer.

4. Child's Positive Affect

Displays of positive affect refer to the child's general positive mood. This is a trait of the child himself/herself and not just the way in which he/she interacts with his/her parent, although this will contribute to the assessment of mood.

Consider here *how* and *when*:

- a) The child's mood is clearly positive. Thus, he/she seems to be happy. Examples: child clearly smiles and keeps a "happy face".
- b) Child is enthusiastic. The presence of enthusiasm is scored as positive affect where it is clear to the observer that there are signs of "happiness" (e.g. smiles). Therefore, a child that is enthusiastically engaged in a different task rather than in playing with his/her parent, can still score high in positive affect.
- c) There is positive affect conveyed in the way child responds directly to his/her parent. Example: if parent introduces a game that the child enjoys, child will laugh and/or smile during it.
- d) Child's vocal quality/tone of voice (including vocalisations) conveys positive affect such as: happiness, pleasure, and enthusiasm.

Scores:

1 – No Positive Affect

Note: There has to be clear pervasiveness of absence of positive affect by the child as defined above. Specific examples are shown below:

- a) Child's mood is neutral. Example: this child does not show signs of either being happy or unhappy throughout the interaction. He/she acts like if in an "automaton" type of mood where no signs of positive or negative mood can be picked up. Instead, his/her mood is just absent (e.g. he/she acts like a "robot", no feelings incorporated)
- b) Absence of enthusiasm
- c) Absence of positive affect in child's responses to parent's overtures.
- d) Absence of child's vocal quality/tone of voice that conveys positive affect such as: happiness, pleasure, and enthusiasm.

NOTE – The word "absence" is used in the above description as an equivalent to "neutral" affect and not as the equivalent of the opposite to positive affect, which will be negative affect. Thus, a 1 scored-child in this category is not a child who displays negative affect towards his/her parent. Instead, this is a child who does not show signs of ANY type of affect, either positive or negative. However, because this is a score incorporated in the "Child's Positive Affect" dimension of this scale, "neutral affect" here means "absence of behavioural and/or verbal signs of positive affect by the child".

2 - Minimal Positive Affect.

Note: The degree of pervasiveness and the degree of intensity (e.g. clear/unambiguous signs of positive affect) indicates predominantly lack of positive affect by the child; a '2' differs from a '1' in showing one or two mild examples of positive affect amidst a general pattern of neutral affect. Example: even if all the above elements constitutive of this dimension of "Positive Affect" are not present during the entire interaction, this is a child that smiled (weak/modest example) once or twice at some point during the play.

3 – Fairly Positive Affect.

Note: Generally, this child can be considered as a little bit more neutral in affect rather than showing positive affect. Thus, this child will provide some scattered evidence of some examples of positive affect but these won't constitute strong evidence of positive affect; or child shows two strong examples of positive affect (e.g. laughs) amidst a strong pattern of neutral affect. Therefore, this child displays positive affect in few instances but overall he/she wasn't providing clearer examples of positive affect.

4 – Somewhat Positive Affect

Note: The intensity/frequency in which positive affect is displayed is balanced by the intensity/frequency in which neutral affect is displayed. Thus, several examples of

positive affect will be balanced with several examples of neutral affect. The overall impression would be that this is a child that partly shows positive affect and partly shows neutral/flat affect. Example: A child that, albeit smiling several times at his/her parent's actions, provides several examples of neutral affect.

5 – Good Positive Affect.

Note: There is an overall pattern in which displays of positive affect are greater/more prominent than neutral affect. Generally, there is evidence of positive affect by the child throughout the interaction. The examples of positive affect are clear examples and unambiguous. These, however, are offset by modest or infrequent examples of neutral affect. Example: generally, child smiles, has a positive tone of voice and has positive mood but, even if in fewer instances, he/she also seems to lack enthusiasm. A score of 5 is given when there is clear evidence of spontaneity in child's positive mood. This is a child that does not need to be driven in order to show signs of happiness, bubblyness throughout the play interaction. In addition, positive affect is still scored whether or not the child's positive emotional state is directly related with the play itself.

6 – Very Good Positive Affect.

Note: There has to be a consistent pattern where episodes of positive affect are displayed.

This is a child that consistently shows signs of positive affect as defined above. However, although consistently exhibiting signs of positive affect, there will be at least one example where positive affect might be expected but is not seen, even though he/she has been given the opportunity to do so (e.g. parent repeats an action that previously elicited a positive response and child doesn't respond with positive affect). Thus, child consistently shows: a) positive mood, b) enthusiasm, c) positive tone of voice but, on one non-trivial occasion, will not respond to his/her parent's overtures in a way that conveys positive affect/happiness.

7 – Extreme Positive Affect

Note: This child must either display all the above criteria or those that are displayed must be extreme manifestations of positive affect. The presence of positive affect is pervasive and completely unambiguous to the observer.

5. Child's Negative Affect

Displays of negative affect refer to the child's general negative mood. This is a trait of the child himself/herself and not just the way in which he/she interacts with his/her parent, although this will contribute to the assessment of mood.

Consider here *how* and *when*:

- a. The child's mood is clearly negative. This can be shown by either:
 1. Negative facial expressions: seriousness, frowning, angry faces, etc; and/or:

2. Negative bodily gestures: pulling, slapping, smacking, shaking, keeping distance from the parent as in avoiding interaction with him/her, etc.
- b. Child lacks enthusiasm. This child is disinterested/detached.
- c. Child shows negative affect in her responses to his/her parent.
Example: if parent introduces a new game, child reacts negatively either vocally or behaviourally, even if the game is one that the child typically enjoys.
- d. Child's vocal quality/tone of voice (including vocalisations) conveys negative affect such as: agitation, opposition, and irritation.

Scores:

1 – No Negative Affect

Note: There has to be clear pervasiveness of absence of negative affect by the child as defined above. Specific examples are shown below:

- a) Children's mood is neutral. Example: this child does not show signs of either being happy or unhappy throughout the interaction. He/she acts like if in an "automaton" type of mood where no signs of positive or negative mood can be picked up. Instead, his/her mood is just absent, (e.g. he/she acts like a "robot", no feelings incorporated).
- b) Absence of lack of enthusiasm.
- c) Absence of negative affect in child's responses to his/her parent.
- d) Absence of child's vocal quality/tone of voice (including vocalisations) that conveys negative affect such as: agitation, opposition, and irritation.

NOTE – The word "absence" is used in the above description as an equivalent to "neutral" affect and not as the equivalent of the opposite to negative affect, which will be positive affect. Thus, a 1 scored-child in this category is not a child who displays positive affect towards his/her parent. Instead, this is a child who does not show signs of ANY type of affect, either positive or negative. However, because this is a score incorporated in the "Child's Negative Affect" dimension of this scale, "neutral affect" here means "absence of behavioural and/or verbal signs of negative affect by the child".

2 - Minimal Negative Affect.

Note: The degree of pervasiveness and the degree of intensity (e.g. clear/unambiguous signs of negative affect) indicates predominantly lack of negative affect by the child; a '2' differs from a '1' in showing one or two mild examples of negative affect amidst a general pattern of neutral affect. Example: even if all the above elements constitutive of this dimension of "Negative Affect" are not present during the entire interaction, this is a child that kept physical distance from the parent (weak/modest example) once or twice at some point during the play.

3 - Fairly Negative Affect

Note: Generally, this child can be considered as a little bit more neutral in affect rather than showing negative affect. Thus, this child will provide some scattered evidence of some examples of negative affect but these won't constitute strong evidence of negative affect; or child shows two strong examples of negative affect (e.g. whining tone of voice) amidst a strong pattern of neutral affect. Therefore, this child displays negative affect in few instances but overall he/she wasn't providing clearer examples of negative affect.

4 – Somewhat Negative Affect

Note: The intensity/frequency in which negative affect is displayed is balanced by the intensity/frequency in which neutral affect is displayed. Thus, several examples of negative affect will be balanced with several examples of neutral affect. The overall impression would be that this is a child that partly shows negative affect and partly shows neutral affect. Example: A child that, albeit having a negative tone of voice several times, provides several examples of flat affect.

5 – Fair Amount of Negative Affect.

Note: There is an overall pattern in which displays of negative affect are greater/more prominent than neutral affect. Generally, there is evidence of negative affect by the child throughout the interaction. The examples of negative affect are clear examples and unambiguous. These, however, are offset by modest or infrequent examples of neutral affect. Example: generally, child conveys negative affect in responses to parent, has a negative tone of voice and has negative mood but, even if in fewer instances, he/she also seems to be enthusiastic. A score of 5 is given when there is clear evidence of spontaneity in child's negative mood. This is a child that does not need to be driven in order to show signs of irritability, detachment throughout the play interaction. In addition, negative affect is still scored whether or not the child's negative emotional state is directly related with the play itself.

6 – Very Negative Affect

Note: There has to be a consistent pattern where episodes of negative affect are displayed. This is a child that consistently shows signs of negative affect as defined above. However, although consistently exhibiting signs of negative affect, there will be at least one example where negative affect is expected but not seen. Example: child consistently shows: a) negative mood, b) lack of enthusiasm, c) negative tone of voice but will not exhibit signs of negative affect in direct response to parent's actions on one occasion.

7 - Intense Negative Affect

Note: This child must either display all the above criteria or those that are displayed must be extreme manifestations of negative affect. The presence of negative affect is pervasive and completely unambiguous to the observer.

6. Mutuality

This code is a dyadic-based one. The intention is to code the quality of the interaction between parent and child but seeing both of them as a unique feature of the relationship (i.e. parent and child interacting are not separate things!)

Major behavioural cues to look at when trying to code mutuality would be:

- a. Acceptance of parental involvement in play. It has to be clear to the observer that as the child plays with the toys, he/she will feel comfortable if the parent gets involved in play.;
- b. Parent and child play together, instead of playing separately as a parallel activity. Both partners are actively involved in the play. This contrasts with an interaction where each partner plays separately, or where one partner passively observes the play;
- c. Shared attention. There is mutual sharing of a topic or focus between parent and child. This can involve sharing actions, feelings, experiences, games or objects, but it must involve a reference to the person and the object by looking, showing, giving, body orientation, or some other acknowledgement of the other's focus. There must be a sense of 'togetherness' during play. Note that this can still occur in the absence of clear and appropriate eye contact.
- d. Appropriate Positive Affect-matching: e.g. if child looks at the parent smiling, the parent reciprocates this same behaviour immediately or with a complementary behaviour such as smoothly patting the child in the head;
- e. Flow of the interaction. It will appear to the observer that the interaction flows smoothly and naturally, at a steady and relaxed pace. This contrasts with a stilted interaction, which appears awkward or somewhat forced.
- f. Coordinated/Shared Body Orientation: parent and child keep closeness to each other, their bodies are coordinated/oriented towards one another during the activity. They don't seem to "go or stay somewhere else" separately (e.g. parent and child are facing one another closely enough in order to exchange necessary amount of toys in order to build something, instead of having a parent seated in a sofa and distant from child while the latter is on the floor not even facing the parent while playing).

Scores

1 – *No Mutuality.*

Note: There has to be clear pervasiveness of absence of mutual behaviours elicited by the dyad as defined above. Specific examples are shown below:

- a. Child does not accept the parent's involvement in play. Child is ill at ease with parental involvement in play throughout the interaction.
- b. There is no joint play. Example: once parent and child start playing at a separate level, they will continue playing separately as if doing a parallel activity.
- c. No shared attention. There is no sense of togetherness and no acknowledgement of the other's focus of attention.

- d. No Appropriate Positive Affect-matching: e.g. if child looks at the parent smiling, the parent does not reciprocate with the same or a complementary behaviour.
- e. The interaction does not flow. As parent and child play, it appears stilted and awkward to the observer.
- f. No Coordinated/Shared Body Orientation: parent and child keep a distance between themselves, their bodies are not co-ordinated and/or oriented towards one another during the activity. They seem to “go or stay somewhere else” separately (e.g. while parent is seated facing the child this one is facing backwards to parent and stands up several times if distracted).

2 - Minimal Mutuality.

Note: There is pervasive non-mutuality, but slight evidence of mutuality (whereas a ‘1’ is a total absence of Mutuality, ‘2’ is scored when there is at least one clear but modest example). There are several examples of what constitutes ‘minimal’; in general, each example indicates that the dyad provides slight evidence that they are working together or otherwise show some slight connection/interdependence with each other. That may be expressed in terms of *cooperating with one another* in order to reach a common goal, [NB: although this scale is not about the dyad’s ability to reach a goal as such; instead, it

is *how* they work together in reaching the goal, cooperatively versus in a parallel manner]. For example, the dyad might exchange/share play pieces on 1-2 occasions but otherwise either not engage with one another or engage in a non-mutual way (e.g., intrusive, parent-centred manner). That is, there is a clear instance in which the dyad has a reciprocal interchange. There are other instances in which a ‘2’ may be coded: any instance in which there is brief, modest, and/or minimal evidence of one of the indicators of mutuality as set out in the definition.

3 - Fair Mutuality.

Note: Generally, this dyad is more non-mutual than mutual. Thus, this dyad will provide scattered evidence (i.e., 3 or more clear but modest examples) of mutual behaviours; or, there is somewhat better than scattered evidence/modest examples of mutuality but there are also several clear examples of strong non-mutual behaviours (parent self-centred play, shunning the other’s involvement or suggestion). Example: Although there are several (3-plus) occasions where parent and child play together, both parent and child typically play “separately” from or parallel to one another, doing different things throughout the interaction.

4 - Medium Mutuality.

Note: The intensity/frequency in which mutual behaviours are displayed is balanced by the intensity/frequency in which non-mutual behaviours are displayed. Thus, several examples of mutual behaviours will be balanced with several examples of non-mutual behaviours. The overall impression would be that this is a dyad that is partly behaving mutually and partly behaving non-mutually. Example: A dyad that, albeit showing several signs of positive shared affect, provides several behavioural

cues as to how both parent and child play at a separate/parallel level, where no joint play takes place during the interaction.

5 – Good Mutuality.

Note: There has to be an overall pattern where more mutual behaviours are displayed than non-mutual behaviours. Thus, the general style is mutual. These examples of mutual behaviours provide strong evidence of mutuality. However, there are also modest signs of non-mutual behaviours. Example: generally, child accepts parental involvement in play, joint play, positive affect-matching and shared-attention but, even if in fewer instances, the dyad also has difficulties in maintaining the flow of the interaction, and in keeping a coordinated/shared body orientation.

6 – Very Good Mutuality.

Note: There has to be a consistent pattern where episodes of mutual behaviour are displayed. This is a dyad that consistently shows signs of mutuality as defined above. However, although consistently exhibiting signs of mutuality, there will be at least one example where mutual behaviour is expected but not seen; or despite pervasive and clear evidence of mutuality, there is a slight indication of non-mutuality. Example: dyad consistently shows: a) child acceptance of parental involvement, b) joint play, c) shared attention, d) positive affect-matching, e) coordinated/shared body orientation but the dyad has difficulties in maintaining the flow of the interaction.

7 – Extreme Mutuality.

Note: This dyad must either display all the above criteria or those mutual behaviours that are displayed must be extreme manifestations of mutuality. The various types of mutual behaviours are pervasive and completely unambiguous to the observer.

CARP-A Score Sheet

Participant:

Date:

Rater:

1) Sensitive responding

Score:

Comments:

2) Parent positive affect

Score:

Comments:

3) Parent negative affect

Score:

Comments:

4) Child positive affect

Score:

Comments:

5) Child negative affect

Score:

Comments:

6) Mutuality

Score:

Comments:

APPENDIX C: MATERIALS

C.1. Toys used in CAMPP

Garage

Cars

Teaset

Doll

Toy food boxes

Plastic food and utensils

Shopping basket and cash register

2 x telephones with pull along cord

Marble maze and marbles

Pop-up toy

Stacking cups

Bubbles

Crayons and Paper

Jigsaw

APPENDIX D: STATISTICAL METHODOLOGY

D.1 Example of statistical methodology used to explore between-group differences

Statistical transformations were required to explore play differences between the two groups of children and their caregivers. The following example works through the analysis exploring T1 play differences to demonstrate the methodology used.

Time One Child Play Complexity

Tables 85 to 91 report the ANCOVAs conducted to explore between group differences in T1 child play complexity. All analysis controlled for chronological age and IMD score.

Table 97: ANCOVA for T1 Simple Exploratory Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4878.877 ^a	3	1626.292	5.451	.002
Intercept	6939.661	1	6939.661	23.259	.000
Age At T1	3083.262	1	3083.262	10.334	.002
IMD Score	432.834	1	432.834	1.451	.232
Group	3889.746	1	3889.746	13.037	.001
Error	26554.659	89	298.367		
Total	60713.170	93			
Corrected Total	31433.536	92			

Dependent Variable: T1 Simple Play Percentage

a. R Squared = .155 (Adjusted R Squared = .127)

Table 98: ANCOVA for T1 Cause and Effect Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1561.393 ^a	3	520.464	1.577	.201
Intercept	6974.466	1	6974.466	21.129	.000
Age At T1	1202.090	1	1202.090	3.642	.060
IMD Score	10.960	1	10.960	.033	.856
Group	161.197	1	161.197	.488	.486
Error	29378.410	89	330.094		

Total	82832.786	93			
Corrected Total	30939.803	92			

Dependent Variable: T1 Cause and Effect Percentage

a. R Squared = .050 (Adjusted R Squared = .018)

Table 99: ANCOVA for Game and Bubble Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	387.279 ^a	3	129.093	2.073	.109
Intercept	312.681	1	312.681	5.021	.028
Age At T1	22.675	1	22.675	.364	.548
IMD Score	234.891	1	234.891	3.772	.055
Group	183.938	1	183.938	2.954	.089
Error	5542.716	89	62.278		
Total	7232.163	93			
Corrected Total	5929.995	92			

Dependent Variable: T1 Game and Bubble Percentage

a. R Squared = .065 (Adjusted R Squared = .034)

Table 100: ANCOVA for Simple Functional Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3126.386 ^a	3	1042.129	2.989	.035
Intercept	1465.462	1	1465.462	4.203	.043
Age At T1	124.326	1	124.326	.357	.552
IMD Score	10.237	1	10.237	.029	.864
Group	1998.286	1	1998.286	5.731	.019
Error	31032.292	89	348.677		
Total	79874.326	93			
Corrected Total	34158.678	92			

Dependent Variable: T1 Simple Functional Percentage

a. R Squared = .092 (Adjusted R Squared = .061)

Table 101: ANCOVA for Advanced Functional Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7366.444 ^a	3	2455.481	11.969	.000
Intercept	3243.414	1	3243.414	15.810	.000

Age At T1	6587.707	1	6587.707	32.111	.000
IMD Score	3.362	1	3.362	.016	.898
Group	6090.436	1	6090.436	29.687	.000
Error	18258.684	89	205.154		
Total	31371.783	93			
Corrected Total	25625.128	92			

Dependent Variable: T1 Advanced Functional Percentage

a. R Squared = .287 (Adjusted R Squared = .263)

Table 102: ANCOVA for Symbolic Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.009 ^a	3	.336	.351	.788
Intercept	.589	1	.589	.616	.435
Age At T1	.003	1	.003	.003	.955
IMD Score	.396	1	.396	.414	.522
Group	.442	1	.442	.462	.499
Error	85.178	89	.957		
Total	91.237	93			
Corrected Total	86.187	92			

Dependent Variable: T1 Symbolic Percentage

a. R Squared = .012 (Adjusted R Squared = -.022)

Table 103: ANCOVA for No Play Between Children with Autism and Neurotypical Controls.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2771.239 ^a	3	923.746	4.584	.005
Intercept	2987.230	1	2987.230	14.825	.000
Age At T1	4.631	1	4.631	.023	.880
IMD Score	85.839	1	85.839	.426	.516
Group	1159.680	1	1159.680	5.755	.019
Error	17933.081	89	201.495		
Total	76571.025	93			
Corrected Total	20704.320	92			

Dependent Variable: T1 No Play Percentage

a. R Squared = .134 (Adjusted R Squared = .105)

As shown in tables 85 to 91, four significant differences were found between the two groups; children with autism spent more time engaged in simple exploratory play ($F = 13.04, p < .01$) however this was a function of age ($F = 10.33, p < .01$). Children with autism also spent more time not actively playing ($F = 5.75, p = .02$) and less time engaged in simple functional ($F = 5.73, p = .02$) and advanced functional play ($F = 29.69, p < .01$). The difference between the two groups on advanced functional play was not independent of age ($F = 32.11, p < .01$).

The non-significant variables (Cause and Effect, Game and Bubble and Symbolic) were grouped together within SPSS and named “T1 Child Play Reference Point.” The four variables that produced a significant group difference were then compared to this reference point to ensure they were statistically different.

Table 104: Paired sample T-tests between T1 child play complexity and T1 reference point

	Mean	Std. deviation	t	df	Sig (2-tailed)
T1 Simple Exploratory - T1 Reference	17.74 27.59	18.48 19.08	-3.76	92	.00
T1 Simple Functional - T1 Reference	22.17 27.59	19.27 19.08	-1.60	92	.11
T1 Advanced Functional - T1 Reference	7.86 27.59	16.69 19.08	-6.48	92	.00
T1 No Play - T1 Reference	24.51 27.59	15.00 19.08	-1.23	92	.22

As shown in table 92, simple functional and no play were not different from the T1 Child Play Reference therefore were not included further in the analysis. T1 simple exploratory and advanced functional play were transformed using the formula reported in section 7.5.1 and below;

$$Y1 = \ln \left\{ \frac{x1 + 1}{xR + 1} \right\}, Y2 = \ln \left\{ \frac{x2 + 1}{xR + 1} \right\}, Y3 = \left\{ \frac{x3 + 1}{xR + 1} \right\} \dots$$

For simple exploratory play \ln refers to the log ratio transformation function within SPSS. $x1$ is simple exploratory play and xR the T1 Child Play Reference Point. For advanced functional play, the formula was the same except simple

exploratory play is replaced with this variable. The transformed variables were included in the SPSS database and labelled T1 Simple Exploratory Transformed and T1 Advanced Functional Transformed.

The same technique was followed at T2 and T3 for child play and at all time points for caregiver play. All subsequent analysis used the transformed variables were appropriate.

D.2. Example of statistical methodology used to explore between-timepoint differences

Further statistical transformations were required to explore play change over time. These were only conducted for child play and the two groups were analysed separately. The following example uses play change between T1 and T2 in the children with autism to demonstrate the methodology used.

Change Between T1 and T2: Children with Autism

Paired sample t-tests were conducted between T1 and T2 play percentages (original scores not transformed data). These are reported in table 93.

Table 105: Paired sample t-tests between T1 and T2 play complexities:

Children with Autism

	Mean	Std. Deviation	t	df	Sig (2-tailed)
T2 Simple Exploratory – T1 Simple Exploratory	8.77 21.48	9.44 20.56	-4.65	48	.000
T2 Cause & Effect – T1 Cause & Effect	22.61 21.76	20.66 16.33	.31	48	.755
T2 Game & Bubble – T1 Game & Bubble	7.74 4.83	14.08 9.12	1.47	48	.148
T2 Simple Functional – T1 Simple Functional	20.09 16.80	21.03 15.73	1.14	48	.261
T2 Advanced Functional – T1 Advanced Functional	11.04 5.12	25.25 12.91	2.95	48	.005
T2 Symbolic – T1 Symbolic	1.46 .31	4.21 1.22	1.99	48	.052
T2 No Play – T1 No Play	28.44 29.60	17.15 16.86	-.42	48	.673

Two significant differences were found between T1 and T2; Simple exploratory play reduced ($t = -4.65$, $p < .01$) and advanced functional play increased ($t = 2.95$, $p < .01$). These variables were transformed using the method described in section 7.5.1 and formula below;

$$y1 = \ln\left\{\frac{x2+1}{x1+1}\right\}, y2 = \ln\left\{\frac{w2+1}{w1+1}\right\} etc..$$

For T1-T2 simple exploratory change, x2 refers to simple exploratory play at T2, and x1 to simple exploratory play at T1. ln refers to the log ratio transformation performed in SPSS. y1 is the new variable created which was labelled T1 to T2 Simple Exploratory Change – Autism. The new variable was used in all subsequent analysis predicted play change.

APPENDIX E: DISTRIBUTION OF PLAY COMPLEXITY

E.1. Distributions of child play complexity at T1 - Original percentages

Figure 12: Histogram of mean T1 child simple exploratory play percentages

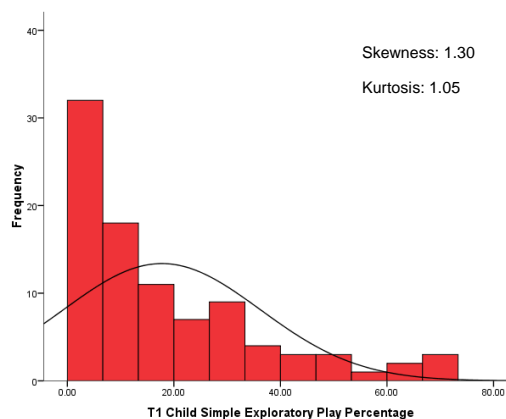


Figure 13: Histogram of mean T1 child cause and effect play percentages

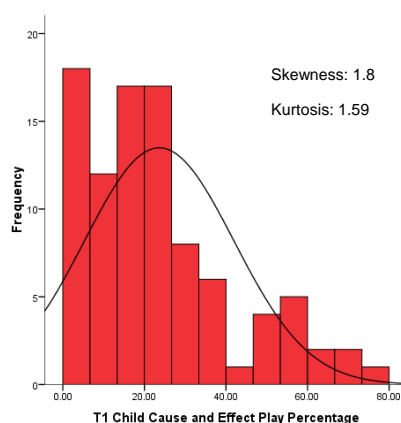


Figure 14: Histogram of mean T1 child game and bubble play percentages

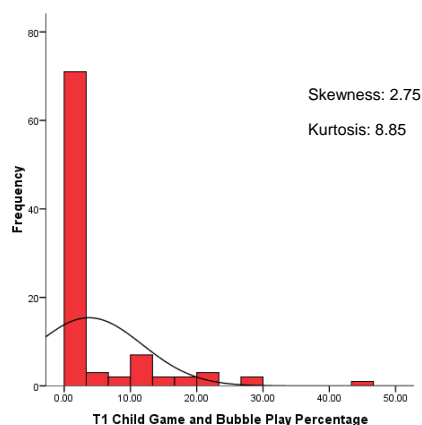


Figure 15: Histogram of mean T1 child simple functional play percentages

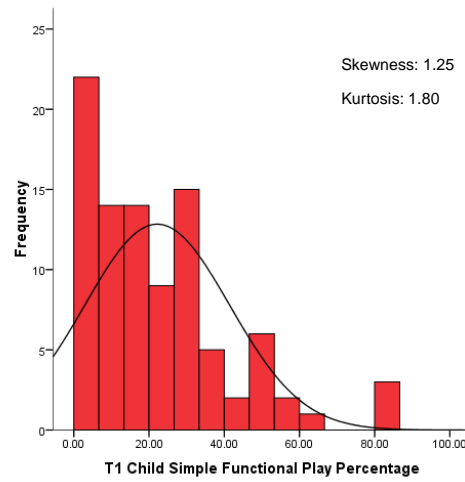


Figure 16: Histogram of mean T1 child advanced functional play percentages

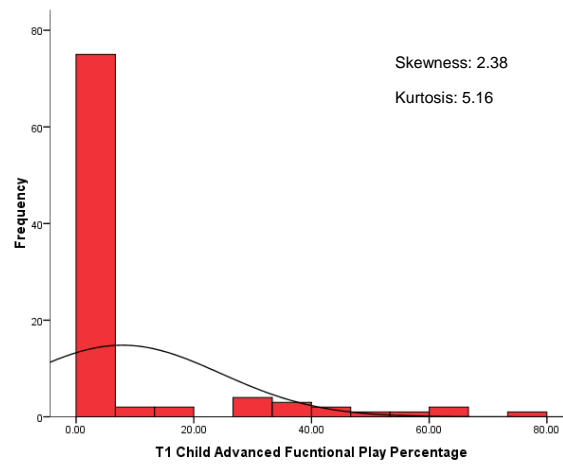


Figure 17: Histogram of mean T1 child symbolic play percentages

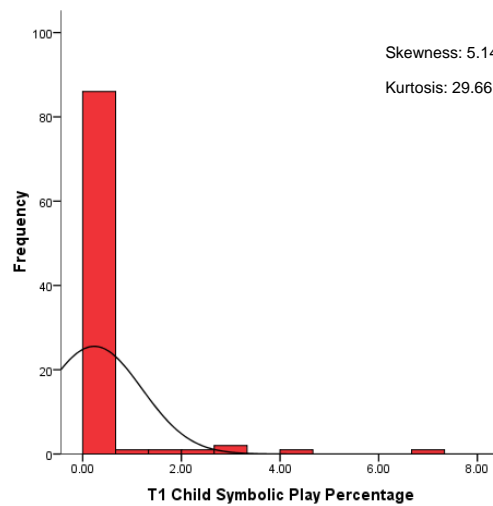
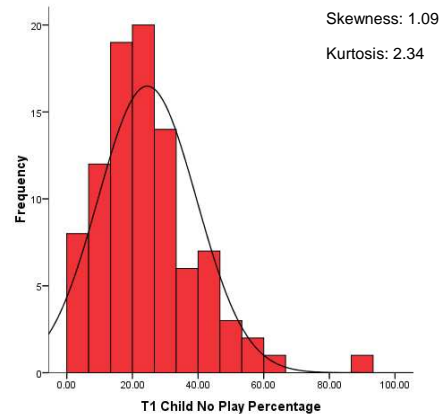


Figure 18: Histogram of mean T1 child no play percentages



E.2. Distributions of child play complexity at T1 - Transformed variables

Figure 19: Histogram of mean T1 child simple exploratory play - transformed

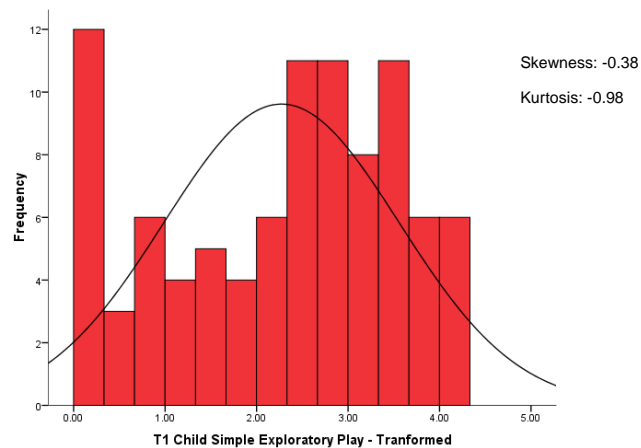
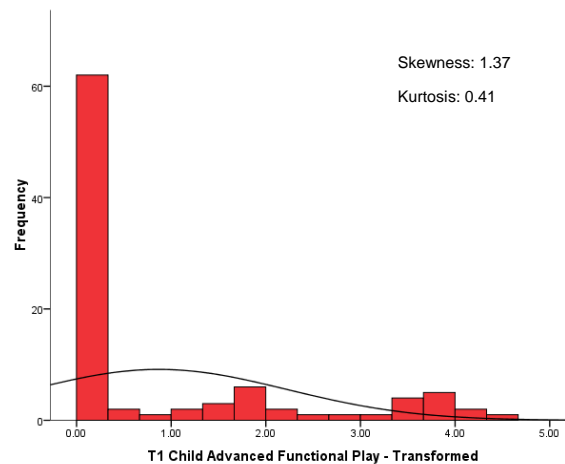


Figure 20: Histogram of mean T1 child advanced functional play - transformed



E.3. Distributions of caregiver play complexity at T1 - Original percentages

Figure 21: Histogram of mean T1 caregiver simple exploratory play percentages

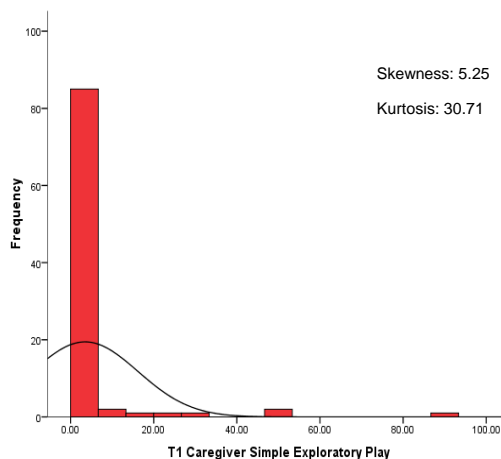


Figure 22: Histogram of mean T1 caregiver cause and effect play percentages

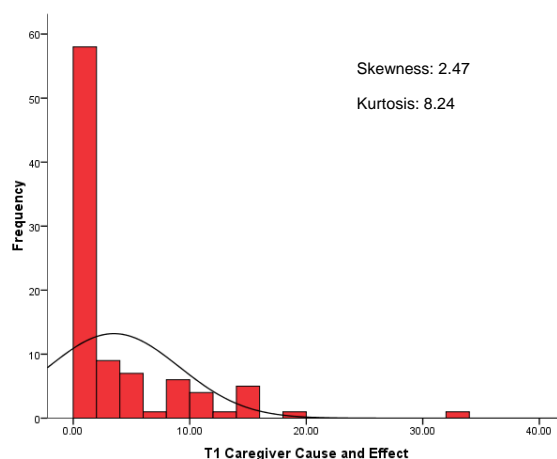


Figure 23: Histogram of mean T1 caregiver game and bubble play percentages

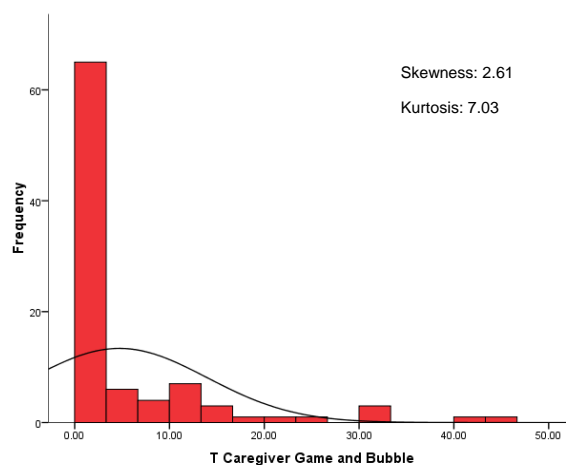


Figure 24: Histogram of mean T1 caregiver simple functional play percentages

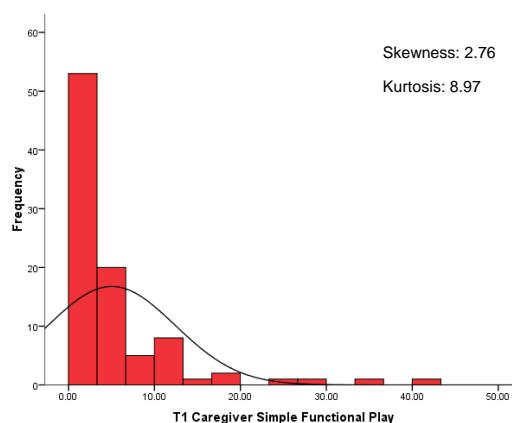


Figure 25: Histogram of mean T1 caregiver advanced functional play percentages

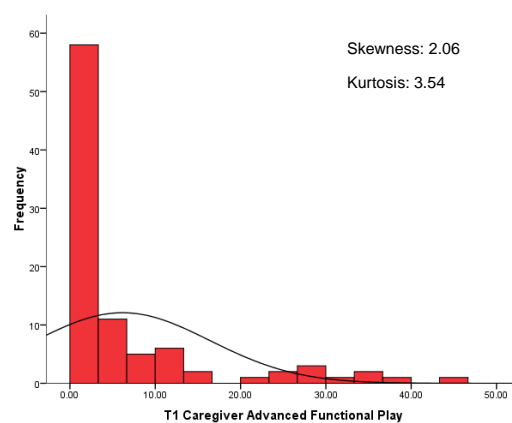


Figure 26: Histogram of mean T1 caregiver symbolic play percentages

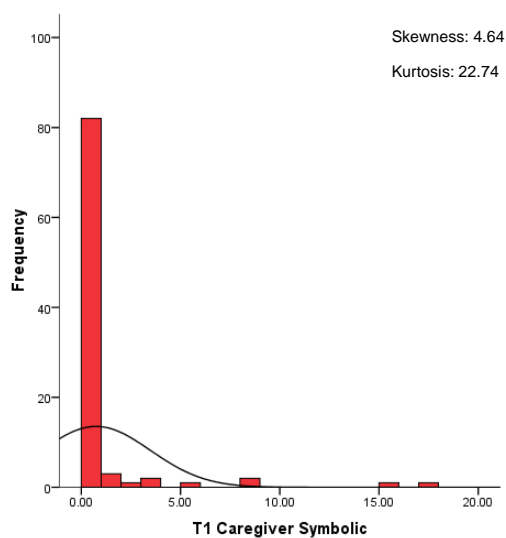


Figure 27: Histogram of mean T1 caregiver facilitating percentages

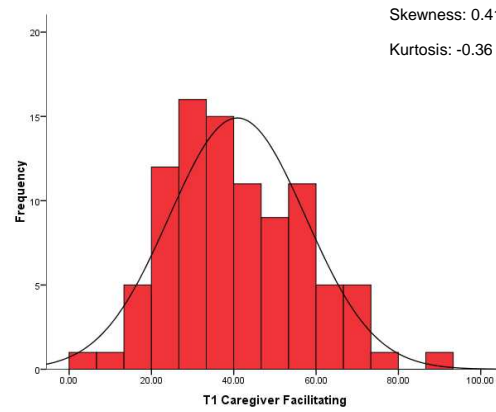
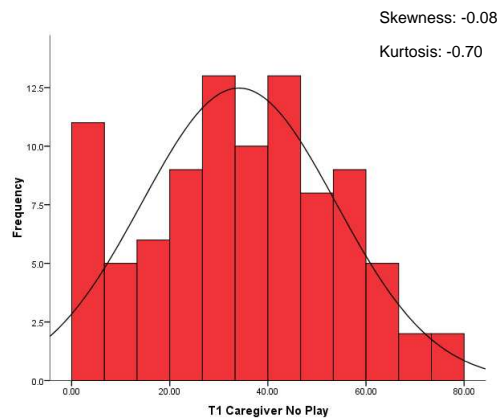


Figure 28: Histogram of mean T1 caregiver no play percentages



E.4. Distributions of caregiver play complexity at T1 - Transformed

Figure 29: Histogram of mean T1 caregiver cause and effect play - transformed

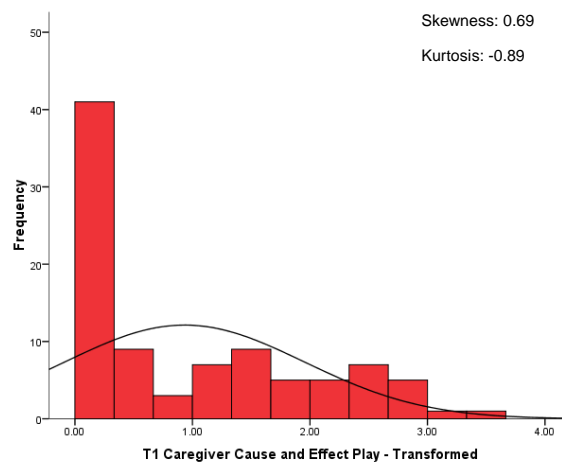


Figure 30: Histogram of mean T1 caregiver game and bubble play - transformed

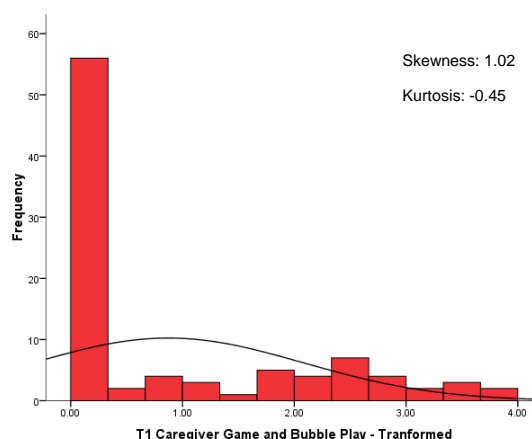


Figure 31: Histogram of mean T1 caregiver simple functional play - transformed

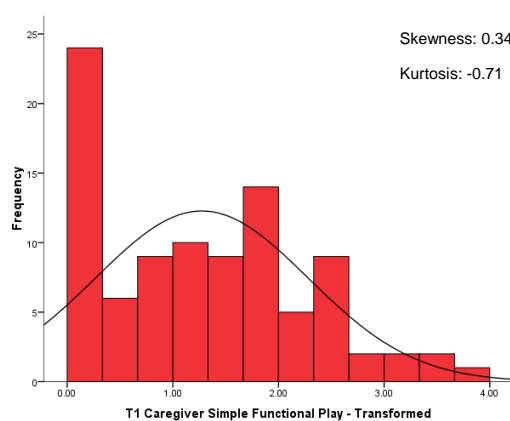
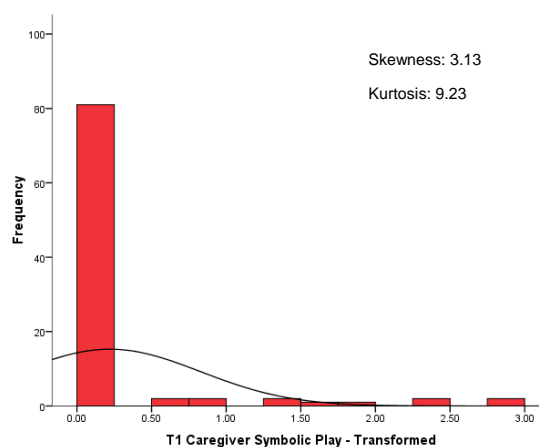


Figure 32: Histogram of mean T1 caregiver symbolic play - transformed



Appendix E.5. Distribution of play change scores between T1 and T2 – Transformed

Figure 33: Histogram of T1 to T2 Simple Exploratory Play Change - Transformed

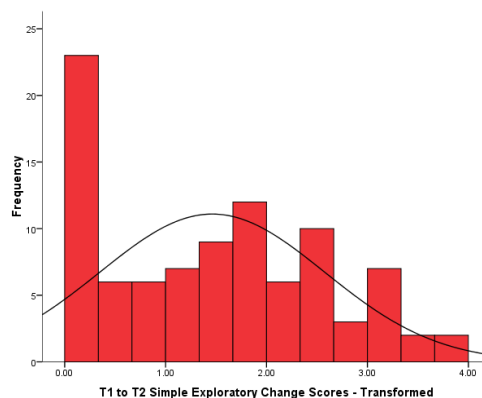


Figure 34: Histogram of T1 to T2 Advanced Functional Play Change - Transformed

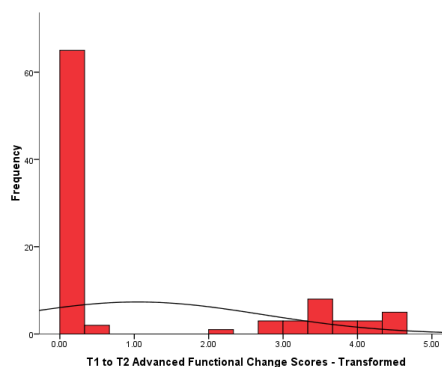


Figure 35: Histogram of T1 to T2 Symbolic Play Change - Transformed

