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Social gaze and symbolic skills in typically developing infants and children with autism

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Social Gaze and Symbolic Skills in Typically Developing

Infants and Children with Autism

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Declaration.

The work contained in this thesis was carried out by the author in the academic year 2000-2001 whilst a postgraduate student in the Department of Psychology at the University of Durham. None of the work contained in this thesis has been submitted in candidature for any other degree.

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CONTENTS

LIST OF TABLES

Abstract

The aim of this thesis was to investigate, through two observational studies, the relation among social gaze, play and language in 27 typically developing infants (study 1) and 18 young children with autism (study 2). The child's spontaneous play behaviour and their spontaneous social gaze behaviours were assessed in a five-minute free-play observation session. Measures of children's language were obtained using the MacArthur Communicative Development Inventory, and measures of overall mental ability were obtained using the Bayley Mental Scale of Infant Development-II. Two hypotheses were tested. The first concerned the relation between play and language. The hypothesis was that symbolic play and language reflect the emergence of a common underlying symbolic ability in 18-24 month olds infants. Results did not show a link between these twin symbolic abilities supporting the view that later in development word-learning diverges from other form of symbol development. The second concerned the relation between play and social gaze. The hypothesis was that social gaze is important for the emergence of symbolic development in typically developing infants and preschool children with autism and developmental delays. Results supported the view that social interaction is important for symbolic and pre-symbolic skills but suggested that the use of social gaze may have a general rather than a specific role in assisting symbolic activity. The implications of these findings for the developmental accounts of typically infants and children with autism are discussed.

Introduction

The second year of life represents a period of rapid development in the emergence of language and symbolic play competence (e.g., Bates, O'Connel, & Shore, 1987; McCune-Nicolich, 1981, Tamis-LeMonda & Bornstein, 1990). The purpose of this thesis was to investigate two key issues of concern to theorists of cognitive and language development studying this period of development. The first question is whether different manifestation of symbolic ability emerges from a common underlying origin. The second is the extent to which social interaction plays a role in symbolic development.

Theorists of cognitive and language development have suggested that twin symbolic capabilities, language and play, probably reflect the emergence of a common underlying "representational competence" (Bates, Benigni, Bretherton, Camaioni, & Volterrra 1979; McCune, 1995). Although empirical studies suggest some temporal and structural correspondences between early language and symbolic play however, evidence for the strength of the language-play relation is not entirely consistent. It has been suggested (Namy & Waxman, 1998) that, although early word acquisition is a function of a general symbolic activity, later in development word-learning diverges from symbol development more generally, as infants begin to employ those features of language that distinguish it from general symbol use. One aim of this observational study was to investigate the relationship between language and both symbolic and pre-symbolic (functional) play competence in 18-24 month olds infants. At this age most children are actively producing new words as well as

1

starting to combine words, and by this age children are also capable of symbolic activities that include incorporating others (e.g., doll) in pretend play as well as using an object as if it is something else (e.g., using a brick as some soap). Infants appear to use symbolic gestures in ways that are virtually identical to the way that they employ words. Words and gestural behaviours in play are both used to represent information about object and events in the real world. The hypothesis we aimed to test in this study was that if language and symbolic play both reflect the development of the same underlying symbolic ability, we should expect correlations between these two symbolic capabilities

In addition to the issue concerning single and multiple routes to symbolic development another issue of concern to theorist studying cognitive and language development is the role played by social interaction in the emergence of symbolic skills (Vygotsky, 1978; Bruner, 1990; Tomasello, 1999). It is well known for example that some social interaction skills such as joint attention (coordination of the infant's and other's attention to object or events with the goal of sharing attention) are significant predictors of language development (Mundy & Gomez, 1998; Carpenter, Nagell, & Tomasello, 1998). It is also known that infants check other people's gaze when in the process of learning novel words (Baldwin, 1995). However, surprisingly few studies have thus far investigated the interrelations between social interaction skills and symbolic play (Bates, Benigni, Bretherton, Camaioni, & Volterrra 1979, Charman, 1997; Laakso, Poikkeus, Eklund, & Lyytinen, 1999). It has been hypothesised that when infants first begin to use symbolic play these acts may be accompanied by acts of gaze to another person as the child negotiates the meaning of the act for the other as well as for self (Tomasello, 1999). At this stage children begin

to understand that another person is doing something "for" them, and then they learn to do this "for" other people in much the way that they reverse roles and produce linguistic symbols for other people; "the fact that the symbol is for the benefit of others is indicated by the way the child looks to other people (and sometimes smiles) when producing a play symbol" (Tomasello, 1999, pp.129-130). The second aim of this study was to explore this hypothesis, examining the extent to which children initiate social gaze (look to an adult) when engaging in acts of both symbolic and non-symbolic (functional) play.

Autism provides an especially interesting perspective on the development of communicative and symbolic functioning, as it involves specific impairment in both of these social cognitive skills. In fact, these impairments are considered by several theoretical accounts to be central to the disorder (e.g., Baron-Cohen, 1993; Hobson, 1993; Leslie, 1987; Mundy & Sigman, 1989, 1993). However, although there is considerable evidence that the development of communicative and symbolic functioning is impaired in children with autism (Baron-Cohen, 1993; Leslie, 1987, 1994; Mundy, Sigman, & Kasari, 1993; Charman, Baron-Cohen, Swettenham, Cox, Baird, & Drew, 1997; Sigman & Ruskin, 1999), the relationship between these areas of deficit is not well understood (Mundy, Sigman, & Kasari, 1993). The studies reported in this thesis therefore investigated the relation between initiated acts of social gaze behaviours and spontaneous play behaviours (functional and symbolic) in both typically developing 18-24 moths old infants (study 1) and preschool children with autism and developmental delayed children (study 2). Although our aim was to explore Tomasello's hypothesis that social gaze may have a specific role in assisting symbolic play, it is also possible that social gaze has a much more general role in

development. This interpretation would suggest that gaze to others assists infants in all aspects of learning and is not specific to symbolic play. If this was the case, one would expect to find that children also show social gaze with functional play and that children who show higher amounts of social gaze also show higher amounts of functional play. Even if social gaze is not specifically associated with symbolic play but more generally associated with functional as well as symbolic play however this may still indicate that social gaze has part in symbolic development. Since functional play is a developmental precursor of symbolic play, social gaze may facilitate children first in their functional play, enabling them to move on to symbolic play. This prediction is suggested by studies of children with autism showing that even though they have a specific deficit in social interaction, they show developmental progress in symbolic development as they mature cognitively. It has been suggested (Carpenter, 1997; Leekam, 2000) that, in autistic children, the acquisition of some symbolic skills may proceed by using an alternative route to that used by typically developing children. However, it is also well known that symbolic functioning cannot be acquired in children with autism as early as it is in typically developing infants. Overall the aim of this study was to investigate the hypothesis that the use of social gaze may have a general rather than a specific role in assisting symbolic activity.

Chapter 1 - Symbolic skills in typically developing infants

1.1 – Theoretical proposals

Researchers from different theoretical traditions agree that a pronounced change appears to take place at about 18 months in symbolic abilities. At this age most children are actively producing new words (Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994) and some are starting to combine words and use inflections for expression of semantic meaning. In addition to their language use, by this age children are also capable of symbolic activities that include incorporating others (e.g., doll, adult) in pretend play as well as sequencing the same act to oneself and others (e.g., child drinks from bottle and then feeds doll from bottle) (Belsky & Most, 1981). According to Piaget (1962), these developments in language and symbolic play reflect the development of an underlying symbolic ability, and the beginning of representational thinking. Changes in the capacity for mental representation contribute to the development of language and play by supporting the expression of meaning in these domains (Bates, O'Connell, & Store, 1987; McCune-Nicolich, 1981, McCune, 1995; Piaget, 1962).

Bates et al. (1979) extended Piaget's proposal in suggesting that symbolic play and language share underlying cognitive structures or "software". In order to describe the relationship between these homotypic progression Bates et al. borrowed the term *homology* from the ethological literature, where it is used to characterize the evolution of somewhat dissimilar surface structure from a common ancestral form: a

duck's and a penguin's wings are homologous, a porpoise's flippers and cod's fins are not. The term homology is used when there is reason to believe that the same underlying factors may be responsible for generating correlations between two homotypic progressions. At least three types of homology are possible:

- *Remote homology*. Correlation of A and B are due to general maturational factors. If remote homology obtained, one would expect correlation between A and B as well as correlations of A and B with a host of other maturationally driven variables.

- *Specific homology*. Both A and B are outward manifestations of a specific, much more narrowly defined underlying factor C. Specific homology requires fairly strong intercorrelations between A and B, as well as relative independence of these two variable from other variable not influenced by C.

- *Local homology*. A and B are related to each other at some points in time but not others, because C, an underlying capacity, has several distinct subcomponents. During periods when A and B draw on a common subset of C's components, both will be highly correlated. During periods when A and B draw on few common components of C, they will be weakly correlated. This is the model proposed in Fischer's (1980) theory of skill development.

In relation to the development of symbolic skills, Bates et al. (1979) supported the idea of "homology through shared origins" (local homology): within this kind of model one would expect correlations between linguistic and non-linguistic aspects of symbol development, based on the view that these different aspects of symbol use share underlying cognitive structures or "software".

McCune (1981, 1995) expanded Bates's proposal in suggesting that if language and symbolic play both reflect the development of underlying symbolic ability, these processes would be expected to develop in parallel, with transitions to more advanced levels occurring close in time. In McCune's view, both vocal-articulatory behaviours in language and gestural behaviours in play are used to represent information about objects and events in the real world. Several functions are also shared by language and play in the second year of life. First, both involve the communicative function of sharing objects with other. Second, children use both play and language to "try out" various representational equivalences and so learn about the range of acceptable symbolic transformations (McCune-Nicolich, 1981). For McCune (1992) the shift from the pre-linguistic to linguistic phase of vocal development requires progress in a number of specific variables, including phonetic skills sufficient for speech, communicative capability, and awareness of sound-meaning correspondences. Mental representation (cognitive process in which one element, the *signifier*, "stands in" for a separate element, the *signified*) is the internal component that supports the expression of meaning in various modalities, including play and language. McCune (1981, 1995) proposed correspondences in the development of play and language that should follow from her analysis of developmental changes in signifier-signified relationship observable in both domains. Three relationships were proposed: a) onset of the lexicon with onset of pretending, b) onset of combinations in language with onset of symbolic play combinations, and c) onset of syntax in language with hierarchical combinations in play.

These proposals contrast sharply with other current views in which language and play are seen as developmentally unrelated. Some investigators have argued that language develops along a maturational course that is independent from other aspects of cognition (Harris, 1983; Petitto, 1988). Such developmental independence would provide support for Chomsky's long-standing argument that language is an autonomous, encapsulated, "modular" cognitive system (Chomsky, 1965; Fodor, 1983). However, a review of recent literature leads us to consider that at least some aspects of non-verbal cognition (e.g. symbolic play) are reliably associated with the progress in language (see Bates, Thal, Fenson, Whitesell, & Oakes, 1989, for a review).

1.2 - Definitions

The observed interrelations between language and play depend also on the definition of symbolic play adopted by the research (Tamis-LeMonda & Bornstein, 1994). Some confusion exists over the terminology employed in discussions of symbolic play in general. This is the result of both a proliferation of apparently analogous labels: *symbolic, pretend, imaginative* etc. and of inconsistency in the definition of these labels. Piaget (1962) argued that symbolic ability emerges during the period of sensorimotor development as the distinction grows between *signifier* and *signified*. For Piaget, early pretence symbolizing develops in a hierarchical fashion from familiar self-directed actions performed out of context, through the symbolic identification of one object with another, to increasingly complex symbolic combinations (Piaget, 1962).

This account has been elaborated by McCune-Nicolich (1981), who proposed that the sequence of developments of pretend play behaviours between 8 and 30 months exhibits a hierarchical order. The sequence is proposed as ordinal, reflecting the gradual transition from meaning fused with action, to the point where actions are guided by autonomous internal meaning (Werner & Kaplan, 1963). Representational play develops in an orderly fashion, beginning with pre-symbolic acts (Level 1), progressing next to single pretend acts (Levels 2 and 3), then to representational sequence (Level 4), and finally to hierarchical pretend (Level 5). At Level 1, the child recognizes the function of an object by use, for example when a child briefly touches an empty cup to his or her lips then sets it aside. In these cases the observer recognizes that this act represents literal drinking of liquid from a cup. However, the signifier (drinking gesture) is merely a part of the signified (literal drinking), with deletion of swallowing and other consumatory behaviours. This act is pre-symbolic and shows the recognition of the relationship between perceptual features of a familiar object and action. At Level 2, pretence is distinguished from pre-symbolic play by evidence that the child processes the link between the play act and its real counterpart. The child essentially imitates his or her own behaviours out of context, while indicating by sound-effects, facial expressions, or gestures an awareness of the differentiation of literal (signified) and played (signifier) behaviours. This suggests a mental comparison between the two, and thus an awareness of the distinction between signifier and signified. At Level 3, play involves the activities of others, and the use of actors other than oneself demonstrates that the meaning of such actions is differentiated from the specific bodily acts of the real behaviour. At this level, the child's pretence actions based on behaviours observed in others (e.g., cleaning with a sponge, reading a book) and uses others (e.g., mother) as actors in play (e.g., feeds

mother), indicating *decentration*. At Level 4, a combinatorial symbolic ability

supports portrayal of a variety of signifier-signified relationships in sequence. The

child shows recognition of differentiated components of events that can be referenced

separately by, for example, pretending to drink from a cup, then pouring liquid into

the cup, or offering a drink to the mother or doll. Finally in Level 5, pretence is

considered hierarchical when the action follows from internal mental processes,

rather than being dominated by perceptual aspects of real object in the environment.

When the child picks up a doll, then searches for a bottle, and finally feeds the doll,

internal mental processes that are evident from the search behaviour that guide first

the search and then the play act. A new form of integration is achieved in this case by

the internal representational intention, which can be inferred to precede and to

accompany the play action. Similarly, establishment of equivalence between a real

object and representational meaning (e.g., block = food) or designation of an

inanimate object as having animate qualities (e.g., making a doll walk) depends on a

prior representational intention or plan. In this case, the integration is hierarchical, as

the internal plan is apparent before the play action, and performs an integrative

function across external behavioural acts (McCune, 1995).

Leslie (1987) attributed such differentiation to an internal process termed

decoupling. In his paper, Leslie tried to explain the external symbolic activity of

pretending in terms of properties of the internal representations that underlie it. For

Leslie, the basic evolutionary and ecological point of internal representation must be

to represent aspects of the world in an accurate, faithful, and literal way, in so far as

this is possible for a given organism. Leslie calls this "a capacity for primary

representation" that is defined in terms of its direct semantic relation with the word.

Leslie argued that this basic capacity for representation is not sufficient to sustain pretence. In order for the child to perform the non-literal mental transformations typical of pretend play he or she must first be able to simultaneously appreciate two alternative and contradictory models of reality (e.g., "This banana is a telephone"). This simultaneous appreciation is dependent on the metarepresentational system (representation of a representation), a cognitive mechanism which functions by *decoupling* the pretend world from the real world such that the child is able to internally represent the external environment in a manner that prevents the literal world from being corrupted by what is represented in the fantasy world. The emergence of metarepresentation through the growth of a *decoupling* mechanism implies a major developmental discontinuity.

To summarize, Piaget was fundamentally interested in the nature of intelligence and how it changes with development, and his interest in pretence was subordinate to this. On the other hand, McCune-Nicolich was concerned with the different forms of symbolizing in early development and with working out their operational definitions. Finally, Leslie was primarily concerned with the underlying mechanisms and with the information-processing task these mechanisms have to perform in generating pretence.

Recently the growth of research into the play of different subject populations has emphasized the need for a stringent definition of what constitutes symbolic play. In this regard Ungerer and Sigman (1981) have claimed that complete differentiation of objects and actions is necessary in order to say that children playing symbolically. Baron-Cohen (1987) also argued that appropriate play with objects or miniature yet

realistic objects cannot be taken as evidence of symbolism as the objects may simply be perceived as small yet real objects. This kind of play has been termed "functional" in contrast to symbolic play. Ungerer and Sigman (1981) provided an adequate definition of this form of play: "the appropriate use of an object, or the conventional association of two or more objects, such as spoon to feed a doll, or placing a teacup on a saucer". Leslie (1987), on the other hand, proposed three fundamental, symbolic forms of pretence: a) *object substitution* - using an object as if is something else (e.g., using a brick as some soap), b) *attribution of false properties* – attribution of properties to an object as if they exist (e.g., pretending a doll is ill), and c) *reference to an absent object* – making a reference to something as if it is present (e.g., driving a truck over an invisible bridge). Thus, if a child correctly positions a toy bottle near his mouth, as if feeding himself, this is functional play. However, the play would be symbolic if the child held a building block near his mouth, made drinking noises as if he was drinking milk from "the bottle" and wiped his mouth afterwards as if milk had been spilled.

All these views have influenced recent empirical research on the early development of pretend play. Because of a general consensus on basic theoretical questions, effort has concentrated on documenting certain sorts of behavioural change Three main developmental trends have been studied: *decentration* (moving from self as agent to other as agent in pretence); *integration* (combining pretend acts to form sequences); *decontextualization* (moving away from using realistic objects in pretence). The first (*decentration*) clearly reflect a growing separation of signifier and signified within the domain of a child's own actions, while the latter indicates a

similar separation in terms of the child's relation to objects and their meaning (Jarrold, Boucher & Smith, 1993).

1.3 - Empirical evidence

In this section the research findings related to the language play relationship are reviewed. A large number of studies have so far investigated the relationship between symbolic play and language development (McCune, 1981, 1995; Kelly & Dale, 1989; Ungerer & Sigman, 1984; Bornstein, Selmi, Heaynes, Painter, & Marx 1999; Goodwyn & Acredolo, 1993; Namy & Waxman, 1998). Kelly and Dale (1989), who studied 20 children in the age range 12 to 24 months, found that children not yet using words also failed to show functional play, whereas single-word speakers exhibited pre-symbolic play schemes and self and other pretend activities. Similarly, longitudinal studies of Ogura (1991) and Veneziano (1981) revealed temporal relations between play and early language development. McCune's (1995) analyses of a cross-sectional sample between 8 and 24 months of age indicated, in line with her earlier findings (McCune-Nicolich & Bruskin, 1982; Nicolich, 1977), that children who made specific representational transitions achieved language milestones more quickly. For instance, a significant association was found between the onset of pretending and the beginning of vocabulary development. Children's independent combinatorial pretence was also significantly related to the onset of word combinations.

Research findings regarding the strength of language-play relation are not entirely consistent. For instance, Shore, O'Connell, and Bates (1984), did not find any significant relation between mean length of utterances (MLU) and functional play. Only after play behaviour was classified into levels of abstraction, did significant associations emerge between sequence length in substitution play and MLU. Symbolic play has greater cognitive demands than does functional play with real toy object. In particular doll-directed play appears to be a strong correlate of language acquisition (Sigman & Sena, 1993). Ungerer and Sigman (1984) reported that children who engaged in a greater number of doll-directed and other-directed play acts at 13.5 months of age had high language vocabulary both concurrently and at 22 months. At the latter, age the children's language abilities were related to symbolic play, but not to the amount of functional play in which objects are simply combined by stacking or putting one within another.

Although studies on the relation between play and language have generally emphasised that early word acquisition is a function of a general symbolic activity, implying that infants would learn words and other symbolic forms with equal facility at the onset of word acquisition, there is consistent empirical evidence that later in development, word-learning diverges from symbol development more generally, as infants begin to employ those features of language that distinguish it from general symbol use (Namy & Waxman, 1998; Bornestein, Selmi, Haynes, Painter, & Marx, 1999). For example, Acredolo and Goodwyn (1988) reported that, although there are individual differences in the longevity of infants' gestural vocabularies, the use of symbolic gestures generally declined markedly following the onset of combinatorial speech. Consistent with this finding, Iverson, Capirci, and Caselli (1994) also found

that at 16 months, infants used both words and symbolic gestures to name objects, but by 20 moths, the infants had essentially ceased to use symbolic gestures as names for object categories. This finding implies that, over time, word learning diverges from symbol use more generally and that words take on a privileged status in the infant's communicative repertoire (Namy & Waxman, 1998).

1.4 - Conclusion

The second year of life represents a period of important changes in children's mental abilities, such as the emergence of language comprehension, language production, and symbolic play (e.g., Bates, O'Connel, & Shore, 1987; McCune-Nicolich, 1981, Tamis-LeMonda & Bornstein, 1990). At the start of the second year, children begin to use words spontaneously and to engage in concrete and functional play activities with objects. Later in the second year, children increasingly represent the world symbolically in both language and play; they incorporate others into their representations of events by describing others' actions, possessions, and the like in language and pretence toward others in play (McCune, 1995; McCune-Nicolich, 1981; Ogura, 1990). Some researchers (Bates et al., 1979, McCune, 1995) suggested that these twin symbolic capabilities reflect the emergence and possibly the growth of a common underlying "representational competence". Indeed, Piaget (1962), Vygotsky (1962), and Werner and Kaplan (1963) all asserted that the ontogeny of thinking in the child may be concerned less with surface manifestations, that is language or play per se, and much more with deep structures, that is the child's understanding and use of meaning, representation, and symbols. Although, studies

concerning the relation between early language and symbolic play suggest some temporal and structural correspondences, the strength of language-play relation is not entirely consistent. It has been suggested (Namy & Waxman, 1998; Bornestein, Selmi, Haynes, Painter, & Marx, 1999) that, although early word acquisition is a function of a general symbolic activity, later in development, word-learning diverges from symbol development more generally, as infants begin to employ those features of language that distinguish it from general symbol use.

Having reviewed the relationship between play and language in this chapter, the next chapter provides background to the issue of the relationship between social interaction and symbolic ability. Intentional communication requires that the child has an internal representation of someone else's communicative intentions or mental states (Leslie & Happe, 1989; Tomasello, 1995). It has been argued that factors related to individual differences in both the tendency to initiate and respond to social behaviours share a common variance with language development. This view is supported by the findings of several authors (Bruner, 1995; Tomasello, 1998; Mundy & Gomez, 1998) who showed that some social interaction skills such as joint attention interaction (coordination of the infant's and other's attention to object or events with the goal of sharing attention) were significant predictors of language development. However, although it has been hypothesised that the emergence of communicative intention (child's awareness that a sign is understood by recipient) is an important part of symbolic development (Bates et al., 1979; Tomasello, 1999), surprisingly few studies have thus far investigated the interrelations between social interaction skills and symbolic play (Bates, Benigni, Bretherton, Camaioni, & Volterrra 1979, Charman, 1997; Laakso, Poikkeus, Eklund, & Lyytinen, 1999).

However Tomasello (1999) has suggested that when infants first begin to use symbolic play these acts may be accompanied by acts of gaze to another person as the child negotiates the meaning of the act for the other as well as for self. The aim of the next chapter is to investigate these hypothesis.

Chapter 2 - The social basis of symbolic skills

2.1 - Joint attention and language

The link between verbal ability and joint attention has been explored in several studies (Saxon & Reilly, 1998; Sigman, 1998; Woodward & Hoyne, 1999) with mixed results. Much of the research on the connection between joint attention skills and language development has focused on the important role that episodes of joint attention play in child-caregiver interactions (Bruner, 1975; Dunham, Dunham & Curwin, 1993; Tomasello, 1988). Bruner (1975), for example, claimed that children acquire the conventional use of a linguistic symbol by learning to participate in an interactive format (form of life, joint attention scene) that they understand, first non-linguistically, so that the adult's language can be grounded in shared experiences whose social significance she already appreciates. Said another way, if linguistic symbols are social conventions that gain their communicative significance by "agreement" among users, children can acquire active use of linguistic conventions only if they enter into this agreement by participating in the kinds of social interaction that constitute that convention's communicative significance (Carpenter, Nagell, & Tomasello, 1998).

Bruner (1975) laid out a way of thinking and talking about language acquisition, not in terms of the structures of formal linguistics, but rather in terms of processes of communication. The basic argument is that there is continuity in the process by which children communicate with others pre-linguistically and linguistically. At the root of

this commonality are processes of joint attention. In a joint attention episode, both members of a dyad are simultaneously focused on an object or set of objects, while maintaining awareness of the other member's parallel focus (Markus, Mundy, Morales, Delgado, & Yale, 2000). In support of this view, Bakeman and Adamson (1986) found that the vast majority of all conventionalised acts (mainly gestures and words) by both infants and their mothers were produced when they were jointly engaged with an object (both participants focusing on the same object). Moreover Tomasello and Todd (1983) found that longer sustained episodes of joint focus provide an interactive context, which leads to larger vocabularies in the children of such dyads. Language development in twins is often delayed, for example, because of the additional time constraints of two infants on one caregiver affording a relatively smaller fraction of time in joint attentional episodes with their caregivers (Tomasello, Mannle, & Kruger, 1986). Carpenter, Nagell, and Tomasello (1998) found that infants who spent more time in joint attention engagement with their mothers at 12 months of age comprehended and produced more language at that same early age and in the months immediately following. They also found that mothers who followed into their child's attentional focus with words at 12 months of age had children with larger comprehension vocabularies in the month immediately following (with relationship to language production showing later). Hence, the optimal environment for language learning and development in young children may be characterized by greater amounts of time spent with caregivers, within episodes of joint attention focus (Markus et al., 2000).

In addition to caregiver-child interaction effects, joint attention skills have been also associated with language development as they reflect the maturation of important

social, cognitive and self-regulatory capacities within the infant (Corkum & Moore; Mundy & Gomez, 1998, Tomasello, 1995). This hypothesis leads to the prediction that individual differences in infants' joint attention skills, assessed apart from the contribution of caregivers, should also be associated with language development (Mundy & Gomes, 1998). Carpenter, Nagell, and Tomasello (1998) explored the developmental sequence of emergence of these social-cognitive skills in a longitudinal study of 24 typically developing infants from 9 through 15 months. They found that individual infants showed a reliable developmental pattern of emergence of these skills. The most common order of emergence of these major social-cognitive and communicative skills measured was: (1) joint engagement (shared attention with adults by alternating gaze between an object and the adult), (2) communicative gestures (pointing, showing and giving), (3) attention following (follow the gaze direction of an adult to an object), (4) imitative learning, (5) referential language. Positive correlations were found between the ages of emergence of each pair of social-cognitive skills or their component tasks. Mundy, Kasari, Sigman and Ruskin (1995) reported in their study that a measure of responding to joint attention bids, or the capacity of the child to follow the direction of gaze and pointing of an experimenter, was a significant predictor of receptive language development.

Different types of measures of joint attention are not equivalent in their correlations with language. Mundy et al. (1995) found that a measure of *initiating* joint attention bids (pointing and showing) did not display the same degree of association with receptive language as did the measure of *responding* to joint attention bids (following gaze and pointing). Alternatively, Descrochers, Morissette, and Ricard (1995) observed that following gaze at 15 months was related to

expressive, but not receptive language at 24 months. In contrast, Ulvund and Smith (1996) have reported predictive correlations between this type of joint attention measure and receptive, as well as expressive language development. In addition, Ulvund and Smith (1996) observed significant associations between initiating joint attention bids and both receptive and expressive language.

One difficulty with assessing the link between these two abilities is that joint attention measures traditionally include a range of behaviours: e.g. requesting, showing, pointing, and they include both attention directing behaviours by the child and responses to another's joint attention initiative. Current theory on early nonverbal communication often emphasizes that the development of different types of joint attention skills may reflect a single common cognitive process (Bates et al., 1979; Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994; Tomasello, 1995). Consequently, researchers often combine different types of joint attention behaviours into aggregate measures in the study of the relations between early gestural communication and language development (Bates, Thal, Whitesell, Fenson, & Oakes, 1989; Fenson et al., 1994). However, such aggregate measures may be unwarranted and diminish the power of research to determine the precise relationship between gestural joint attention development and language acquisition. This is because different types of joint attention skills may reflect partially distinct processes associated with comprehension and expression factors in early social-communication development (Mundy & Gomez, 1998).

Some investigators have found that one of the critical joint attention behaviours for predicting language development was pointing (simultaneous extensions of the

arm and index finger toward a target) (Bates et al, 1979; Charman et al, 1997). In Bates et al. view (1979) the particularly strong relation between language and pointing suggest that this gesture is related to language, not only through a general factor of communication with conventional signals, but also through a more specific set of structures involved in the act of reference to external objects and events. In a sense, pointing, for Bates et al, is really a gestural, sensorimotor form of naming, with no function other than sharing reference with the listener. In line with this view, Camaioni, Caselli, Longobardi, and Volterra (1991) found that the amount of pointing at 12 months predicted speech production rates at 24 months. Butterworth and Morissette (1996) studied the relation between age of pointing onset and the subsequent comprehension and production of words and gestures. They found that the earlier the onset of pointing, the greater were the number of different gestures produced, and the greater the number of words comprehended, at 14.4 months. Finally, Descrochers, Morissette, and Ricard (1995) found that during the second year of life the production of communicative pointing was related to both the comprehension and the production of language.

Although the link between joint attention skills and language has been explored in several studies (Saxon & Reilly, 1998; Sigman, 1998; Woodword & Hoyne, 1999: Mundy & Gomez, 1998: Markus, Mundy, Morales, Delgado, & Yale, 2000), surprisingly few studies have thus far investigated the interrelations between symbolic play and joint attention skills competence either in typically developing infants (Bates, Benigni, Bretherton, Camaioni, & Volterrra 1979; Charman, 1997; Laakso, Poikkeus, Eklund, & Lyytinen, 1999) and in developmental delay children (Mundy, Sigman, Ungerer, & Sherman, 1987; Mundy, Sigman, & Kasari, 1990;

Charman, Baron-Cohen, Swettenham, Cox, Bairs, & Drew, 1997; Sigman & Ruskin, 1999). It has been hypothesised that the emergenge of communicative intention (child's awareness that a sign is understood by the recipient) is an important part of symbolic development (Bates et al., 1979; Tomasello, 1999). The second aim of the study 1 was to investigate this hypothesis, examining the relation between the early manifestation of joint attention skills such as gaze checking and the development of symbolic play.

2.2 – Social interaction and symbolic play development

2.2.1 – Theoretical proposals

In Bates et al view (1979) the "symbolic capacity" emerges from the onset of communicative intentions and conventional signal including the discovery that things have names. As mentioned earlier, communicative intention is operationalised as signalling behaviour in which the sender is aware *a priori* of the effect that a signal will have on his listener, and he persists in that behaviour until the effect is obtained or failure is clearly indicated, while conventional signal includes sounds or gestures whose form and function are agreed upon and recognized by both parent and child. For Bates et al. the onset of communicative intentions and conventional signalling occurs at around 9-10 months of age for most infants. At this stage we can see three important changes in the child behaviours. The first is that the child begins to alternate eye contact between the goal and the adult while he emits his signal. At this point, it is difficult to avoid the inference that the child sees some relationship among the goal, the adult, and the signal. Although Bates et al do not mean that all

intentional communication involves shifting eye contact, they require these behaviours as evidence that the child is aware of the effects that his signal will have as he emits them. The second is that the child will augment, add, or substitute signals contingent upon changes in adult behaviours toward the goal. Hence we can infer that these behaviours are aimed at the adult agent, rather than the goal-object itself. The third is that changes in the form of the signal toward abbreviated and/or exaggerated patterns that are appropriate only for achieving a communicative goal (e.g. a reach-and grasp motion may become abbreviated into a short open-shut intention movement that is apparently aimed at the adult listener rather that the goal). Another change, at this age, is the presence of communicative conventions that can be inferred from two aspects of behaviour: 1) the form of the signals change in shape, toward a stable, agreed upon version; 2) the signals are used regularly and predictably within certain communicative situations.

To summarize, we can infer the onset of intentionality from at least three types of evidence: change in eye contact and checks for feedback, alterations in signalling until the goal is reached, and changes in the shape of signals toward a form that is appropriate only for communication. We can infer that the child recognizes the conventional nature of signals from a move toward stability in the form of signals, regularity of use in communicative routines, and the adoption of arbitrary behaviours that could only have been derived through imitation in social games. However, the kind of conventionalised communication that we observe at 9-10 months of age is still not symbolic communication. For Bates et al. (1979) conventional communication is not symbolic communication until we can infer that the child has objectified the vehicle-referent relationship to some extent, realizing that the vehicle

(the symbol) can be substituted for its referent for certain purpose, at the same time realizing that the symbol is not the same thing as its referent. It is at around 13 months of age that most children achieve the stage where they discover that the convention is a "symbolic vehicle" that "name", "stand for", or "evokes" a particular element in that situation. Naming acts occur both inside and outside of communicative schemes. Some of the first naming acts occur within the already established imperative frames (still accompanied by pointing, reaching, etc.) or in the declarative bids for shared attention to object. However, naming also occurs in solitary play, as objects are noticed and recognized prior to use in some further activity. Apparently the naming game serves both a cognitive and social function from its first appearance by around 13 months of age. It is also around this age that we witness the earliest evidence for nonverbal symbolic activity in play. At this stage the object is "recognized by carrying out an activity typically associated with that object" (e.g., the child places a toy telephone receiver against his ear, stirs in a bowl with a spoon, etc.). However, it is easier for observers to recognize this kind of play when the child uses as his symbolic vehicle a stereotypic behaviour that could only have been derived through observation and imitation of adult activities that are (probably) poorly understood (Bates et al., 1979).

Overall intentional communication through conventional signal is viewed as a process that precedes, correlates with, and hence possibly contributes to the emergence of symbols. However, Bates believes that the symbolic function involves a further development, a separate capacity that is manifested in both communicative and non-communicative behaviour, greatly changing the form of each. Symbolic

activity includes symbolic communication. However, symbolic activity may also include some private and often idiosyncratic behaviour (Bates et al., 1979).

Tomasello (1998) proposed a different view, in which these different social-cognitive skills in late infancy are all manifestations of infants' emerging understanding of other people as intentional agents whose attention and behaviour to outside objects and events may be shared, followed into, and directed in various ways. During the second year of life the child begins to comprehend that a person may attend selectively (intentionally) to some things in the environment and ignore others (and may also intend for person to selectively attend to some things in the environment and ignore others). At this stage the child begins to understand that others' behaviours are motivated by special kind of intention, namely, a communicative intention. But understanding a communicative intention can only take place within some kind of joint attention scene (social interactions in which the child and the adult are jointly attending to some third thing), which provides its social-cognitive ground. Learning to express a communicative intention (using the same communicative means as in both gestural communication, symbolic play, and language) requires an understanding that the participant roles in this communicative event can potentially be reversed: I can do for her what she just did for me. Thus, if a child learns to point for others by imitatively learning the pointing gesture from adults pointing for her, then her pointing thereby becomes symbolic. Similar phenomena occur during early play development.

In Tomasello's view, early in development when young infants start to grasp, suck, and manipulate objects, they learn something of the objects' affordances for

action. Later, as children observe other people using cultural tools and artefacts, they often engage in the process of imitative learning in which they join the other person in which they understand and adopt the intention of adults as they use objects and artefacts (e.g. we use hammers for hammering and pencils for writing) (Tomasello, 1999). During this process the child comes to see some cultural objects and artefacts as having, in addition to their natural sensory-motor affordances, another set of "intentional affordances" based on her understanding of intentional relations that other persons have with that object or artefact- that is, the intentional relations that other persons have to the world through the artefact (Tomasello, 1999a). This distinction (natural vs. intentional affordances) is especially clear in children's early symbolic play. A two-year-old may pick up a pencil and pretend it is a hammer and looking to an adult with playful expression as she knows that this is not the intentional/conventional use of this object and that her unconventional use is something that may be considered funny. This behaviour involves two crucial steps: a) the infant must be able to understand and adopt the intentions of adults as they use objects and artefacts; b) the child "decoupling" intentional affordances from their associated objects and artefacts so that they may be interchanged and used with "inappropriate" objects playfully (Tomasello, 1999).

Thus, when children begin to understand other persons as intentional agents, and so imitatively learn the conventional use of artefacts through them, the world of cultural artefacts becomes imbued with intentional affordances to complement their sensory-motor affordances – with children's very strong tendency to imitate adult interactions with objects clearly apparent (Striano, Tomasello, & Rochat, 1999). Although early play symbols are imitated from others, they are also produced for

others. In fact children learn to use objects as symbols in much the same way they learn to use linguistic symbols. At this stage children begin by attempting to understand another person doing something "for" them, and then they learn to do this "for" other people in much the way that they reverse roles and produce linguistic symbols for others people; "the fact that the symbol is for the benefit of others is indicated by the way the child looks to other people (and sometimes smiles) when producing a play symbol" (Tomasello, 1999, pp.129-130).

Overall, then, acquiring the conventional use of an intersubjectively understood linguistic symbol requires that the child: 1) Understand other as intentional agents; 2) Participate in joint attentional scenes that set the social-cognitive ground for acts of symbolic communication; 3) Understand not just intentions but communicative intentions in which someone intends for her to attend to something in the joint attentional scene; and 4) Reverse roles with adults in the cultural learning process and thereby use toward them what they have used toward her - which actually creates the intersubjectively understood communicative convention or symbol (Tomasello, 1999).

These views contrast sharply with other currently influential views in which these different skills are seen as developmentally unrelated. For example, Mundy and Gomez (1998) argue against the commonality of the cognitive processes that may be shared between different pre-linguistic skills. They suggested that since social interactional abilities emerge before infants are facile with symbolic skills (referential looking and protodeclarative pointing emerge between 6 and 12 months, before pretend play emerges between 12 and 24 months of age), it may be expected that the

earlier phases of joint attention reflect processes other then symbolic competence. For Mundy and Sigman (1993), joint attention skills are not an early manifestation of purely cognitive symbolic or metarepresentational abilities, but part of a process of integrating self - and other - affect that initially involves primary affective experience, which ultimately contributes toward the development of the symbolic representational skills necessary for the development of symbolic representational, and later development of a theory of mind. Surprisingly few studies have thus far investigated the interrelations between joint attention skills and symbolic play competence.

2.2.2 - Empirical evidence

Bates et al. (1979) investigated, in a longitudinal study of 25 American and Italian children, the relationship between communicative and cognitive development from 9 to 13 months. They found that the same cognitive capacities that relate to language (symbolic play, tool use and imitation) also relate to some preverbal communications that precede and correlate with language (giving, showing and pointing). Moreover, they found in a follow-up from eleven of the 25 infants seen again at around 18 months, that the earliest manifestations of intentional communication were the most sensitive indicators of later developments in symbol use. Similar results were found by Bates, Thal, Fenson, Whitesell, and Oakes (1989), who investigated in their two studies the relationship between symbolic play and communicative gestures (showing, giving and pointing) in children during their second year of life. In both studies, one that made use of detailed questionnaires administrated to the parents of 95 children between 12 and 16 months, and one based on a laboratory experiment with 41 children between 13 and 15 months of age, Bates et al. found a significant

relationship between deictic gestures (giving, showing, pointing, ritual request) and enactive names (functional and symbolic play).

Charman et al (2000), in a small sample (13 children) of infants for whom measures of play (functional and symbolic play), joint attention (gaze switches between an adult an active toy and looking to an adult during an ambiguous goal detection task) and language had been collected at 20 months of age found that there were several cross-sectional associations between the different precursor abilities at 20 months of age. The findings are consistent with the notion that these infant abilities are manifestations of a unitary social cognitive representational ability to understand and interact with people (joint attention) and objects (play).

Research findings on the strength of symbolic play and joint attention relationship relation are not entirely consistent with each other. For example Laakso et al. (1999) studied children's early social interactional behaviours and symbolic play competence at 14 months in a sample of 111 mother-infant pairs. The categories of social interactional behaviours, joint visual attention, socially coordinated and object orientated interactions were assessed via observations of mother-infant joint play. An index of symbolic play was derived from the child's solitary play, which was assessed independently. Laakso et al., found that at 14 months, infants' social interactional behaviours (joint visual attention, socially coordinated behaviours, object orientated behaviours) and play competence (total number of functional and symbolic acts) were not statistically significantly related each other.

2.3 – Summary and aims of Study 1

Joint attention is a fundamental aspect of early social development that is considered to be associated with language development (Bruner, 1975; Bates et al., 1979; Tomasello, 1995). Joint attention skills refer to the capacity to coordinate attention with others regarding objects and events (Mundy & Gomez, 1998). Although much of the research on the connection between joint attention skills and language development has focused on the important role that episodes of joint attention play in child-caregiver interactions (Bruner, 1975; Dunham, Dunham, & Curwin, 1993; Tomasello, 1988), few studies have so far investigated the influence of the maturation of important social, cognitive and self-regulatory capacities within the infant (Corkum & Moore, 1998; Mundy & Gomez, 1997; Tomasello, 1995). The latter hypothesis leads to the prediction that individual differences in infants' joint attention skills, assessed apart from the contribution of caregivers, should also be associated with language development (Mundy & Gomez, 1998).

Although the link between joint attention and language has been explored in several studies (Saxon & Reilly, 1998; Sigman, 1998; Woodward & Hoyne, 1999; Mundy & Gomez, 1998; Markus, Mundy, Morales, Delgado, & Yale, 2000), few studies have so far investigated the relations between symbolic play and joint attention skills (Bates, Benigni, Bretherton, Camaioni, & Volterrra 1979, Charman, 1997; Laakso, Poikkeus, Eklund, & Lyytinen, 1999). Bates et al. (1979) suggested that these social-cognitive skills are related to each other based on the view that these different aspects of symbol use share underlying cognitive structures or "software". In Bates et al. view (1979) the definition of "symbol" emerges from the onset of

31

communicative intentions and conventional signal including the discovery that things have names. However, Bates et al. believe that the symbolic function involves a further development. This is the child's discovery that the convention is a "symbolic vehicle" that "names", "stands for", or "evokes" a particular element in that situation, a separate capacity that is manifested in both communicative and non-communicative behaviour, greatly changing the form of each. Tomasello (1998), suggested that these different social-cognitive skills in late infancy are all manifestations of infants' emerging understanding of other people as intentional agents whose attention and behaviour to outside objects and events may be shared, followed into, and directed in various way. These views contrast sharply with other currently influential views in which these different skills are seen as developmentally unrelated. Mundy and Gomez (1998) argue against the commonality of the cognitive processes that may be shared between different pre-linguistic skills. They suggested that since social interactional abilities emerge before infants are *facile* with symbolic skills it might be expected that the earlier phases of joint attention reflect processes other than symbolic competence.

Overall, one of the aims of the study 1 was to explore these hypothesis, examining in particular the extent to which children initiate social gaze (look to an adult) when engaging in acts of symbolic and pre-symbolic (functional) play in 18-24 month olds infants. We decided not to include joint attention measures as pointing, showing, giving because the purpose of our study was to investigate the early manifestation of joint attention skills as shown in referential looking (checking with toy) and also because it has been demonstrated that early manifestation of social gaze as shown in eye-to-eye gaze (isolated checking) is related to the later joint attention skills (e.g.,

Trevarthen & Hubley, 1978; Carpenter, Nagell, & Tomasello, 1998). Moreover, according with the sequence of developments of pretend play behaviours proposed by McCune (1981, 1995), and evidence on the development of play behaviours in typically developing children (e.g., McCune-Nicolich & Bruskin, 1982; Sigman & Sena, 1993), we decided to group the play behaviour into functional act (object-orientated and self/other-orientated) and symbolic act (doll-orientated and substitution). In this way we wanted to investigate not only the relation between some aspect of joint attention skills (e.g., referential looking) and symbolic play development but also the precursors of these social-cognitive skills as shown in social gaze (as precursor for joint attention skills) and functional play (as precursor for symbolic play).

2.4 - Study 1: Social gaze and symbolic skills in typically developing infants.

2.4.1 – Introduction

The first aim of this study was to investigate the relation between language and play (functional and symbolic) behaviours in 18-24 moth olds infants, in order to test the hypothesis that these two twin symbolic capabilities (language and play) reflect the emergence of a common underlying "representational competence" (Bate et al., 1979; McCune, 1995). We decided to group the play behaviours into functional and symbolic act as it has been suggested that play competence could reflect two different underlying mental capacities: exploratory competence (functional play) and representational competence (symbolic play) (Leslie, 1987; Ungerer & Sigman, 1981).

Theorist of cognitive and language development have also supported the view that social interaction is important for symbolic development (Vygotsky, 1978; Bruner, 1990), however, surprisingly few studies have so far investigated the interrelations between social interaction skills and symbolic play (Bates et al., 1979; Laakso et al., 1999). It has been hypothesised than when infants first begin to use symbolic play these acts may be accompanied by acts of gaze to another person as the child negotiates the meaning of the act for the other as well as for self (Tomasello, 1999). The second aim of this observational study was to explore these hypothesis, examining in particular the extent to which children initiate social gaze (look to an adult) when engaging in acts of symbolic and non-symbolic (functional) play in 18-24 month olds infants. In this way we wanted to test whether children check at the same time as they carry out acts of either symbolic or functional play or whether

34

competence in checking even when they are not playing would also associated with the ability of symbolic or functional play.

In all the two aims of this observational study are firs investigating the relation between language and play (functional and symbolic) and second investigating the relation between initiated acts of social gaze and play (functional and symbolic).

In order to investigate these social cognitive skills we decided to use a setting that was successfully used in a previous study investigating social interaction skills in children with autism (Leekam, Lopez, & Moore, 2000). To assess the spontaneous play behaviours (functional and symbolic) we used a set of conventional objects (e.g., car, doll, spoon, etc.) that could elicited either functional play or symbolic play, we avoid to use junk object (e.g., string, lollipop stick, etc.) as we wanted to be sure about the symbolic ability of the child. Moreover, in order to investigate the initiation of social gaze behaviours we put the child in a chair with a table in front of him; in this way the child had to turn his head in order to have eye contact with the researcher that was sitting to the side of, and slightly behind the child without initiating any social interaction with the child. Finally, in order to investigate the language production we used the MacArthur Communicative Development Inventory. This questionnaire has two forms: Words and Gestures (Infant form), designed for use with 8- to 16- month olds children, and Words and Sentences (Toddler form), designed for use with 16- to 30- month old children. The latter focus only in the production of words and sentences meanwhile the other one checks also test language comprehension and the production of gestures. We decided to use the Words and Sentences form as it is the most appropriate form for 18-24 month olds children.

2.4.2 – Method

<u>Participants</u>

Twenty-seven infants (14 male and 13 female) ranging in age from 18-24 months were recruited from five nurseries based in Durham city. An additional 3 children did not cooperate and opted out of the session, and 1 child was excluded as he had a low mental age score (mental age of 52). The mean chronological age of the 27 children was 21.15 months and the Standard Deviation is 2.41.

<u>Design and procedures</u>

The study was conducted in a quiet room or space in the nursery. Children took part in a 5-minute free play observation session. The child sat on a chair and played with a set of toys placed on a table. The set of toys consisted of: telephone, tea set, doll, building blocks, nest of cups, magic baby bottle, plastic fruit, stick, tooth brushes, hair brushes, car. The experimenter sat directly behind the child (about 10 cm) without drawing the child's attention to any toy in the room or telling the child what to do. In order to have eye contact with the experimenter the child had to turn his head of 90 degree or more. If the child showed a toy or interacted with the experimenter in any way, the experimenter could only smile and say "thank you" or other appropriate but non-leading responses. The session was recorded by one video camera situated in front of the child (3 metres). Moreover toddlers were assessed with the Bayley Mental Scale of Infant Development-II (Psychological Corporation, 1994). This test provided a measure of overall mental ability, including nonverbal and verbal components. Finally we asked parents to fill the UK revised short-form version of the MacArthur Communicative Development Inventory -words and sentences

from- (MCDI; Dale, 1996; Fenson et al., 1994). This is a questionnaire used as measure of the child's words and sentences production.

Scoring

Occurrences of the child's spontaneous play behaviour and the spontaneous initiation looking behaviours were coded from videotapes using a 10-second time-sampling procedure (see Laakso et al., 1999). Child's behaviour was observed over six time samples per minute (giving 30 time samples per subject for the 5-min period). The observation time started as soon as the child started playing with toys and sat in a comfortable position on the chair. For every 10-second period in which the child exhibited the criterion behaviour at least once, he or she received one tally mark. Thus, the score for each of the coded behaviour categories could range from 0 to 30. Both spontaneous play behaviours and spontaneous initiation looking behaviours were coded at the same time and reported in the same paper. Altogether, play behaviours were grouped into functional acts and symbolic acts (McCune, 1995), while social gaze behaviours were grouped into isolated gaze, checking with toy, checking during functional play and checking during symbolic play (the latter two categories were included only as qualitative measures). Two different types of functional acts and symbolic acts were recorded:

Functional play

Object orientated:

- Visually guided manipulation that is particularly appropriate for a certain object and involves the intential extraction of some unique piece of information (e.g., turn dial on toy phone, push car on floor)

- Bringing together and integrating two objects in an appropriate manner, that is, in a manner intended by the manufacturer (e.g., set cup on saucer; put together Lego)

Self-other orientated:

- Appropriate pretence activity directed toward self (e.g., raise cup to lip, raise phone receiver to ear) or appropriate pretence activity directed away from child toward other (adult)

Symbolic play

Doll orientated:

- Appropriate pretence activity directed away from child toward doll (feed doll with spoon, bottle or cup)

Substitution:

- The use of an object as if it were another object (e.g., using a teacup as if were a telephone receiver).

Altogether, four social gaze categories were coded:

- *Isolated checking* (when not manipulating or touching a toy child turns head to face of adults and makes eye-contact with tester).

- *Checking with toy* (when manipulating or touching a toy child turns head to face of adult and makes eye-contact with tester; social gaze was not coded when child was showing or giving object or about to show or give object and when child play functional or symbolic way).

- *Checking during functional play* (when engaging in functional play child turns head to face of adult and make eye-contact with tester).

- *Checking during symbolic play* (when engaging in symbolic play child turns head to face of adult and make eye-contact with tester).

Reliability

One coder (blind to the purpose of the study) coded both child's spontaneous play behaviour and spontaneous initiation social gaze behaviours. To assess inter-observer reliability, a second coder independently coded a random sample of 30% of the data for both play and social gaze behaviours. Overall agreement between the coders for the appearance of the play behaviours was 95% and a Cohen's Kappa coefficient of .89, and overall agreement between coders for the production of social gaze was 98% and a Cohen's Kappa coefficient of .90.

In this section the results are presented in the following order: (1) Descriptive Statistics for play behaviours categories (functional and symbolic play), social gaze categories (isolated checking and checking with toy), vocabulary production and Bayley Mental Scale score; (2) Concurrent association between language (vocabulary production) and play (functional and symbolic) in order to test the hypothesis that this twin symbolic capabilities reflect the development of underlying symbolic ability; (3) Concurrent association between social gaze (isolated checking and checking with toy) and play (functional and symbolic) in order to test the hypothesis that social interaction is important for the symbolic development. We investigated two types of relationship between these skills: 1) general association between production of social gaze (isolated checking and checking with toy) and production of play (functional and symbolic) during the all session; 2) production of social gaze behaviours (isolated checking and checking with toy) during symbolic and pre-symbolic (functional) play acts.

Descriptive Statistics

Tables 2.1 and 2.2 present the means, standard deviations and range for the frequency of the play behaviour categories (functional and symbolic play) and for the frequency of the social gaze categories (isolated checking and checking with toy). As can be seen from the data, some categories (isolated checking, checking with toy, and symbolic play) have high standard deviations. The Kolmogorov-Smirnov test was used to test whether the data distribution was normal. Functional play was normally distributed, but isolated checking, checking with toy and symbolic play were not normally distributed. In view of this we decided to use non-parametric statistic for the

latter categories. Finally, Table 2.3 present the means, standard deviations and range for the MacArthur vocabulary production (number of words) and the Bayley Mental Scale raw score.

Table 2.1

Means, standard deviations and range for the frequency of functional and symbolic play behaviours.

Measures	Mean	SD	Range
Functional play	10.78	5.21	1-20
Symbolic play	2.03	2.55	0-9

Table 2.2

Means, standard deviations and range for the frequency of isolated checking and checking with toy behaviours.

Measures	Mean	SD	Range
Isolated checking	0.59	0.84	0-3
Checking with toy	2.67	2.46	0-9

Table 2.3

Means, standard deviations and range for the MacArthur vocabulary production (number of words) and Bayley Mental Scale raw score.

Measures	Mean	SD	Range
Vocabulary production	41.21	19.44	11-80
Bayley Mental Scale score	105.92	15.70	78-135

In relation to the frequency of play behaviours all 27 children produced at least one act of functional play behaviour, in particular all of them showed at least one object-orientated act and 16 of them at least one self/other orientated act. On the other hand only 17 children produced symbolic play behaviours, in particular 9 of them produced at least one doll-orientated act and 14 of them produced at least one act of substitution. No child in our study showed a symbolic play act without showing also functional play behaviours (see Table 2.4).

Table 2.4

Number of children showing different types of play behaviours.

	Symbolic + functional	Symbolic only	Functional only	No play
Number of children	17	0	10	0

In relation to the frequency of social gaze, we found that 11 children out of 27 produced at least one isolated checking behaviour, while checking with toy was produced by a larger number of children (21 out of 27). Only 3 children did not show any social gaze acts included in our study (see Table 2.5). In order to investigate the difference between subjects showing isolated checking only (3 children) and subject showing checking with toys only (13 children) we used a non-parametric test for two related dichotomus variables (McNemar's test). A significant relationship was found $(p < .021)$.

Table 2.5

Number of children showing different types of social gaze behaviours.

	Isolated + checking with toys	Checking with toys only	Isolated only	No checking
Number of children	8	13	3	3

Concurrent association between language and play

In order to investigate the relationship between play behaviours (functional and symbolic) and vocabulary production correlation analyses were computed using a non-parametric statistic (Spearman's correlation coefficient) since some of the data were not normally distributed. No significant relationships were found between both functional (rho = -.01, $p = .99$) and symbolic play (rho = -.14, $p = .57$) with the vocabulary production.

Concurrent association between social gaze and play

In order to investigate the relation between social gaze and play the social gaze

categories and play behaviour categories were collapsed into two categories: total

gaze checking (Mean = 3.26, SD = 2.64) and total play (Mean 12.70, SD = 5.53) as

most of our data were not normally distributed. For total gaze checking category and

total play category full correlations (Pearson correlation as these two categories are

normal distributed) were computed. Partial correlations with Bayley Mental Scale

partialled out were also computed. Significant relationships were found between

amount of gaze checking and amount of play, either with the full correlation ($r = .48$,

$p < .01$) and the Bayley Mental Scale-partialled correlation ($r = .54$, $p < .01$).

The data for symbolic play were not normally distributed. Table 2.6 summarises

the amount of gaze for symbolic and functional play independently. The data were

split into 3 groups: 1) no checking at all; 2) between one and 3 gaze checking; and 3)

more than 4 gaze checking behaviours. As we can see from Table 2.6, only three

children did not show gaze checking. There was no difference in the percentage of

children in each play category (symbolic + functional and functional only) showing

less then 4 o more then 4 gaze behaviours.

Table 2.6

Number of children using different categories of play who show gaze checking behaviours.

	Number of gaze checking behaviours		
	0	1-3	4-more
Symbolic + functional	1	9	7
Functional only	2	5	3

Finally, we wanted to see if children showed social gaze when engaged in symbolic or functional play. Children did not check when engaging in play behaviours (functional and symbolic). In fact only 7 children out of 23 checked when engaging in play behaviours, in particular 6 children checked during functional play and only one checked during symbolic play.

2.4.4 – Discussion

The first aim of this observational study was to investigate the relation between language and play (functional and symbolic) in twenty-seven 18-24 months old infants during a 5 minutes free-play observation. We found no relation between language (vocabulary production) and play (functional and symbolic). This result does not support the view, presented by theorist of cognitive and language development (e.g., Bates et al., 1979; McCune, 1995), that language and play reflect the emergence and possibly the growth of a common underlying symbolic ability. It

may support the view that, although early word acquisition is a function of a general symbolic activity, later in development word-learning diverges from symbol development more generally, as infants begin to employ those features of language that distinguish it from general symbol use (see, Namy & Waxman, 1998, for a review).

However, a different explanation for our results could be the one presented by Tamis-LeMonda and Bornstein (1994) that language-play relations are specialised rather than global and only certain aspects of language relate to play. Although studies on the relation between play and language have generally emphasised language production, language comprehension might have as much or more theoretical significance at the early ages. Receptive language and symbolic play are considered salient indicators of representational competence as they are based on similar symbolic-conceptual processes: in vocabulary comprehension a sound stands for a object, person, or activity, and in symbolic play an object or person stands for another object or person (Laakso, Poikkeus, Eklund, & Lyytinen, 2000). Furthermore, also the specific setting that we used in our study may have prevented children showing a larger amount of play behaviours, it is possible that if the infants had been playing on the floor could facilitate the expression of symbolic play behaviours. It is also possible that having a adult in front of him/her could motivate the child to engage in more pretence play acts as within the normal game routine. Future research incorporating measures of both verbal production and verbal comprehension and varying the play setting will help us to clarify the developmental relationship between these different abilities.

The second aim of this study was to examine the relationship between social interaction and play. Theorists of cognitive and language development also supported the view that social interaction is important for symbolic development (Bruner, 1990; Tomasello, 1999). It has been hypothesised that when infants first begin to use symbolic play these acts may be accompanied by acts of gaze to another person as the child negotiates the meaning of the act for the other as well as for self. (Tomasello, 1999). The second aim of this observational study was to explore this hypothesis, examining the extent to which children inititate social gaze when engaging in acts of symbolic and non symbolic play. Results showed an association between gaze and play that was not confined specifically to symbolic play. Frequency of gaze checking across the 5-minute period was positively correlated with the frequency of both functional and symbolic play. This association was found independently of non-verbal ability.

Although overall frequency of gaze checking was related to amount of play across the session, analysis of each play events showed that children tended not to use social gaze at the same time as they carried out acts of either symbolic or functional play but at other times when they were not engaged in a play activity. Given these discrepant results it is possible that children were either inhibited from checking at the beginning and therefore played without checking or the opposite pattern may have occurred, they may have been anxious at the beginning and therefore checked without playing. In order to investigate these different explanations we decided to split the data in two equal parts: the first two and a half minutes and the second two and a half minutes. Regarding the play behaviours we found that although the amount of play behaviours did not change between first and second (48.0% the first half and 52% the

second half), nearly all the children that showed play behaviours during the five minutes showed at least one play behaviour during the first half. In fact 25 out of 27 children showed at least one act of functional play behaviour, and 13 children out of 17 showed at least one symbolic play behaviours. The same pattern seems to happen regarding the social gaze behaviours. 16 children out of 18 did check with toys during the first half, 5 children out of 11 showed isolated checking during the first half. It therefore appears that the children in our study were not inhibited or anxious from checking at beginning of the free-play observation.

Finally a clear finding of this study was that symbolic play never occured in a child who did not use also functional play. This result supports McCune's view that the development of pretend play behaviours exhibits a hierarchical order, beginning with pre-symbolic acts as shwon in functional play behaviours and progressing next to symbolic acts as shown in symbolic play behaviours.

Overall these results support the view that social interaction is important for pre-symbolic and symbolic development. If the emergence of symbolic development relies a social interaction skill then children with autism, who are well known to have a specific deficit in symbolic development skills and in social interaction should differ from developmental delayed children who also have delays in symbolic development but do not have specific impairment in social interaction. A second observational study was therefore conducted to investigate the relations between social gaze and symbolic play development in young autistic children and developmentally delay children. This study is reported in the next chapter.

Chapter 3 - Social interaction and symbolic skills in children with autism and developmental delay.

3.1 Introduction

Joint attention behaviours develop pre-linguistically and involve the triadic coordination of attention between the infant, another person, and an object or event (Charman, 2000). There is substantial experimental evidence for impairments in both the production and comprehension of joint attention behaviours in children with autism. For example, Mundy, Sigman, Ungerer, and Shernman, (1986) reported that while children with autism produced comparable amounts of both frequency of eye contact and requesting gestures to mental handicap controls they were specially impaired in turn-taking, response to invitations from the adult, and pointing, showing, or making eye contact while holding an object or watching an object in motion. In the latter situations the autistic children tended to focus their attention on the toys rather than divide their attention between the toy and the experimenter, as did the normal and mentally retarded children. It may be that autistic children have difficulty with joint attention skills because they are not proficient with a flexible, triadic attention-development (Mundy et al., 1993). In fact it has been found that, compared with children with other developmental delays, children with autism initiate fewer episodes of joint engagement (otherwise known as referential looking) (e.g., Charman et al., 1997) and have more difficulty following others' gaze direction and pointing gestures (e.g., Baron-Cohen, 1989; Leekam, Baron-Cohen, Perrett, Milders, & Brown, 1997). Children with autism produce imperative gestures as often as other

children but they produce declarative or sharing gestures far less than other children (e.g., Baron-Cohen, 1989; Sigman & Ruskin, 1999). Finally, although deficits in child-initiated joint attention behaviours were found for both low and high mental age preschoolers with autism, deficits in responding to, or following, adult-initiated joint attention behaviours were only apparent for the low mental age group (e.g., Mundy, Sigman, & Kasari, 1994). It appears that at least some aspects of joint attention –in particular the initiation of triadic joint attention acts- are severely impaired in autism, meanwhile other aspects –-such as requesting behaviours and gaze monitoring- may be impaired only in younger, or lower functioning, children with autism (Charman, 1997; Leekam, Humisett, & Moore, 1998).

There is also considerable evidence that the development of symbolic play skills is impaired in children with autism (Libby, Powell, Messer, & Jordan, 1998). However, the extent of this deficit remains unclear. In unstructured or free-play conditions, children with autism produce significantly less symbolic play, but intact functional play, compared with chronological or mental age-matched comparison groups (Jarrold, Boucher, & Smith, 1993; Libby, Powell, Messer, & Jordan, 1998). Under structured, or prompted, conditions, some studies have found that children with autism produced fewer functional and symbolic acts than did developmentally delayed controls (Mundy, Sigman, Ungerer, & Sherman, 1986), whereas in at least one study, children with autism produced as many functional play and symbolic acts as did controls (Lewis & Boucher, 1988). Thus, while most theoretical attention has focused on the impairments in symbolic, rather then functional, play in autism (Leslie, 1987; Baron-Cohen, 1989a; Mundy et al., 1993; Harris, 1993), the relationships between the cognitive abilities required for functional and symbolic play

are poorly understood. Otherwise, although there is considerable evidence that both the development of joint attention and pretend play skills are impaired in children with autism, the relations between these areas of deficit are not well understood (Mundy, Sigman, & Kasari, 1993).

3.2 - Theoretical proposals

Some accounts of autistic psychopathology give a crucial role to early impairments in joint attention and suggest that these lead to impoverished development of representational abilities that underline the later emerging impairments in pretend play and theory of mind. In these accounts, the representational system impaired in autism is dedicated to psychological reasoning (specifically reasoning about the cognitive or affective states of others) rather than a more general cognitive impairment (e.g., Baron-Cohen, 1993; Hobson, 1993; Leslie, 1987; Mundy and Sigman, 1989, 1993).

Leslie (1987) proposed that symbolic play is an early manifestation of the child's capacity for metarepresentation, directly linking the cognitive capacities involved in pretending to the later development of a theory of mind. Leslie and Happe' (1989) argued that symbolic play are only comprehensible to an observer because they are signalled as pretend by an exaggerated enactment, which signals the intention to communicate. They argued that perception of such intention or goal directedness is direct but that, while the display is directly perceived, the content or message of such displays cannot be directly perceived and can only be inferred by a central

mechanism that can metarepresent. This applies not only to symbolic play acts but also to communicative acts such as joint attention skills that emerge as forms of ostensive communication that require recognizing someone else's mental state (Charman, 1997). "This is a further link between pretence and gestures like pointing as forms of ostensive communication. In both cases, the displayed acts trigger the metarepresentational mechanism, which may allow the actor's intention to be inferred" (Leslie & Happe', 1989; p.210). For Leslie (1994) the interpretation of an agent's behaviour in terms of underlying intention is the key to the origins of a theory of mind

Mundy and Sigman (1989) have provided an alternative account to the metarapresentational thesis proposed by Leslie to link joint attention and symbolic play. They provide evidence that joint attention and symbolic play skills are not positively correlated in autism, as would be expected in both relied on an underlying metarepresentational ability. They argued that a social communication disorder exists in autism prior to the possible contribution of metarapresentational deficits and that the metarrepresentational deficit does not cause autism but it is a *sequela* of autistic developmental disturbance. For Mundy and Sigman (1993) joint attention skills are not an early manifestation of purely cognitive symbolic or metarepresentational abilities, but part of a process of integrating self and other affect that initially involves primary affective experience, which ultimately contributes toward the development of the symbolic representational skills necessary for the development of symbolic representational, and later development of a theory of mind.

Hobson's (1993) account differs from Mundy and Sigman's in the primary role he gives to affect. For Hobson it is the special nature of *affective information* itself that allow the infant to differentiate people from objects and embark on a line of development toward more explicit understandings of the mental life of self and other. These experiences lead to an understanding of persons as subjects of experience relating of the word, which underlies the sharing of attention and communicating found toward the end of the first year of life in behaviours such as joint attention and social referencing. For Hobson (1989) the capacity to recognize the psychological co-orientation of self and other acts as a basic for a more general capacity to adopt multiple orientations to a given object or situation-as is necessary for pretend play

Overall these different accounts outlined above propose a special role for joint attention in the development of pretend play and the later development of theory of mind (see Charman, 1997 for a review). Surprisingly few studies have been explored the link between these two social-cognitive skills (Mundy, Sigman, Ungerer, & Sherman, 1987; Mundy, Sigman, & Kasari, 1990; Charman, Baron-Cohen, Swettenham, Cox, Bairs, & Drew, 1997; Sigman & Ruskin, 1999).

3.3 – Empirical evidence

Mundy et al (1990) examined, in a longitudinal study of a sample of 15 autistic children and a language-matched sample of mentally retarded children, the development of non-verbal joint attention skills and play competence. At the initial and follow-up assessments these children were administrated the Early Social-

Communication Scales and with a play assessment (Ungerer & Sigman, 1981) that provided frequency measures of both functional and symbolic play. The data from the group comparisons in this study provided two notable findings. First, joint-attention deficits were manifested by the autistic sample in the first testing session, and this was before the emergence of either functional or symbolic play deficit. The autistic children also displayed significant deficits on joint attention skills at the latter assessment. Second, functional play deficits were observed on the second assessment, before the clear appearance of symbolic play deficit. Finally, initial joint attention skills scores were a significant predictor of symbolic play development at follow-up in the mental retarded sample and approached significance in its predictive association with symbolic play in the autistic sample.

Charman et al., (1997) found that, compared with developmentally delayed and normally developing children, 20 month olds children with autism were specifically impaired on some aspects joint attention. Both the infants with autism and the infants with developmental delay demonstrated functional play, but very few participants in either group produced spontaneous pretend play. Finally in the developmental delay group, but not the autism group, pretend play was shown following prompting.

Sigman and Ruskin (1999) examined, in a study of 70 children with autism, 93 children with Down syndrome, 59 children with developmental delay, and 108 typically developing children (with the first three groups of children studied when they were between 2 and 6 years of age), the relations between non-verbal communication, play and language skills. Non-verbal communication skills were measured in standardized social interaction between the experimenter and the child

(Early Social Communication Scales), five different categories were assessed: initiates joint attention, initiate behaviours regulation, initiate social interaction, responds to joint attention, responds to social interaction. Representational play skills were assessed in a structured setting in which the experimenter presented the child with groups of related toys. Play behaviours were grouped into functional acts and symbolic acts. Sigman and Ruskin (1999) found that the children with autism showed significantly less initiated joint attention and response joint attention than the other groups of children, and they used significantly fewer symbolic play acts of different kinds than all the other groups but did not differ from the other group regarding functional acts. Finally, in order to assess the extent to which these domains are related, correlations were computed between the initiated join attention and the response joint attention with the number of different functional and symbolic acts shown during play. All the correlations were significant for the children with autism. For the other children, the number of different functional play acts was correlated only with the responding to bids for joint attention.

Overall, the pattern of impairments outlined above is quite consistent with views that typical development of specific communicative behaviours is part of the unfolding of a biologically based, social, or social-cognitive system, which is missing or impaired in autism. Nevertheless, despite specific impairments in both the emergence of communicative intentions and the emergence of symbolic ability, children with autism show developmental progress in these areas as they mature cognitively (Travis & Sigman, 2001).

3.4 - The development of communicative and symbolic functioning in children with autism.

Contrasting the timing and course of this developmental progress with typical development is informative with respect to basic issues involving the nature of the impairments in autism and the nature of typical development. First, communicative development appears to be more disorganized than does symbolic development. In this regard Carpenter (1997) found that, the order of emergence of communicative skills in autistic children in comparison with typically developing and learning disabled children, was substantially altered. In typically developing children the main communicative skills emerged in the following order: (1) joint engagement (shared attention with adults by alternating gaze between an object and the adult), (2) communicative gestures (pointing, showing and giving), (3) attention following (follow the gaze direction of an adult to an object). However in children with autism, the pattern of emergence of these communicative skills was different: (1) communicative gestures, (2) joint engagement, (3) attention following. Furthermore, considering the evidence from lexical and play development, disruption of symbolic functioning seems less a case of disorganized development, as some have suggested (Cicchetti, Beeghly, & Weiss-Perry, 1994), and more a case of delayed and arrested development. Earlier developing forms of symbol use, such as words and functional play, appear fairly intact in autism, although they are delayed. More advance forms, such as understanding subtleties of language use and engaging in symbolic forms of pretence, do appear to be considerably impaired. In comparing the extent of the atypical development for communicative and symbolic abilities, it is clear that deviation from typical development is greater in the case of communicative

functioning (see Travis & Sigman, 2001 for review). Moreover, autism presents a case where basic pre-linguistic communicative intentions are substantially delayed, not only in relation to cognitive abilities, but also in relation to language (Carpenter, 1997; Leekam, Lopez, & Moore, 2000). The appearance of lexical symbols prior to well-developed communicative intentions is surprising from both cognitive (e.g., Piaget, 1962) and social perspectives (Vygotsky, 1962; Bruner, 1975), because both postulate some continuity between early communicative signalling and later use of linguistic symbols. It has been hypothesised that the mastery of lexical symbols before communicative behaviours in some children with autism would suggest that refinement and extension of communicative behaviours is not the only possible route to symbol mastery (Travis & Sigman, 2001). Furthermore, it would support a view of symbolic ability as separable from its communicative functions. Such a finding would be quite consistent with the view proposed by Bates et al. (1979), who argues that although pre-linguistic signalling precedes and may contribute to the emergence of true symbols, the symbolic function is a separate capacity. However the substantial delay in acquisition of lexical symbols in autism highlights the facilitate power of supportive social contexts in typical symbolic development. The earliest symbolic words and gestures are acquired at about 12 to 15 months in typically developing children, while they do not begin to appear until 20 to 30 months Mental Age in children with autism (Charman, Baron-Choen, Swettenham, Cox, Baird, & Drew, 1997; Lewis & Broucher, 1988; Sigman & Ungerer, 1984). This suggests that in order for symbolic behaviours to emerge at around 12 to 15 months of age, as they do in typically development, supportive social contexts are necessary (Travis & Sigman, 2001).

3.5 – Summary and aims of Study 2

Although, there is considerable evidence that the development of joint attention and symbolic play skills are impaired in children with autism (Baron-Cohen, 1993; Leslie, 1987, 1994; Mundy, Sigman, & Kasari, 1993; Charman, Baron-Cohen, Swettenham, Cox, Baird, & Drew, 1997; Sigman & Ruskin, 1999), the relations between these areas of deficit are not well understood (Mundy, Sigman, & Kasari, 1993). Some accounts of autistic psychopathology give a crucial role to early impairments in joint attention and suggest that these lead to impoverished development of representational abilities that underline the later emerging impairments in pretend play and theory of mind (e.g., Baron-Cohen, 1993; Hobson, 1993; Leslie, 1987; Mundy & Sigman, 1989, 1993).

The aim of the second observational study is to explore this hypothesis, examining the extent to which children inititate social gaze when engaging in acts of symbolic and non symbolic play in 18 children with autism and 18 children with developmental delay. In particular the aim was to test the hypothesis presented in the discussion of the first study, that, although social gaze interaction is important for symbolic developemnt, the use of social gaze may have a general rather than a specific role in assisting symbolic activity. This interpretation would suggest that gaze to others assists infants in all aspects of learning and is not specific to symbolic play.

3.6 - Study 2: Social gaze and symbolic play development in children with autism.

3.6.1 – Introduction

The aim of the second observational study is to investigate the relation between social gaze and play in children with autism and developmental delay. The videotapes from this study come from a previous study investigating social interaction skill in children with autism (Leekam, Lopez, & Moore, 2000). The setting used from this study is exactly the same as we used in the first study. The MacArthur Communicative Development Inventory used in this study is slightly different to the one that we used in the first study. This questionnaire has two versions: Words and Gestures (Infant form) that is designed for use with 8- to 16- month olds children, and Words and Sentences (Toddler form) that is designed for use with 16- to 30- month olds children. In the first study we used the Words and Sentences version and in this study Leekam et al. (2000) used the Words and Gestures version.

3.6.2 – Method

Participants

Autism (AD) group. Thirty-six preschool children (18 with autism and 18 controls) aged 2 years 10 months to 5 years 10 months participated in the study. Only children with an official clinical diagnosis of autism according to the revised third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; American Psychiatric Association, 10987) the DSM-IV (American Psychiatric

Association, 1994), or the International Classification of Disease (ICD-10; World Health Organization, 1992) were selected for the AD group. The majority of children were diagnosed at Guy's or Maudsley Hospital, London, by means of the Autistic Diagnostic Interview (Le Couteur et al., 1989). The remainder were diagnosed by local pediatricians who use ICD-10 criteria in their diagnostic practice.

Developmental delay (DD) comparison groups. Children were selected for the control group if they had developmental delays but no sign of autism. Six children in the control group had known organic disorders. The others had global or specific developmental delays (i.e., learning and/or language impairments) not associated with specific disorders. Some AD children had very high IQ scores; in order to match these scores in the control group, we included 2 typically developing children with IQs and mental ages in the normal range. The mean chronological age and Mental Scale score of the two groups are shown in the Table 3.1.

Matching Procedure. Each autistic child was individually matched with a child in the comparison group. Matching was based on nonverbal ability in order to control for effects of general ability, which might affect performance (see Leekam, Lopez & Moore, 2000).

Table 3.1

Means and standard deviations for the Chronological Age (express in months) and the Bayley Mental Scale raw score.

Measures	Developmental delay group	Autism group
Chronological Age		
Mean	53.89	52.72
SD	6.91	11.13
Mental Scale		
Mean	68.83	81.78
SD	36.13	36.61

Design and procedures

Testing took place at the University laboratory at the University of Kent. Each

child took part in a 5-minute free play observation session, however we coded only

the first three minutes as not all children played during the all section. This

unstructured play session preceded a long more structured session lasting 15 minutes.

The child sat on a chair and played with a set of toys posed on a table. The set of toys

was composed of: telephone, tea set, doll, building blocks, nest of cups, magic baby

bottle, plastic fruit, stick, tooth brushes, hair brushes, car. The experimenter sat

directly behind the child (about 10 cm) without drawing the child's attention to any

toy in the room or telling the child what to do. In order to have eye contact with the

experimenter the child has to turn his head of 90 degree or more. If the child showed

a toy or interacted with the experimenter in any way, the experimenter could only

smile and say "thank you" or other appropriate but non-leading responses. The

session was recorded by one video camera situated in front of the child (3 metres). The children were assessed with the Bayley Mental Scale of Infant Development-II (Psychological Corporation, 1994). This test provided a measure of overall mental ability, including non-verbal and verbal components. Finally we asked parents to fill the MacArthur Communicative Development Inventory –words and gestures form- (MCDI; Dale, 1996; Fenson et al., 1994). This is a questionnaire used as measure of the child's words (production and comprehension) and gestures (production).

Scoring

We used exactly the same categories that we did in previous study (see pp.36-38). The only difference is that we collapsed the two play behaviours categories (functional and symbolic) as only one child out of 36 showed symbolic play behaviours during the 3 minutes free-play in this study.

Reliability

One coder (blind to the purpose of the study) coded both child's spontaneous play behaviour and spontaneous initiation social gaze behaviours. To assess inter-observer reliability, a second coder independently coded a random sample of 30% of the data for both play and social gaze behaviours. Overall agreement between the coders for the appearance of the play behaviours was 95% and a Cohen's Kappa coefficient of .89. Overall agreement between coders about the production of social gaze was 95% and a Cohen's Kappa coefficient of .88.

<u>Descriptive Statistics</u>

Table 3.2 and 3.3 presents means and standard deviations for the frequency of the play behaviour category (total play) and for the frequency of the social gaze categories (isolated checking and checking with toy) in both developmental delay and autistic groups. As can be seen from the data some categories have high standard deviations. The Kolmogorov-Smirnov test was used to testing whether the distribution was normal in our data. All categories except for total play were not normal distributed. Finally, Table 3.4 present the means, standard deviations and range for the MacArthur vocabulary production and comprehension (number of words).

Table 3.2

Means and standard deviations for the frequency of total play behaviours in both developmental delay and autistic children.

Measures	Developmental delay group	Autism group
Total play		
Mean	6.00	4.83
SD	4.46	3.71

Table 3.3

Means and standard deviations for the frequency of isolated checking and checking with toy behaviours in both developmental delay and autistic children.

Measures	Developmental delay group	Autism group
Isolated checking		
Mean	1.72	0.94
SD	1.74	2.18
Checking with toy		
Mean	1.61	0.11
SD	2.30	0.32

Table 3.4

Means and standard deviations for the MacArthur vocabulary production and comprehension (number of words) in both developmental delay and autistic groups.

Measures	Developmental delay group	Autism group
Vocabulary production		
Mean	223.00	113.06
SD	155.46	106.80
Vocabulary comprehension		
Mean	281.94	179.82
SD	120.95	117.12

In relation to the frequency of play behaviours nearly all children (16 developmental delay children and 16 autistic children) produced functional play behaviour. On the other hand only one child (DD) out of 36 produced one act of symbolic play (see Table 3.5). It seems clear that DD and AD do not differ in their production of play.

Table 3.5

Number of children showing different types of play.

		Symbolic + functional	Symbolic only	Functional only	No play
Developmental delay	Number of children	1	0	15	2
Autism	Number of children	0	0	16	2

In relation to the frequency of social gaze we found that 21 children (15 DD and 6 AD) showed at least one act of isolated checking and 13 children (11 DD and 2 AD) showed at least one act of checking with toys. Regarding the combination between checking with toys and isolated checking, 9 children showed both social gaze categories in the developmental delay group (DD) during the 3 minutes observational study but none of the autistic children (AD) did, moreover 10 AD children did not show any social gaze behaviours at all. In contrast only 1 DD child showed no social gaze. These difference was significant, χ^2 (2, N = 36) = 16.36, p < .000 (Columns 2 and 3 were collapsed to avoid low expected frequencies).

Table 3.6

Number of children showing different types of social gaze.

		Isolated + checking with toys	Checking with toys only	Isolated only	No checking
Developmental delay	Number of children	9	2	6	1
Autism	Number of children	0	2	6	10

In order to investigate the differences between developmental delay and autistic group in the amount of gaze checking (isolated checking + checking with toys) did show play, the data were split into 3 groups: 1) no checking at all; 2) between one and 3 gaze checking; and 3) more than 4 gaze checking behaviours. As we can see from Table 3.7, 8 DD children that showed at least one play behaviour did check more than 4 times, in contrast to no AD children. On the other hand 9 AD children that showed at least one play behaviour did not check at all in contrast to only 1 DD child.

Table 3.7

Number of children using the total play category that show gaze checking behaviours.

		Number of checking behaviours		
		0	1-3	4-more
Developmental delay	Total play	1	8	8
	None	0	1	1
Autism	Total play	9	7	0
	None	1	0	1

Concurrent association between social gaze and play

As for Study 1 we decided to collapse the social gaze categories in only one category: total gaze checking (Mean = 3.33, SD = 2.52 for the developmental delay group; and Mean = 1.05, SD = 2.15 for the autism group), as the social gaze categories were not normally distributed. However this variable (total gaze checking) was not normally distributed. Non-parametric correlation analysis (Spearman correlation) was computed. We did not find significant relationships between amount of gaze checking and amount of play in either developmental delay (rho = -.290, p = .243) and autistic groups (rho = -.159, p = .528).

Finally, we wanted to see if children were showing social gaze when engaged in symbolic or functional play. AD children and DD children did not differ in the production of social gaze when engaging in play behaviours. In fact only 5 DD

children out of 16, and only 5 AD out of 16 checked gaze when engaging in play behaviours.

3.6.4 - Discussion

Some accounts of autistic psychopathology give a crucial role to early impairments in joint attention and suggest that these lead to impoverished development of representational abilities that underlie the later emerging impairments in pretend play and theory of mind (e.g., Baron-Cohen, 1993; Hobson, 1993; Leslie, 1987; Mundy & Sigman, 1989, 1993). The aim of this second observational study was to explore this hypothesis, examining the extent to which children with autism and developmental delay group initiate social gaze when engaging in acts of play behaviours. In particular we wanted to test the hypothesis presented in the discussion of the study 1, that although social gaze interaction is important for symbolic development, the use of social gaze may have a general rather than a specific role in assisting symbolic activity. Results showed that children with autism showed fewer social gaze behaviours than the developmental delayed group. Moreover, according with previous studies (e.g., Jarrold, Boucher, & Smith, 1993) we found no significant difference between autistic children and developmental delayed children in the production of functional play.

If we consider functional play as pre-requisite for the symbolic play appearance (as shown in the first study) the finding that autistic children did not differ from developmental delay children in pre-symbolic behaviours could support the view presented by Carpenter (1997) and Leekam et al. (2000) that, in autistic children, the

68

acquisition of some symbolic skills may precede using an alternative route by recognizing the vehicle-referent relationship without the intentional communicative function (Leekam & Moore, 2001). The possibility that children with autism can recognize the symbolic function independently of making any social or mental inferences is also suggested by children's performance on the "false photograph" task (Leekam & Perner, 1991). Children with autism seem able to understand that a photograph represent its referent independently of the reality of the current situation, whereas they seem unable to make the same kind of inferences for a person's mental state.

However, it is also possible that the specific setting that we used in our study may have prevented children showing a larger amount of play behaviours, for example playing on the floor could facilitate the expression of symbolic play behaviours, likewise having a adult in front of the child could motivate children to engage in more pretence play acts as it would happen in the normal game routine.

General conclusion

The aim of this thesis was to investigate the relation between social gaze and symbolic skills (language and play) in typically developing children infants and children with autism. Two main questions were investigated. The first was if symbolic play and language reflect the emergence of a common underlying symbolic ability. The second was if social interaction and in particular social gaze has a specific role in the emergency of symbolic development. To investigate these issues we examined the relationship between two symbolic skills, language and symbolic play, to establish if there were positive relationship (Study 1), and we also looked at the initiating of social gaze (look to an adult) when engaging in acts of both symbolic and non-symbolic (functional) play, to establish if there were general rather then specific relationships between social gaze and play (Study 1 and Study 2).

The first observational study investigated the relationship between language and symbolic and pre-symbolic (functional) play competence in 18-24 month olds infants during a 5 minutes free-play. Play and language were not related to each other in our study. This result could have several explanations: 1) it could be that, although early word acquisition is a function of a general symbolic activity, later in the development word-learning diverges from symbol development more generally (Namy & Waxman, 1998); or 2) it could be that language-play relations are specialized rather than global and only certain aspects of language (as comprehension) relate to play (Tamis-LeMonda & Bornstein, 1994); or 3) it could be also that the specific setting we used may have prevented children showing more and more frequently play

behaviours. Future research will help us to clarify the developmental relationship between these different abilities using, for example, different language measures as the Reynell developmental Language Scales (RDLS; Reynell & Huntley, 1987) that provides separate measures of verbal comprehension and expressive language, or using a different setting that could facilitate the spontaneous play behaviours as having the child sitting on the floor and playing with adult in the same way that the child use to do normally.

Theorist of cognitive and language development have being also supported the view that social interaction is important for symbolic development (Vygotsky, 1978; Bruner, 1990; Tomasello, 1999). The second observational study was to investigate the relation between social interaction and symbolic play development, examining the extent to which children initiate social gaze (look to an adult) when engaging in acts of symbolic and pre-symbolic (functional) play in 18-24 month olds infants. Children in our study tended not to use social gaze at the same time as they carried out acts of either symbolic or functional play but at other times when they were not engaged in a play activity. In addition the significant association between gaze and play that we found was not confined specially to symbolic play. These results do not fully support the view proposed by Tomasello (1999) that early play symbols are produced for others as we found that only 1/3 of the children check when engaging in a play behaviour (functional and symbolic) and only one child out of 14 checked when engaging in a symbolic play act. The finding gives greater support for the view presented by Bates et al. (1979), who argue that although prelinguistic signaling precedes and may contribute to the emergence of true symbols, the symbolic function is a separate capacity. However despite a general faliture to use social gaze when

engaged in a play act, infants who engaged in more play also engaged in more social gaze across the wide session. This significant association between play and social gaze supports the view that although social interaction is important for symbolic development, the use of social gaze may have a general rather than a specific role in assisting symbolic activity (Vygotsky, 1978; Bruner, 1990). In this regard the early development of symbolic abilities in autism may also provide an infomative contrast with typical development.

Autism provides an especially interesting perspective on the development of communicative and symbolic functioning, as it involves specific impairment in both of these skills. However, although these impairments are considered by several theoretical accounts to be central to the disorder (e.g., Baron-Cohen, 1993; Hobson, 1993; Leslie, 1987; Mundy & Sigman, 1989, 1993), the relations between these areas of deficit are not well understood (Mundy, Sigman, & Kasari, 1993). The aim of the second observational study was to investigate the relation between initiated acts of social gaze behaviours and spontaneous play behaviours (functional and symbolic) in young children with autism and developmental delayed children as a comparison group. Results showed that like typically developing infants most autistic and developmental delayed children do not use social gaze by checking another face when actually engaging in play (in both typically developing and autistic and developmental delayed groups we found 1/3 children checking when playing). However children with autism did show less social gaze behaviours than did the developmental delay group. Finally, we found no significant difference between autistic children and developmental delayed children in the production of functional play, meanwhile none of the children (except one) in our study showed symbolic play

behaviours. If we consider functional play as pre-requisite for the symbolic play appearance (as showed in the first study) the latter finding could support the view presented by Carpenter (1997) and Leekam et al. (2000) that, in autistic children, the acquisition of some symbolic skills may proceed using an alternative route by recognizing the vehicle-referent relationship without the intentional communicative function (Leekam & Moore, 2001). These results will support also Bates et al. (1979) view that the symbolic function is a separate capacity, however the substantial delay in the symbolic development (no autistic children in our study showed symbolic play acts) could highlights the facilitate power of supportive social contexts that we found in typically developing infants.

Overall these results (typically developing infants and children with autism) could support the view presented by Travis and Sigman (2001), that although symbolic abilities can be acquired without finely tuned social support, they cannot be acquired as early as they are in typical development. However, unfortunately, the method used in our study also has several limitations as we saw in the discussions of the two studies. Future research will help us to clarify the development of communicative and symbolic functioning in both typically developing infants and children with autism. For example, a longitudinal study investigating these social-cognitive skills in typically developing infants starting at an early stage (before 9 months) will help us to understand better the relationship between social gaze (dyadic and triadic) and the development of symbolic skills (language and play). Future research should also utilize a different procedure such as having the child playing on the floor and/or sitting in front of an adult will facilitate the production of symbolic play acts and social gaze behaviours. Furthermore studying older autistic children will clarify the

development of communicative and symbolic functioning. Some symbolic play capacities do develop as children with autism get older and it would be important to examine the way that changes in social interactional abilities change along side these developments.

In summary, despite all its limitations, the present study provided a valuable contribution to our understanding of the relation between different aspects of the symbolic development as in language and play and the research highlight the important contribution of social gaze in the development of pre-symbolic and symbolic ability.

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