Humour and Laughter in Children with Autism Spectrum Disorders

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Table of Contents

Abstract

Autism spectrum disorders (ASDs) are common childhood conditions characterised by impairments in social and communicative functioning (APA, 2000). Children with ASDs typically have difficulty interacting with others and reading social cues. They rarely share their emotions and interests with others, tending to prefer solitary activities (Barnhill, 2001; Schreibman, 2005). One important social behaviour is humour. Humorous interactions facilitate the development of social and communication skills, and provide children with opportunities to form social relationships (Martin, 2007). Studying humour and laughter in children with ASDs can provide unique insights into their socio-communicative impairments, and aid in the development of effective interventions. The current study investigated humour and laughter in 16 school-aged children with autism and Asperger Syndrome (AS). The control group included 15 typically developing children and children with Down Syndrome matched on chronological age and nonverbal cognitive ability. Humour was explored through parent questionnaires and direct observations of children engaged in play. Based on theory and past research, children with ASDs were expected to have difficulty with the interpersonal aspects of humour, particularly sharing humour and laughter with others. Furthermore, although early forms of humour may be intact, children with ASDs were expected to have difficulty producing and understanding humour at an appropriate developmental level. The findings of the present study support current beliefs that laughter is present in the lives of children with ASDs in response to simple events. However, difficulties emerge for more complex forms of humour that involve cognitive and linguistic demands or social understanding, including jokes, playful teasing, and socially inappropriate humour. Furthermore, children with ASDs display difficulties sharing

their laughter with others and responding appropriately to others' laughter. Consistent with past research, the humour difficulties of children with ASDs were found to be related to impairments in language and ToM. Findings are discussed with consideration of the limitations of the study and areas for future research.

Statement of Authorship

Except where explicit reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis by which I have qualified for or been awarded another degree or diploma. No other person's work has been relied upon or used without due acknowledgement in the main text and bibliography of the thesis.

Signed: _____

Dated: _____

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List of Figures

List of Tables

Chapter 1: Introduction

Autism spectrum disorders (ASDs) are common childhood conditions characterised by impairments across three areas of functioning: (a) social development, (b) language and communication, and (c) imagination (Ozonoff & Rogers, 2003). Social impairments are considered the hallmark feature of ASDs (Jobe & White, 2007; Schreibman, 2005). Children with ASDs typically have difficulty interacting with others and reading social cues. They rarely share their emotions and interests with others, tending to prefer solitary activities (Barnhill, 2001; Schreibman, 2005).

One important social behaviour is humour. Humorous interactions facilitate the development of social and communication skills, and provide children with opportunities to form social relationships (Cunningham, 2005; Martin, 2007). Investigation of humour in children with ASDs is of particular importance, given their deficits centre around interacting and communicating with other people. Parents and families of children with ASDs can give so much to their child, getting so little in return (Beals, 2003).

Due to their social and communicative impairments, it has been theorised that children with ASDs have difficulty understanding humour and using it appropriately in social situations (Howlin, 1997; Lyons & Fitzgerald, 2004). Currently, empirical studies investigating humour in individuals with ASDs are sparse. Most studies have adopted a cognitive approach to studying humour, exploring the ability of individuals to produce and comprehend jokes and cartoons. These studies suggest that even high-functioning individuals with ASDs have difficulty comprehending cognitively complex humour, such as jokes and riddles (Emerich, Creaghead, Grether, Murray, & Grasha, 2003; McCormick, 1993;

Ozonoff & Miller, 1996). Furthermore, while individuals with ASDs are capable of producing humour, the majority of humour occurs at a developmental level below what is expected (Emerich et al., 2003; Van Bourgondien & Mesibov, 1987).

To date, only one study has examined humour in ASDs from a socio-affective perspective (Reddy, Williams, & Vaughn, 2002). The authors used a naturalistic design to explore spontaneous occurrences of humour and laughter during social interactions. They found that, while children with autism are capable of producing humour and laughter, they have difficulty sharing these emotional experiences with others and engaging in humour and laughter-related interactions. In particular, children with autism have difficulty with humour that relies on social knowledge and awareness, such as teasing and socially inappropriate humour.

1.1 Aims of the Current Study

The current study plans to build on the research by Reddy and colleagues (2002) by exploring spontaneous, naturally occurring episodes of humour and laughter that arise during children's social interactions. Studying humour and laughter can provide unique insights into the socio-communicative impairments of children with ASDs, and aid in the development of effective interventions. Child development researchers to date have predominantly focused on mental illness and deficits at the expense of positive experiences and assets, such as humour and happiness (Lefcourt, 2001). Recognition of abilities and areas of strength can help develop understanding among parents and families of children with ASDs, and improve their ability to communicate and interact with their children.

The current project is divided into two studies. Study 1 uses parental reports to explore children's laughter and production of humour. Study 2 involves naturalistic observations of children's humour and laughter whilst engaged in play.

Although the current investigation is largely exploratory, a number of tentative hypotheses are offered. Based on theory and past research, it is expected that children with ASDs will have difficulty with the interpersonal aspects of humour, particularly sharing humour and laughter with others. Furthermore, although early forms of humour may be intact, children with ASDs are likely to have difficulty producing and understanding humour at an appropriate developmental level. They may have particular difficulty with cognitively complex forms of humour, such as jokes and riddles.

1.2 Thesis Organization

Following the current chapter, chapter 2 of this thesis will present an overview of ASDs, including diagnostic features, prevalence, and developmental progression. To provide greater understanding of the impairments in ASDs, chapter 3 will review etiological theories of ASDs. This chapter will be divided into two main parts: biological theories and cognitive theories. Chapter 4 will then discuss the concept of humour, with particular emphasis on theories of humour and the parallels between humour and other aspects of development. The final chapter in the review of literature, Chapter 5, will provide a summary of past research on humour and laughter in ASDs.

The current project will be outlined in Chapter 6. This chapter will include aims and hypotheses, participants, and materials. The specific procedure for study 1 and study 2 will be presented in chapters 7 and 8 respectively. Each chapter will also include results and a brief discussion. A general discussion will be provided in Chapter 9.

Chapter 2: Autism Spectrum Disorders: Historical Analysis and Overview

Autism was first documented more than 60 years ago when child psychiatrist Leo Kanner described 11 children who shared an inability to relate to others, impairments in communication, and an obsessive need for sameness. All children were also described as unusually preoccupied with certain objects or topics (Kanner, 1943). Stressing what he called a profound aloneness in these children, Kanner (1943) adopted the term *infantile autism*, borrowing from the work of psychiatrist Eugen Bleuler who used the word *autism* in the early 1900s to refer to the detachment from reality seen in individuals with schizophrenia (Bleger, 1974; Szatmari, 2000).

Kanner (1943) identified the pathognomic features of autism that are still considered essential for diagnosis. He also highlighted several co-existing problems, including disrupted appetite and eating patterns, disturbances in mood, and the presence of medical conditions, such as repeated ear infections and seizures. Anxiety was also common, with many children displaying intense fears of everyday things, such as water or kitchen utensils (Kanner, 1943). Kanner (1943) strongly believed that autism was inherited; he noted that some parents and siblings experienced qualitatively similar symptoms of autism, including obsessiveness and language delays.

One year after Kanner's (1943) publication, Austrian paediatrician, Hans Asperger, described a similar yet milder form of autism in a group of boys (Szatmari, 2000). These children exhibited social deficits and a desire for sameness, but functioned at an appropriate level in terms of cognitive and language development (Asperger, 1944/1991). Similar to Kanner, Asperger used the term

autism, describing the pattern of behaviours in these children as *autistic psychopathology* (Asperger, 1944/1991).

Asperger's work attracted little international attention until Wing's (1981) publication in the English language literature where she coined the term *Asperger Syndrome* (AS; Church, Alisanski, & Amanullah, 2000; Ghaziuddin, 2002). Wing (1981, 1988) considered AS and infantile autism as belonging to the same group of conditions sharing impairments across social functioning, communication, and imagination. More specifically, she proposed the existence of an *autistic continuum* in which AS constitutes a milder form of the same underlying disorder seen in autism (Wing, 1988).

Today, autism and AS are listed as childhood disorders in the current edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR; American Psychiatric Association [APA], 2000). Within this classification system, autism and AS are characterised as *pervasive developmental disorders* (PDD), referring to a group of conditions sharing impairments across three areas of functioning: social interaction, communication and language, and the presence of stereotyped behaviours and interests (APA, 2000). Wing's (1988) concept of an autistic continuum has persisted and there is currently a general acceptance that autism and AS represent *autism spectrum disorders* (ASD) existing along a continuum ranging from mild to severe (Dodd, 2005; Prior, 2005). To date, some controversy remains over how broadly the spectrum extends (Dodd, 2005; Volker & Lopata, 2008). For the purposes of this review, the term ASD will be used to refer only to autism and AS.

2.1 Diagnostic Criteria

Autism is the most severe of the spectrum disorders with individuals displaying deficits across all three areas of functioning: (a) impairments in social functioning, (b) restricted and repetitive patterns of behaviour and interests, and (c) impairments in language and communication (APA, 2000; Ozonoff & Rogers, 2003). In contrast, AS is considered to represent the high-functioning end of the autism spectrum (Prior, 2005; Steyn & Le Couteur, 2003). Individuals with autism and AS share impairments across social interaction and repetitive interests and behaviours; however, a diagnosis of AS applies only when there is no history of delay in language development or cognitive development (APA, 2000; Ghaziuddin, 2002; Woodbury-Smith & Volkmar, 2009). Children with AS must also function at an age-appropriate level in terms of adaptive behaviour (APA, 2000), which reflects their ability to take care of themselves and function independently in day-to-day settings, including school and home (Goodlin-Jones & Solomon, 2003).

2.1.1 Impairments in social functioning. Impairments in social interaction are perhaps the hallmark feature of ASDs (Bellini, 2009; Jobe & White, 2007). Social difficulties are typically pervasive and span all ages (Bauminger & Kasari, 2000; Tantam, 2000). Infants with an ASD may fail to cuddle or smile at other people; adolescents may interact with others but do so in an awkward or inappropriate manner (Bauminger & Kasari, 2000; Schreibman, 2005). Even individuals with ASDs who possess average intellectual ability lack basic social awareness and have difficulty interacting with other people (Howlin, Mawhood, & Rutter, 2000; Liss et al., 2001).

The social deficits in ASDs are manifest in a number of different ways (Barnhill, 2001; Baron-Cohen & Bolton, 1993). While some children attempt to

establish friendships, most will show no interest in other children (Barnhill, 2001; Volkmar & Wiesner, 2009; Wing & Gould, 1979). Even among children who seek social interactions, there is a high degree of variability in the way they interact. Some children will present as shy and passive, whereas others are socially intrusive and inappropriate, failing to read others' social cues and emotions (Church et al., 2000; Plimley & Bowen, 2007; Wing & Gould, 1979). The diagnostic criteria for autism and AS require impairments in social functioning across two of the following areas: (a) use of nonverbal behaviours, (b) sharing of interests and experiences with others, (c) social and emotional reciprocity, and the (d) development of friendships (APA, 2000).

In the nonverbal domain, children with ASDs have difficulty using gestures during social interactions (APA, 2000; Lewis, 2003; Ruble, 2001; Schreibman, 2005). They often fail to use everyday social gestures, such as nodding, waving, and pointing (Capps, Kehres, & Sigman, 1998; Hobson & Lee, 1998; Schreibman, 2005; Wimpory, Hobson, Williams, & Nash, 2000). Some children with ASDs may use gestures but in an atypical manner, such as nodding to mean *no* or crossing their arms to express happiness (Hamaguchi, 2001; Landry & Loveland, 1988; Plimley & Bowen, 2007; Ozonoff, Dawson, & McPartland, 2002). Other children may come to rely on idiosyncratic or unconventional forms of nonverbal communication, such as flapping their arms to request an object (Keen, 2003; Meadan, Halle, Ostrosky, & DeStefano, 2008) or self-harming to express distress (Schreibman, 2005; Vitkus, 1996). Many children with ASDs also display impairments in eye gaze (APA, 2000; Bowman, Hinkley, Barnes, & Lindsay, 2004; Schreibman, 2005). They frequently avoid eye contact during social interactions, or they may adopt a stiff, blank stare

appearing to look though other people (Gillberg & Gillberg, 1989; Schell, Stark, & Giddan, 1967; Schreibman, 2005).

Given their difficulties in nonverbal communication, most children with ASDs display impairments in *joint attention*. Joint attention refers to the sharing of experiences with others through the use of nonverbal behaviours, such as eye contact and gestures (Bruinsma, Koegel, & Koegel, 2004; Mundy & Markus, 1997). This capacity typically emerges between 6 months and 12 months of age, and is well established by 18 months (Hamaguchi, 2001; Leekam, López, & Moore, 2000; Sigman & Capps, 1997). Two classes of joint attention have been identified in the literature: (a) response to joint attention, where the child follows the gaze and gestures of another person; and (b) initiation of joint attention, in which the child seeks the attention of another person through eye contact, pointing, or gestures (Dawson et al., 2004; Isaksen & Holth, 2009; Warreyn, Roeyers, Wetswinkel, & de Groote, 2007).

Children with ASDs typically have difficulties in both classes of joint attention relative to typically developing children (Adamson, Bakeman, Deckner, & Romski, 2009; Dawson, Meltzoff, Osterling, Rinaldi, & Brown, 1998; Sigman & Ruskin, 1999; Warreyn, Roeyers, Oelbrandt, & de Groote, 2005), children with intellectual disability (Mundy, Sigman, Ungerer, & Sherman, 1986; Sigman & Ruskin, 1999) and children with developmental and language delays (Landry & Loveland, 1988; Leekam et al., 2000; Stone, Ousley, Yoder, Hogan, & Hepburn, 1997; Warreyn et al., 2007). Children with ASDs have particular difficulty in initiating joint attention (MacDonald et al., 2006; Warreyn et al., 2007). Many children with ASDs will eventually develop the ability to respond to joint attention bids; however, impairments in initiating joint attention persist, even among children

with average intellectual ability (Charman, 1998; Mundy, Sigman, & Kasari, 1994; Sigman & Ruskin, 1999).

Impairments in initiating joint attention appear to be especially severe for *declarative* acts, where the child seeks to share an interest or experience, as opposed to *imperative* joint attention acts, where the child requests an object or activity (Mundy et al., 1986; 1994; Sigman, Mundy, Sherman, & Ungerer, 1986; Sigman & Ruskin, 1999; Warreyn et al., 2007; Wetherby, Prizant, & Hutchinson, 1998). Often children with ASDs make no attempts to share their enjoyment or interests with others, preferring to enjoy their favourite activities alone (APA, 2000; Mundy & Crowson, 1997; Ozonoff et al., 2002). They have little interest in or reaction to praise, and rarely show others their accomplishments or achievements (Kasari, Sigman, Baumgartener, & Stipek, 1993; Ozonoff et al., 2002). Mundy (1995) suggested that joint attention impairments in children with ASDs are related to motivation. Imperative joint attention acts are less impaired because there is an immediate reward of obtaining a preferred activity or object (Mundy, 1995). In contrast, the reward for declarative bids is less salient and reinforcing, presenting more difficulty for children with ASDs (Tomasello, 1999; Vismara & Lyons, 2007).

Although many children with ASDs exhibit joint attention deficits, some children with ASDs are able to respond to and initiate bids for joint attention (Mundy et al., 1986; Sigman & Ruskin, 1999; Warreyn et al., 2007). Several contributing factors have been presented in the literature, including the familiarity of the other person involved in the interaction (Hobson & Lee, 1998) and the nature of the interaction (Mundy et al., 1986). For example, compared to other social play situations, Mundy et al. (1986) found no difference between children with autism

and controls on joint attention following tickling. They suggested that joint attention might be less impaired in physical social activities.

Joint attention deficits have important developmental implications for children with ASDs. The inability to attend to social stimuli limits the involvement of children in the early social experiences important for social development (Mundy & Neal, 2001; Warreyn et al., 2007). Joint attention also provides the basis of shared experience that is important for language development (Mundy, 1995; Tomasello, 1999). Indeed, joint attention behaviours in infancy and childhood have been found to be important predictors of social functioning (Charman, 2003; Sigman & Ruskin, 1999) and language ability (Charman, 2003; Mundy, Sigman, & Kasari, 1990; Sigman & Ruskin, 1999; Smith et al., 2007) in individuals with ASDs.

Joint attention is also an important precursor to emotional development (Morales, Mundy, Crowson, Neal, & Delgado, 2005; Van Hecke et al., 2007). Joint attention exchanges allow children to share their affective experiences with others and develop social relationships, thereby providing vital learning opportunities that are the foundation for emotional development (Keltner & Haidt, 1999; Vismara & Lyons, 2007; Warreyn et al., 2007). Lacking these early experiences, children with ASDs typically have difficulty understanding and sharing emotions with others (APA, 2000; Ozonoff et al., 2002). In fact, children with ASDs are often described as being emotionally "flat" or "blunt" because of their limited display of emotions in social interactions (Capps, Kasari, Yirmiya, & Sigman, 1993; Myles & Simpson, 2002; Schreibman, 2005).

This perception appears to stem from an impairment in social sharing rather than a lack of emotional expressiveness, with several studies reporting a spectrum of emotional expression in children with ASDs (Capps et al., 1993; Dawson, Hill,

Spencer, Galpert, & Watson, 1990; Yirmiya, Kasari, Sigman, & Mundy, 1989). In social situations, however, children with ASDs display significantly less emotion compared to matched controls (Joseph & Tager-Flusberg, 1997; Scambler, Hepburn, Rutherford, Wehner, & Rogers, 2007; Snow, Hertzig, & Shapiro, 1987; Trad, Bernstein, Shapiro, & Hertzig, 1993) and are less likely than matched controls to combine positive affect and joint attention behaviours; for example, smiling in response to a shared experience, or combining smiles with eye contact (Dawson et al., 1990; Kasari, Sigman, Mundy, & Yirmiya, 1990; Yirmiya et al., 1989). Thus, while children with ASDs have the capacity to express emotions, they lack appreciation of the meaning of the expression or gesture.

Difficulty sharing emotions with others is also evidenced by the limited emotional responsiveness of children with ASDs (Travis & Sigman, 1998). Studies have consistently found that children with ASDs show little attention to the emotional displays of others compared to matched controls (Corona, Dissanayake, Arbelle, Wellington, & Sigman, 1998; Dawson et al., 2004; Sigman, Kasari, Kwon, & Yirmiya, 1992; Scambler et al., 2007). In fact, children with ASDs often appear to lack empathy because they show little response to others' distress (Frith, 2004; Schreibman, 2005; Sigman et al., 1992). Research shows that children with ASDs also frequently fail to respond to positive emotions from others, including praise and smiles (Dawson et al., 1990; Kasari et al., 1993). Even children who respond to others' emotions may have difficulty making the appropriate response; for example, inadvertently laughing when someone is hurt or upset (Baron-Cohen & Bolton, 1993; Capps et al., 1993; Schreibman, 2005).

Although early studies suggested that children with ASDs have an emotion perception deficit (Hobson, 1986; Scott, 1985; Tantam, Monaghan, Nicholson, &

Stirling, 1989), more recent studies have questioned these findings. One group of researchers have argued that emotion perception deficits are not specific to autism, but are associated with general developmental delays. When children with ASDs are matched with controls on verbal ability, deficits in emotion perception are not found (Braverman, Fein, Lucci, & Waterhouse, 1989; Prior, Dahlstrom, & Squires, 1990; Grossman, Klin, Carter, & Volkmar, 2000; Ozonoff, Pennington, & Rogers, 1990).

Another line of evidence has suggested that impairments in emotional responsiveness in children with ASDs may be the result of an underlying deficit in processing faces (Gepner, de Gelder, & de Schonen, 1996; Hobson, 1989). Studies have found that compared to controls, children with ASDs spend less time focusing on the eyes (Dawson, Webb, & McPartland, 2005; Klin, Jones, Schultz, Volkmar, & Cohen, 2002) and more time focusing on "unimportant" features of the face, such as the ears or chin (Lahaie et al., 2006; Pelphrey et al., 2002). Children with ASDs have also been found to match face pictures according to irrelevant information, such as clothing and accessories, rather than according to facial expressions as control children do (Davies, Bishop, Manstead, & Tantum, 1994; Weeks & Hobson, 1987). While some researchers have argued for a specific deficit in processing faces, others have proposed a global perceptual deficit that also affects processing of non-facial stimuli (Davies et al., 1994; Shah & Frith, 1993). Currently, more research is needed in order to clarify the exact nature of these deficits in children with ASDs (Jemel, Motton, & Dawson, 2006).

Due to their difficulties in sharing emotions and experiences with others, parents and relatives often describe children with ASDs as being in a world of their own (Baron-Cohen & Bolton, 1993; Schreibman, 2005). Some children can be completely unresponsive to others, failing to notice when someone enters a room or

calls their name (Church et al., 2000; Dawson et al., 1998; Hamaguchi, 2001; Kanner, 1943; Schreibman, 2005). In many cases, parents mistakenly believe their child is deaf (Bloch-Rosen, 1999; Ozonoff et al., 2002; Sigman & Capps, 1997).

Children with ASDs typically prefer solitary activities (APA, 2000; Schreibman, 2005). Compared to matched controls, they spend less time in social play (Macintosh & Dissanayake, 2006; Jackson et al., 2003; Pierce-Jordan & Lifter, 2005) and are less likely to engage others in play (Brown & Whiten, 2000; Hauck, Fein, Waterhouse, & Feinstein, 1995; Stone & Lemanek, 1990; Jackson et a., 2003). Even as infants, children with ASDs rarely engage in simple social games, such as peek-a-boo or tickling (APA, 2000; Bernabei, Camaioni, & Levi, 1999; DiLavore, Lord, & Rutter, 1995; Schreibman, 2005). Some children may involve others in their activities, but in unusual ways, for example, using another person's hand as a tool to open a door or pick up an object (APA, 2000; Baron-Cohen & Bolton, 1993; Stone et al., 1997).

As a result of their social impairments, children with ASDs typically have few or no friends (Barnhill, 2001; Church et al., 2000; Ozonoff et al., 2002; Koning & Magill-Evans, 2001). Any social interactions tend to be based primarily on the child's special interests (Barnhill, 2001; Hauck et al., 1995; Ozonoff et al., 2002). Some higher functioning children and adolescents, such as those with AS, may desire friendships but lack the necessary skills, tending to be socially awkward or intrusive by saying hurtful things or asking inappropriate questions (Barnhill, 2001; Church et al., 2000; Myles & Simpson, 2002; Volkmar & Wiesner, 2009). In fact, many children are rejected or teased by their peers due to their inappropriate social behaviour and communication difficulties (Fong, Wilgosh, & Sobsey, 1993; Harnum, Duffy, & Ferguson, 2007; Myles & Simpson, 2002; Tantam, 2000).

2.1.2 Restricted and repetitive behaviour and interests. The second diagnostic feature of ASDs is the presence of restricted and repetitive behaviours and interests. This area refers to a broad class of behaviours linked by repetition, rigidity, and inappropriateness (Carcani-Rathwell, Rabe-Hasketh, & Santosh, 2006; Turner, 1999). The diagnostic criteria for autism and AS require the presence of at least one of these behaviours (APA, 2000). Behaviours may be *lower-level*, such as repetitive motor movements, or they may be more complex, *higher-level* behaviours, such as circumscribed interests, a preoccupation with parts of objects, and an insistence on routines (Szatmari et al., 2006; Turner, 1999).

Many children with ASDs engage in stereotyped body movements, such as rocking or swaying (APA, 2000; Bashe & Kirby, 2005; Schreibman, 2005). They may show abnormalities in gait and posture, such as walking on tiptoes (APA, 2000; Lewis, 2003) or holding a rigid, immobile position for long periods of time, a state referred to as *catatonia* (Wing & Shah, 2000). Repetitive hand movements, including clapping and finger flicking are also common (APA, 2000; Church et al., 2000; Ozonoff et al., 2002; Schreibman, 2005).

Another characteristic common to children with ASDs is a preoccupation with one or more restricted patterns of interest. These interests may be unusual either in intensity or in focus (APA, 2000; Ozonoff et al., 2002; Szatmari et al., 2006). For example, Volkmar et al. (1996) described a preoccupation with clocks in a 15-year-old boy with AS who would frequently reset public clocks and approach strangers to reset their watches. For many children with ASDs, the obsessive interest is their main focus and they only engage in activities related to that interest (Barnhill, 2001; Bloch-Rosen, 1999; Ozonoff et al., 2002).

Children with ASDs typically have excellent memory for their interests and are able to recite volumes of information (Bashe & Kirby, 2005; Bloch-Rosen, 1999; Myles & Simpson, 2002). Carruthers and Foreman (1989) wrote about a boy with AS who was able to name the colour and registration number of all the cars belonging to his family and other regular acquaintances (Carruthers & Foreman, 1989). Other children may memorise entire bus timetables or telephone books (Bashe & Kirby, 2005; Schreibman, 2005). For some children with ASDs, interests become so intense that they interfere with important activities, such as learning (Olley, 1986), social interaction (Bashe & Kirby, 2005; Olley, 1986), and eating (Ozonoff et al., 2002).

Children with ASDs may become overly attached to unusual objects, such as a rubber band or piece of cloth (APA, 2000; Steyn & Le Couteur, 2003). Schreibman (2005) described a boy with autism who would take a hand-held vacuum cleaner to bed rather than a teddy bear or blanket. Many children with ASDs are also preoccupied with parts of objects, such as buttons or wheels (APA, 2000; Ozonoff et al., 2002). Children with ASDs are often particularly interested in the sensory qualities of objects. They may frequently sniff or lick objects, or become fascinated with objects that move and spin, such as fans and washing machines (Hewetson, 2002; Schreibman, 2005; Talay-Ongan & Wood, 2000).

The final area of repetitive and restricted behaviour seen in children with ASDs is an inflexible adherence to routines or rituals (APA, 2000; Barnhill, 2001; Steyn & Le Couteur, 2003). Children with ASDs may insist on being served off the same plate for every meal (Baron-Cohen & Bolton, 1993; Church et al., 2000), taking the same route to school every day (APA, 2000), or being the only person to answer the telephone (Hewetson, 2002). Minor changes or disruptions to routines

and environment can lead to severe distress or anxiety (APA, 2000; Carcani-Rathwell et al., 2006; Steyn & Le Couteur, 2003). Schreibman (2005) presented a case study of a young girl with autism who would throw tantrums if her father's chair was left in the reclining position. Sometimes even the most minute detail is detected, such as the position of a vase on a table (Schreibman, 2005; Steyn & Le Couteur, 2003).

Although repetitive and restricted behaviours can be disruptive and demanding, many believe these behaviours have important implications for children with ASDs. One school of thought is that repetitive behaviours are a source of stimulation or accomplishment for children with ASDs (Bashe & Kirby, 2005; Lovaas, Newsom, & Hickman, 1987). Others suggest that repetitive and restricted behaviours are a coping mechanism for moderating high levels of stress and anxiety (Baron-Cohen, 1989a; Carruthers, 1996) and maintaining order and control (Attwood, 1998). Currently, despite being a diagnostic requirement, this feature of ASDs has received little research attention (South, Ozonoff, & McMahon, 2005; Turner, 1999). To date, most knowledge comes from case studies and anecdotal reports (Hewetson, 2002; Schreibman, 2005). More research is needed in order to clarify the exact nature of these impairments and why they occur.

2.1.3 Impairments in language and communication. Social difficulties and restricted behaviours are diagnostic features of both autism and AS. In contrast, impairments in language and communication are only present in individuals with autism (APA, 2000; Frith, 2003; Ghaziuddin, 2002). These impairments may manifest in one or more of the following ways: (a) a delay or total lack of spoken language, (b) difficulties initiating or sustaining conversation, (c) stereotyped or repetitive language, and (d) lack of pretend play (APA, 2000).

As many as 40% of children with autism remain essentially nonverbal throughout their development (Lord, Risi, & Pickles, 2004; Mesibov, Adams, & Klinger, 1997; Wetherby & Prizant, 1992). When speech does develop, children with autism typically display impairments in *pragmatics* (APA, 2000; Bara, Bucciarelli, & Colle, 2001; Tager-Flusberg, 1999). Pragmatics refers to the social use of language and includes skills such as politeness, turn-taking, and topic maintenance in conversation (Bellini, 2009; Mundy & Markus, 1997; Wilkinson, 1998). The majority of children with autism have difficulty sustaining conversations with others (APA, 2000; Philofsky, Fidler, & Hepburn, 2007; Wilkinson, 1998). They may interrupt others when they are talking (Mesibov, Shea, & Schopler, 2004; Ramberg, Ehlers, Nydén, Johansson, & Gillberg, 1996), introduce socially inappropriate topics (Eales, 1993; Lord, Rutter, & Le Couteur, 1994; Ricks & Wing, 1975), or incessantly ask questions (Hurtig, Ensrud, & Tomblin, 1982; Mesibov et al., 2004; Prizant, 1996).

Children with autism appear to have trouble understanding the needs of their conversational partner (Boucher, 2003; Mesibov et al., 2004). During conversations, they tend to change topics rapidly (Hinerman & Channell, 1986; Mesibov et al., 2004) and insert irrelevant information (Capps et al., 1998; Landa, 2000; Lewis, 2003). Many children with autism also have difficulty identifying topics that are of general interest; their conversations tend to be one-sided and limited to their special interests (Bloch-Rosen, 1999; Landa, 2000; Mesibov et al., 2004; Ricks & Wing, 1975; Schreibman, 2005).

Pragmatics also involves the ability to use and interpret nonverbal communicative behaviours (Mundy & Markus, 1997; Wilkinson, 1998). As previously mentioned, children with autism have impairments in nonverbal

communication (Volkmar & Wiesner, 2009). During conversations, they frequently violate social rules, such as standing too close to someone or talking to someone from the other side of the room (Garfin & Lord, 1986; Landa, 2000; Plimley & Bowen, 2007). They may also have difficulty reading others' social cues; for example, continuing to talk incessantly despite the listener's boredom, irritation, or apparent desire to leave (Bloch-Rosen, 1999; Mesibov et al., 2004).

While pragmatic difficulties are the most prominent linguistic feature of autism, impairments have also been reported across other language systems (Mundy & Markus, 1997; Frith, 2003). Many children with autism repeat words and phrases spoken by others, a behaviour referred to as *echolalia* (Mawhood, Howlin, & Rutter, 2000; Prizant, 1996; Volkmar & Wiesner, 2009). Echolalia may be immediate or occur some time after the word or phrase is heard (delayed echolalia; Baron-Cohen & Bolton, 1993; Schreibman, 2005). Although once thought to be meaningless, a growing body of research suggests that echolalia may be a purposeful behaviour used to communicate a protest or request (Wetherby, 1986; Prizant & Duchan, 1981; Prizant & Rydell, 1984). For example, a child who repeats the phrase *Do you want a biscuit*? might do so for the purpose of requesting a biscuit for themselves (Ricks & Wing, 1975; Schreibman, 2005).

Many children with autism develop an idiosyncratic language that can only be understood by parents and close relatives (APA, 2000; Lord et al., 1994; Prizant & Wetherby, 1987; Ozonoff et al., 2002). For example, Schreibman described a child with autism who would refer to a tape-recorder as "self-destruct in five seconds" (Schreibman, 2005, p. 35), borrowing from the television program "Mission Impossible." Some children with autism may create new words or phrases (Baron-Cohen & Bolton, 1993; Kanner, 1943; Schreibman, 2005), such as *diddle-up*

for shoe (Wing, 1969) or *pling* for pencil (Schreibman, 2005). Pronoun reversal is also common and occurs when the child substitute pronouns such as *he* for *me* (Lord et al., 1994; Wilkinson, 1998; Steyn & Le Couteur, 2003; Volkmar & Wiesner, 2009).

Communication also involves the ability to comprehend the language of others. Many children with autism have difficulty understanding simple questions or instructions (APA, 2000; Hamaguchi, 2001; Plimley & Bowen, 2007). Children with autism have particular difficulty understanding non-literal aspects of speech, such as irony, metaphors, and sarcasm (APA, 2000; Baron-Cohen & Bolton, 1993; Happé, 1994; Mitchell, Saltmarsh, & Russell, 1997; Volkmar & Wiesner, 2009). For example, a child with autism told that it is "raining cats and dogs" may run outside expecting to see falling animals (Schreibman, 2005). This literalness can often interfere with social interactions, as Schreibman (2005) demonstrated in the case of a boy with autism named Danny. For some reason Danny referred to a particular service worker as "Poster." When the worker told Danny his name was not poster, Danny began referring to him as "Not Poster." Many children with autism also have trouble with humour and often fail to understand jokes and cartoons (APA, 2000; Happé, 1994; Landa, 2000; Ozonoff & Miller, 1996).

In addition to non-literal language, some children with autism have difficulty with the sounds of speech, the area of language referred to as *phonology* (APA, 2000; Boucher, 2003; Wilkinson, 1998). Although not universal, several studies have reported phonological impairments in children with autism, including inappropriate use of stress (Baltaxe, 1984; Baltaxe & Simmons, 1985; Shriberg et al., 2001), immature articulation (Bartak, Rutter, & Cox, 1975), poor volume control (Fay & Schuler, 1980; Shriberg et al., 2001), and oddities in pitch or intonation (Fay

& Schuler, 1980; Paccia & Curcio, 1982; Shriberg et al., 2001). Many children with autism speak in a mechanical or monotonous tone that may sound like a robot (Hamaguchi, 2001; Volkmar & Wiesner, 2009). Other children may adopt an unusual tone that is overly nasal (Shriberg et al., 2001) or sounds like a foreign accent (Tantam, 2000).

The final area of communicative impairment in children with autism is pretend play (APA, 2000). Pretend play can be subdivided into two categories: (a) *functional play*, where the child uses an object for its socially designated function, and (b) *symbolic play*, which involves treating an object as if it is something else, such as pretending a shoe is a phone (Bigham, 2008; Leslie, 1987; Libby, Powell, Messer, & Jordan, 1998). Functional play typically emerges around 14 months of age, whereas symbolic play develops slightly later at approximately 20 months of age (Bretherton, 1984; Libby, Powell, Messer, & Jordan, 1997). One group of theories proposes that symbolic play is a necessary precursor to the development of humour. Without the capacity for symbolic thought, children lack the ability to understand the basis of humour (McGhee, 1989). This theory is discussed in more detail in chapter 4.

Compared to matched controls, symbolic play in children with autism is often limited or absent (Baron-Cohen, 1987; Bernabei et al., 1999; Bigham, 2008; Jarrold, Boucher, & Smith, 1996; Libby et al., 1998; Rutherford & Rogers, 2003; Sigman & Ruskin, 1999; Sigman & Ungerer, 1984). When symbolic play is present, it is typically repetitive and lacks creativity (Atlas, 1990; Charman & Baron-Cohen, 1997; Hobson, Lee, & Hobson, 2009; Williams, Reddy, & Costall, 2001). Children with autism often repeat the same play script over and over with little variation (Schreibman, 2005). Wolfberg (1999) wrote of Teresa, a young girl with autism who

became attached to a particular doll. Every day she would perform the same ritual with the doll, bathing it, dressing it, and combing its hair. Some children with autism are capable of understanding and producing elaborate symbolic play when prompted (Charman & Baron-Cohen, 1997; Lewis & Boucher, 1988; Ungerer & Sigman, 1981); however, they still exhibit impairments in spontaneous production of symbolic play acts (Jarrold et al., 1996; Lewis & Boucher, 1988; Libby et al., 1997).

Research findings for functional play are less consistent. While some studies have found impairments the functional play of children with autism (Jarrold et al., 1996; Sigman & Ruskin, 1999; Sigman & Ungerer, 1984; Stone, Lemanek, Fischel, Fernandez, & Altemeier, 1990), other researchers have failed to replicate these results (Baron-Cohen, 1987; Libby et al., 1998). Williams et al. (2001) found that although children with autism did not differ from controls in the amount of time spent in functional play, the functional play of children with autism tended to be simpler and more repetitive. Other studies have supported this finding, suggesting that the functional play of children with autism is less elaborate and varied than the functional play of other children (Atlas, 1990; Sigman & Ungerer, 1984; Williams et al., 2001). Children with autism often use objects in a concrete manner, such as stacking or lining toys, rather than using them for their functional purpose (Hewetson, 2002; Ozonoff et al., 2002; Volkmar & Wiesner, 2009). For example, Sigman and Capps (1997) described a 5-year-old boy with autism who would play with a doll and brush, but only to bang them together.

Language acquisition has important developmental implications for children with autism (Boucher, 2003; Smith, Mirenda, & Zaidman-Zait, 2007). Research has found that language ability is associated with the development of social and emotional skills in children with autism (Ben-Itzchak & Zachor, 2007; Dissanayake,

Sigman, & Kasari, 1996; Hauck et al., 1995; Lord & Pickles, 1996; Yirmiya, Sigman, Kasari, & Mundy, 1992) and is an important predictor of social functioning in later life (Billstedt, Gillberg, & Gillberg, 2005; Howlin et al., 2000; Mawhood et al., 2000; Szatmari, Bryson, Boyle, Streiner, & Duku, 2003). Without language, children may fail to develop important social relationships (Howlin et al., 2000; Travis & Sigman, 1998). In fact, researchers have found that, compared to typically developing children, children with language impairments are less liked by peers (Gertner, Rice, & Hadley, 1994; Hazen & Black, 1989), more frequently ignored by peers (Hadley & Rice, 1991; Rice, Sell, & Hadley, 1991), and more likely to play alone (Hadley & Rice, 1991). Lacking social interactions, children with autism may fail to acquire the social skills and experience necessary for development (Jordan, 2003; Keltner & Haidt, 1999).

2.2 Language and Communication in AS

In contrast to the language impairments seen in children with autism, the diagnostic criteria for AS requires no significant delay in language development (APA, 2000). Many argue, however, that although not delayed, patterns of language and communication in children with AS are often deviant (Adams, Green, Gilchrist, & Cox, 2002; APA, 2000; Eisenmajer et al., 1996; Frith, 2004; Woodbury-Smith & Volkmar, 2009). Several studies have found odd or unusual patterns of communication in children with AS, including the use of idiosyncratic words and phrases (Eisenmajer et al., 1996; Szatmari, Bremner, & Nagy, 1989), echolalia (Church et al., 2000; Szatmari et al., 1989), and speaking with an unusual tone or volume (Eisenmajer et al., 1996; Shriberg et al., 2001; Volkmar & Klin, 2000). Many children with AS adopt a pedantic or scholarly way of speaking (Barnhill, 2001; Ghaziuddin & Gerstein, 1996; Volkmar et al., 1996). They tend to talk in an

overly formal manner, using a large vocabulary and perfect intonation (Ghaziuddin & Gerstein, 1996), a style of speech that has lead to the term *little professor* (Barnhill, 2001; Frith, 2003).

Several researchers have also reported pragmatic difficulties in children with AS, including difficulties initiating and maintaining a conversation (Adams et al., 2002; Barnhill, 2001; Church et al., 2000; Shaked & Yirmiya, 2003), frequently interrupting others (Fine, Bartolucci, Szatmari, & Ginsberg, 1994), and asking inappropriate questions or making inappropriate comments (Barnhill, 2001; Church et al., 2000; Gilchrist et al., 2001; Shaked & Yirmiya, 2003). For example, Volkmar et al. (1996) described a teenager with AS who would frequently talk to others about his sexual needs using graphic expletives. Many children with AS also have difficulty monitoring the informational needs of listeners as shown by providing too much information (Fine et al.,1994) and shifting topics rapidly (Bloch-Rosen, 1999; Volkmar & Klin, 2000). Conversations are typically one-sided, appearing more as a monologue rather than an interaction (Bashe & Kirby, 2005; Shaked & Yirmiya, 2003; Volkmar & Klin, 2000). Compared to other aspects of language, pragmatic difficulties are common among children with AS and appear to be a universal feature of ASDs (Philofsky et al., 2007; Ramberg et al., 1996; Rice, Warren, & Betz, 2005).

2.3 Differential Diagnosis of Autism and AS

The diagnostic distinction between autism and AS has been a topic of considerable debate for many years (Macintosh & Dissanayake, 2004; Volkmar, Lord, Bailey, Schultz, & Klin, 2004). Indeed, there is considerable overlap of the characteristics of these two conditions. The main differentiating criterion between autism and AS is the development of language (APA, 2000; Bloch-Rosen, 1999). Although it may be odd in nature, the language of children with AS is typically

better developed than in children with autism (Dissanayake, 2004; McLaughlin-Cheng, 1998).

For a diagnosis of AS, there must also be no significant delay in intellectual development (APA, 2000). In contrast, autism can occur across all levels of intellectual ability (Fitzgerald & Corvin, 2001). Most studies estimate that around 70% of children with autism have an intellectual disability, that is, an IQ score below 70 on a standardised intelligence test (Chakrabarti & Fombonne, 2001; Fombonne, 2003; Rutter, Bailey, Simonoff, & Pickles, 1997; Tager-Flusberg, Joseph, & Folstein, 2001). Individuals with autism who perform at an average level intellectually (IQ score > 70) are described as having *high-functioning autism* (HFA; Fitzgerald & Corvin, 2001; Ozonoff & Rogers, 2003).

There is currently significant controversy over the difference between AS and HFA. Children with HFA share so many features with children with AS that they are often difficult to tell apart (Frith, 2004). An abundance of research has been devoted to identifying the similarities and differences between HFA and AS. To date, the empirical findings remain inconclusive (Dodd, 2005; Volker & Lopata, 2009). Some researchers have found no clinical distinctions between the two conditions, leading to the notion that AS and HFA are the same disorder. Others suggest that AS and HFA are distinct conditions with fundamentally different clinical presentations (see Freeman, Cronin, & Candela, 2002; Volkmar et al., 2004). The only common ground appears to be the acceptance of a spectrum of autistic-like conditions with varying degrees of severity and functioning (Campbell, 2009; Dodd, 2005; Prior, 2005).

2.4 Summary and Implications for Humour Development

ASDs are characterised by impairments across three areas of functioning: (a) social development, (b) repetitive and restricted behaviours and interests, and (c) language and communication. Social difficulties are considered the hallmark feature of ASDs (Schreibman, 2005; Volkmar & Wiesner, 2009). Impairments typically manifest across several domains, including nonverbal communication, emotional reciprocity, social sharing, and the development of relationships (APA, 2000). Even children with advanced cognitive and language skills, such as those with HFA and AS, have difficulty interacting with others and sharing their emotions and experiences (Howlin et al., 2000; Liss et al., 2001).

The social impairments in ASDs have important implications for the development of humour. Although children with ASDs may appreciate humour, they lack the social skills and awareness necessary to share this humour with others and engage in humour-related interactions (Reddy et al., 2002). The most important ingredients, social sharing and emotional reciprocity, are missing (Lyons & Fitzgerald, 2004).

The language impairments in ASDs have also been linked to humour development both directly and indirectly through social functioning (Lyons & Fitzgerald, 2004). Most humour depends on language (Jones, 1983; Masten, 1986), thus under-developed communication skills may limit the use of humour and laughter by children with ASDs. Pragmatic difficulties in particular may impair the ability of children with ASDs to use humour effectively in social situations. Failure to read social cues may result in humour that is odd or inappropriate; for example, telling a joke that is offensive or laughing when someone is upset (Schreibman, 2005). Responding to other people's humour may also be impaired in children with

ASDs. Their responses may be limited or inappropriate due to difficulties understanding humour that involves symbolic thought (McGhee, 1989) or non-literal language (Landa, 2000; Ozonoff & Miller, 1996).

The final area of impairment in ASDs involves a pattern of repetitive or restricted behaviours. These impairments include repetitive motor mannerisms, obsessive interests, and an insistence on sameness and routines (APA, 2000). Currently, more research is needed to clarify the exact nature of these impairments, including their role in humour development. In a recent study, Werth and colleagues suggested that humour production is influenced by obsessional interests. The authors studied humour in a woman with autism named Grace. Although Grace was able to tell complex jokes and puns, the majority of these jokes focused on her own obsessional interests (Werth, Perkins, & Boucher, 2001). In the same way, it is possible that individuals with ASDs only respond to humour that is related to their special interests. Furthermore, their insistence on sameness may result in humour that is repetitive or follows a particular script. These suggestions remain unsubstantiated, although the current study hopes to offer some insight into this area.

ASDs are one of the most severe childhood conditions, affecting many children and their families (Cohen, 2002; Volker & Lopata, 2008). Despite current knowledge, there is still a lot to learn about ASDs, including the development of humour and laughter. Continued research is of extreme importance given the nature of autistic impairments, which are typically pervasive and lifelong (APA, 2000). Furthermore, ASDs are associated with a number of co-existing medical and psychological conditions, which further affect children's functioning and development (Ghaziuddin, 2002; Volker & Lopata, 2008). These issues will be discussed briefly in the following sections.

2.5 Prevalence of Autism and AS

Although once thought to be rare, studies have reported dramatic increases in the prevalence of ASDs in recent years (Fombonne, 2005; Newschaffer, Falb, & Gurney, 2005). In a recent review, Fombonne (2003) reported that the median prevalence rate for autism in 16 surveys published between 1992 and 2001 was 12.7 per 10,000 children, much higher than the median prevalence rate of 4.4 per 10,000 children for surveys published between 1966 and 1991. Although some authors have proposed an environmental cause (Bernard, Enayati, Redwood, Roger, & Binstock, 2001; London & Etzel, 2000), many have maintained that the rise in prevalence of ASDs is largely attributable to other factors, such as changes in diagnostic classifications, increased awareness and knowledge about ASDs, and improved assessment procedures (Fombonne, 2003; Tidmarsh & Volkmar, 2003; Williams, Mellis, & Peat, 2005; Wing & Potter, 2002).

Due to variations across methodology and sampling, comparisons of the rates of ASDs between studies are problematic (Fombonne, 2005; Williams et al., 2005). Estimates for autism range from 5.2 per 10,000 children (Treffert, 1970) to 72.6 per 10,000 children (Kadesjö, Gillberg, & Hagberg, 1999). Similar variation has been reported for AS, with estimates ranging from 0.3 per 10,000 children (Sponheim & Skjeldal, 1998) to 48.4 per 10,000 children (Kadesjö et al., 1999). In a recent analysis of existing prevalence studies, Fombonne (2005) derived a conservative estimate of 13 per 10,000 children for autism, with the estimate for AS at 2.6 per 10,000 children. Recent studies have suggested that prevalence rates are consistent across ethnic groups and socio-economic levels (Dyches, Wilder, & Obiakor, 2001; Fombonne, 2003).

ASDs occur in both males and females, although they are typically more common in males (APA, 2000; Volkmar, Szatmari, & Sparrow, 1993). Ratios of males to females vary across studies but the accepted mean ratio is 4:1 (APA, 2000; Fombonne, 2003). Among high-functioning children, such as those with AS, the male to female ratio is slightly higher at approximately 5:1 (APA, 2000; Bashe & Kirby, 2005; Fombonne, 2003). Although less common in females, researchers have suggested that ASDs in females are typically associated with lower intellectual ability (Banach et al., 2009; Konstantareas, Homatidis, & Busch, 1989; Tsai & Beisler, 1983; Volkmar et al., 1993) and more severe autistic symptomatology, including greater communication deficits (Carter et al., 2007; Hartley & Sikora, 2009) and more social problems (Holtmann, Bolte, & Poustka, 2007).

2.6 Progression of ASDs

ASDs typically manifest themselves during infancy or early childhood and follow a continuous and pervasive course throughout the lifespan (APA, 2000; Ozonoff & Rogers, 2003). The average age of onset for autism is 3 years (Chakrabarti & Fombonne, 2005). AS appears to have a somewhat later onset than autism, or at least to be recognized somewhat later (Mandell, Novak, & Zubritsky, 2005; Quinn, 2005).

Although behavioural manifestations vary with age, the defining features of ASDs, impairments in socialisation, communication, and repetitive behaviour, are present at all stages of development (Bloch-Rosen, 1999; Frith, 2003). Current research suggests that the severity of these core features may decrease with age (Esbensen, Seltzer, Lam, & Bodfish, 2009; Fecteau, Mottron, Berthiaume, & Burack, 2003; Seltzer et al., 2003; Shattuck et al., 2007), however most individuals continue to meet the diagnostic criteria for ASD as adolescents (Church et al., 2000;

Sigman & McGovern, 2005; Sigman & Ruskin, 1999) and adults (Howlin et al., 2000; McGovern & Sigman, 2005). Only a small percentage of children with ASDs are able to live and work independently as adults (Bernard, Harvey, Potter, & Prior, 2001; Eaves & Ho, 2008; Howlin, Goode, Hutton, & Rutter, 2004). Even adults who are high functioning continue to exhibit some difficulties interacting and communicating with others (APA, 2000; Landa, 2000; Njardvik, Matson, & Cherry, 1999).

Overall, outcome is highly variable and difficult to predict (Eaves & Ho, 2008; Howlin et al., 2000). Some individuals deteriorate behaviourally throughout development, whereas others improve (APA, 2000). The strongest predictors of prognosis are language development and overall intellectual ability (Anderson et al., 2007; Ben-Itzchak & Zachor, 2007; Billstedt et al., 2005; Mawhood et al., 2000; Szatmari et al., 2003), with individuals who function at higher levels in terms of language and cognition generally having a better outcome compared to those whose language and thinking is less developed (APA, 2000; Ozonoff & Rogers, 2003; Volkmar & Wiesner, 2009).

Outcome for children with ASDs is also dependent on *comorbidity* (Dominick, Davis, Lainhart, Tager-Flusberg, & Folstein, 2007; Eaves & Ho, 2008; Ghaziuddin, 2002). Comorbidity refers to the co-occurrence of two or more disorders in the same individual (Costello, Foley, & Angold, 2006; Ghaziuddin, 2002). Comorbid conditions can further disrupt the functioning of children with ASDs and place additional demands on carers and family (Dominick et al., 2007; Ghaziuddin, 2002; Hansen & Hagerman, 2003).

Among the most common comorbid conditions seen in children with ASDs are epilepsy (Fombonne, 2003; Ghaziuddin, 2002), tic disorders (Canitano &

Vivanti, 2007; Ringman & Jankovic, 2000), and chromosomal abnormalities, including Down Syndrome (Morgan, Roy, & Chance, 2003; Zafeiriou, Ververi, & Vargiami, 2007), Fragile X, and tuberous sclerosis (Kielinen, Rantala, Timonen, Linna, & Moilanen, 2004; Rutter, Bailey, Bolton, & Le Couteur, 1994; Wassink, Piven, & Patil, 2001). ASDs are also frequently associated with psychiatric disorders, including ADHD (Ghaziuddin, Weidmer-Mikhail, & Ghaziuddin, 1998; Leyfer et al., 2006), depression (Ghaziuddin & Greden, 1998; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000), anxiety (Lewis, 2003; Kim et al., 2000; Russell & Sofronoff, 2005; White & Robinson-Nay, 2009), sleeping disorders (Dominick et al., 2007; Polimeni, Richdale, & Francis, 2005), and behavioural problems, such as aggression and non-compliance (Dominick et al., 2007; Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). Some children with ASDs exhibit sensory abnormalities, such as a hypersensitivity to sensory stimuli (Baranek, Boyd, Poe, David, & Watson, 2007; Bennetto, Kuschner, & Hyman, 2007; Blakemore et al., 2006). For example, Jones, Quigney, and Huws (2003) described a boy with autism who found it painful to look at bright colours. Other children may show a hyposensitivity to sensory stimuli, such as failing to react to pain or temperature (APA, 2000; Lewis, 2003; Talay-Ongan & Wood, 2000).

Overall, there is large variability in the presentation of ASDs. There is no single feature that is impaired or absent for all children with ASDs (Lord & Risi, 1998) and no two children are exactly alike (Mastrangelo, 2009; Prior, 2005). Symptom presentation appears to vary partially as a function of intellectual ability, with higher IQ typically associated with less severe autistic symptomatology (Dominick et al., 2007; Filipek et al., 1999; Goodlin-Jones & Solomon, 2003; Hauck

et al., 1995; Lord & Pickles, 1996); however, this is not universal (Chan, Cheung, Leung, Cheung, & Cheung, 2005; Kjelgaard & Tager-Flusberg, 2001; Rutter, 1978).

Children with ASDs have within themselves a spectrum of abilities, resulting in advanced skills in some areas and underdeveloped skills across other areas (Bashe & Kirby, 2005; Schreibman, 2005). Some children posses *splinter skills* or special abilities that are in contrast to their severe impairments across other areas of functioning (Hermelin, 2001; Schreibman, 2005). In a minority of cases, these abilities are at the savant level, that is, beyond what it is typical for their age. These special abilities frequently occur in the areas of memory, mathematics, mechanical skills, artistic ability, and musical ability (Lewis, 2003; Young, 2001; Volkmar & Wiesner, 2009).

The most famous example of savant abilities is Dustin Hoffman's character from the movie "Rain Man", based on real-life savant, Kim Peek. He could perform remarkable mathematical calculations in his head, including card counting in Las Vegas, but was unable to function independently. Although splinter skills can be remarkable, they are typically isolated and unrelated to overall level of functioning (Hermelin, 2001; Schreibman, 2005).

2.7 Summary of ASD Issues

Autism spectrum disorders (ASDs) are a group of childhood conditions characterised by impairments across three areas of functioning: (a) social development, (b) repetitive and restricted behaviours and interests, and (c) language and communication (APA, 2000). For the purposes of the current project, the term ASD refers only to autism and Asperger Syndrome (AS). Autism is the most severe of the spectrum disorders with individuals displaying deficits across all three areas of functioning. In contrast, AS is considered to represent the high-functioning end of

the autism spectrum; children with AS typically have better developed language and cognitive skills (APA, 2000; Schreibman, 2005).

The diagnostic features of ASDs have important implications for the ability of children with ASDs to use humour and laughter in social situations. Of particular importance are difficulties with social sharing, social and emotional reciprocity, and pragmatic language. Although children with ASDs may understand and appreciate humour, they lack the necessary social skills and awareness to share this humour with others and engage in humour-related interactions (Reddy et al., 2002). Even children with well developed language and intellectual ability, such as those with AS, continue to have difficulties interacting with others and sharing their emotions and experiences (Liss et al., 2001). Studying humour and laughter in a social context can offer unique insights into the socio-communicative and affective impairments of children with ASDs.

Follow-up studies have suggested that ASDs are not just childhood disorders; they continue into adolescence and adulthood causing impairment in the areas of family, social, and adaptive functioning (APA, 2000). Functioning is often further disrupted by the presence of co-existing conditions, such as epilepsy, chromosomal abnormalities, and psychiatric conditions (Dominick et al., 2007; Ghaziuddin, 2002). Overall, outcome for individuals with ASDs is highly variable and difficult to predict (Howlin et al., 2000).

Although children with ASDs share a number of features, there is considerable variability in symptom presentation across individuals. There is no single feature that is impaired or absent for all children with ASDs, and no two children are exactly alike (Prior, 2005). The heterogeneity across symptom presentation has lead to the conclusion that ASDs are etiologically heterogeneous,

with a number of different etiologies likely (Hansen & Ozonoff, 2003; Rutter, 2005a). Etiological theories of ASDs can be divided into two main categories: (1) biological theories, which attribute ASDs to genetic and physiological factors, and (2) cognitive theories, which posit various cognitive dysfunctions as central to ASDs (Schreibman, 2005). Each theory offers a unique perspective on the socio-communicative impairments in ASDs, including difficulties with humour and laughter. These theories will be discussed in more detail in the next chapter.

Chapter 3: Etiological Theories of Autism and AS

Etiological theories of autism and AS have changed radically in the past few decades. Several years after the publication of his paper, Kanner's initial description of autism as an innate condition was disputed (Dodd, 2005). Other clinicians began to suggest that autism was caused by emotionally cold and rejecting parents (Bettelheim, 1967). This theory prevailed for several years until evidence for the organic etiology of autism began to emerge. Currently, the biological basis of ASDs is widely accepted (Dodd, 2005; Ozonoff & Rogers, 2003).

3.1 Biological Theories of ASDs

The strongest evidence for a biological cause for ASDs comes from genetic research. Genetic conditions and chromosomal anomalies have been reported in as many as 9% of children with ASDs (Wassink et al., 2001). The most common conditions are tuberous sclerosis (Harrison & Bolton, 1997; Smalley, 1998) and Fragile X syndrome (Chakrabarti & Fombonne, 2001; Wassink et al., 2001).

ASDs also appear to have a familial pattern (APA, 2000; Volkar & Lopata, 2009). The sibling recurrence risk among families of children with ASDs has been reported as high as 6% (Rutter, 2005b; Volkmar, Klin, & Pauls, 1998), much greater than the risk in the general population (Chakrabarti & Fombonne, 2005; Yeargin-

Allsop et al., 2003). Several studies have also reported higher concordance rates for autism in *monozygotic* (identical) twins compared to *dizygotic* (non-identical) twins (Bailey et al., 1995; Folstein & Rutter, 1977; Ritvo, Spence, Freeman, Mason-Brothers, & Marazita, 1985). Steffenburg et al. (1989) found a 91% concordance rate for monozygotic twins compared to 0% for dizygotic twins. The concordance rate further increases when AS is considered (Bailey et al., 1995).

The existence of a *broader autism phenotype* (BAP) is additional evidence of the heritability of ASDs. Milder and subtler autistic features have been recognised in close relatives of children with ASDs, including cognitive and social impairments, stereotyped behaviours, and speech and language problems (Bailey et al., 1995; Bolton et al., 1994; Fombonne, Bolton, Prior, Jordan, & Rutter 1997; Piven, Palmer, Jacobi, Childress, & Arndt, 1997). Several studies have also found particular personality characteristics in relatives of children with ASDs, including shyness, aloofness, and rigidity (Bailey, Palferman, Heavey, & Le Couteur, 1998; Piven, Palmer, Landa, et al., 1997).

Although the exact mechanism of genetic transmission has not yet been determined, available evidence suggests that ASDs are under a high degree of genetic control (Volker & Lopata, 2008). Many suggest that there are multiple interacting genes involved in ASDs, each associated with a different feature of the autism phenotype (Piven, 1997; Sigman, Spence, & Wang, 2006; Santangelo & Tsatsanis, 2005). The genes that have come under closest investigation are those related to brain development and function. Nearly every structure of the brain has been implicated in the etiology of ASDs (see Penn, 2006); however, questions remain about many of the findings, with most studies having a correlational rather than causational focus (Schreibman, 2005; Penn, 2006). To date, no single structure

or system has been singled out as the cause of ASDs (Piven, 1997; Steyn & Le Couteur, 2003; Penn, 2006) and it is likely that there are several sites and types of neurological impairments involved (Dodd, 2005; Penn, 2006).

Although the evidence for genetic factors in ASDs is overwhelming, it is generally presumed that environmental factors interact with genetic predispositions to contribute to ASDs (Rutter, 2005a; Schnur, 2005; Sigman et al., 2006). Currently, however, there is considerable debate about what these factors are. Various factors have been implicated, including intrauterine infections (Nelson, 1991), birth complications (Bolton et al., 1997; Kolvin, Ounstead, Humphrey, & McMay, 1971) and exposure to environmental toxins (Bernard, Enayati et al., 2001; London & Etzel, 2000). One controversial study suggested that the MMR vaccine may indirectly cause ASDs, but more recent epidemiological studies have failed to find any link between the MMR vaccine and ASDs (D'Souza et al., 2000; Patja et al., 2000; Taylor et al., 1999). Overall, available research on environmental factors is contradictory and inconclusive (Hansen & Ozonoff, 2003; Sigman et al., 2006) and there is no strong evidence to link any environmental factors to the occurrence of ASDs (Volkmar et al., 2004). Currently, more research is needed into the environmental risk factors for ASDs before effective prevention and intervention strategies can be developed (Sigman et al., 2006).

3.2 Cognitive Theories of ASDs

Building on biological research, cognitive theories have been proposed in an attempt to explore the specific mental functions associated with the neurological impairments in ASDs (Hill & Frith, 2003). Rather than focusing on etiology, these theorists have attempted to identify the core deficit in mental functioning that constitutes autistic symptoms. They have argued that this core deficit involves the

partial or complete lack of the ability to perform a particular cognitive operation (Schreibman, 2005). To date, three major cognitive theories have been proposed: (a) weak central coherence, (b) executive function, and (c) theory of mind.

3.2.1 Weak Central Coherence. The weak central coherence (WCC) theory was first proposed by Frith (1989). This theory proposes that the core deficit in ASDs is a relative failure to process information in context (Frith, 1989; Teunisse, Cools, van Spaendonck, Aerts, & Berger, 2001). Frith (1989) noted that typically developing children and adults have a spontaneous tendency to integrate information into meaning and context. She termed this capability *central coherence*. In contrast, individuals with ASDs display weak central coherence; a processing bias for local information and a relative failure to "see the big picture" (Frith, 1989; Happé & Frith, 2006). They have difficulty integrating information into a meaningful whole; instead, information remains fragmented and relatively meaningless (Frith, 1989; Happé, 1996; Teunisse et al., 2001).

Support for the WCC theory comes from studies using visuospatial tasks, such as the Embedded Figures Test (EFT; Benton & Spreen, 1969). This task requires participants to find hidden shapes in pictures. Higher accuracy scores on the EFT indicate weaker central coherence; that is, a tendency to process information in parts. Researchers have found that on embedded figures tasks, individuals with ASDs perform faster (Jolliffe & Baron-Cohen, 1997; Morgan, Maybery, & Durkin, 2003; Pellicano, Maybery, Durkin, & Maley, 2006) and are more accurate compared to controls (Frith & Happé, 1994; Shah & Frith, 1983; van Lang, Bouma, Sytema, Kraijer, & Minderaa, 2006). Similar results have been reported for the Block Design subtest of intelligence scales. This task requires participants to construct a copy of a design by breaking down visual patterns into component details (Burnette et al.,

2005). Individuals with ASDs have been found to have superior performance on the Block Design subtest (Pring, Hermelin, & Heavey, 1995; Ropar & Mitchell, 2001; Shah & Frith, 1993; Siegel, Minshew, & Goldstein, 1996; van Lang et al., 2006) and equivalent pattern construction tasks relative to controls (Morgan, Maybery, & Durkin, 2003; Pellicano et al., 2006).

Research using visuospatial tasks supports the tendency of individuals with ASDs to focus on local rather than global aspects of information (Booth, Charlton, Hughes, & Happé, 2003). Further evidence for WCC in ASDs comes from studies investigating the integration of stimuli. Compared to controls, individuals with ASDs have been found to have difficulty arranging sentences in accordance with a theme (Jolliffe & Baron-Cohen, 2000) and identifying items that are incongruent with an established context (Jolliffe & Baron-Cohen, 2001). Individuals with ASDs also frequently have difficulty with homograph tasks, which require them to interpret a word dependent on its context. For example, the word *tear* can vary in meaning depending on its context; *tear in her eyes* versus *tear in her clothes* (Burnette et al., 2005). Individuals with ASDs have been found to perform significantly worse on these tasks relative to controls (Burnette et al., 2005; Frith & Snowling, 1983; Happé, 1997; Jolliffe & Baron-Cohen, 1999).

Despite evidence for WCC in individuals with ASDs, the conceptualisation of WCC as a core deficit in ASDs has been questioned. In order to qualify as a core deficit, two main criteria must be met: (a) *specificity*, meaning that the deficit is unique to ASDs and not found in other disorders, and (b) *universality,* meaning that all individuals with ASDs have the deficit (Schreibman, 2005; Sigman & Capps, 1997). The theory must also provide a full account of ASDs, thus be able to explain all the symptoms and associated impairments (Lewis, 2003; Schreibman, 2005).

WCC theory has been used to explain a number of impairments in ASDs, including a focus on parts of objects, sensitivity to minor changes in the environment, circumscribed interests, and splinter skills (Frith, 1989; Joseph, 1999). The socio-communicative impairments in ASDs may result from specific problems with integration of social or environmental cues (Frith & Happé, 1994; Morgan, Maybery, & Durkin, 2003; Schreibman, 2005). In the same way, a failure to account for social context may impair children's ability to share humour and laughter during social interactions (Lyons & Fitzgerald, 2004). The ability of the WCC model to explain other features of ASDs, however, has been questioned (Bara et al., 2001; Teunisse et al., 2001; Turner, 1999). Several researchers have also challenged the universality of the WCC model, with numerous studies reporting no differences between individuals with ASDs and controls on tasks of central coherence, including EFT and Block Design (Beaumont & Newcombe, 2006; Brian & Bryson, 1996; Burnette et al., 2005; Kaland, Mortensen, & Smith, 2007; Mottron, Peretz, & Menard, 2000; Pellicano et al., 2006; Ozonoff, Strayer, McMahon, & Filloux, 1994).

To date, research findings on central coherence in ASDs are conflicting and difficult to interpret (Happé & Frith, 2006). This is perhaps a reflection of the general ambiguity and vagueness of the concept itself (Happé, 1997; Joseph, 1999). Over time, the WCC theory has evolved and become better specified (see Mottron & Burack, 2001; Plaisted, 2001). However, more research is needed in order to understand the exact nature and implications of central coherence abilities in individuals with ASDs (Burnette et al., 2005). Although initially proposed as a core deficit in ASDs, there is currently a lot of doubt over the value of WCC as a theory to explain and make predictions about ASDs. It is now argued that WCC represents

one of several co-existing cognitive deficits in ASDs (Best, Moffat, Power, Owens, & Johnstone, 2008; Happé & Frith, 2006).

3.2.2 Executive function. Another cognitive deficit implicated in the development of ASDs is impairment in *executive function*. Executive function (EF) is an umbrella term used to describe the set of cognitive processes that underlie purposeful behaviours (Hughes & Russell, 1993; Zelazo & Müller, 2002). It involves several related mental operations, including planning, working memory, inhibition, and self-monitoring (Hughes, Graham, & Grayson, 2004; Goodlin-Jones & Solomon, 2003; Ozonoff, 1997). EF also encompasses cognitive flexibility, which enables people to think and behave appropriately according to changing situations (Hill & Frith, 2003; Hughes et al., 2004).

Executive functions first emerge around 12 months of age and continue to evolve throughout development (Griffith, Pennington, Wehner, & Rogers, 1999; Zelazo & Müller, 2002). As EF develops, children are able to learn new skills and behave in a planned and organised manner. Impairments in EF, or a failure to develop sufficient levels of executive control, can adversely affect social interactions (Hughes, 1998; Hughes, Dunn, & White, 1998) and cognitive development (Hughes et al., 2004). Indeed, EF has been found to be an important factor in academic and social readiness for school (Blair, 2002; Blair, Granger, & Razza, 2005).

Several EF impairments have been reported in individuals with ASDs. The first empirical investigation of EF in ASDs was conducted by Rumsey (1985) using the Wisconsin Card Sorting Test (WCST; Heaton, 1981). In this test, participants are required to match cards on different dimensions, such as colour or number (Zelazo & Müller, 2002). The WCST is designed to measure cognitive flexibility or more specifically, *set-shifting*, which is the ability to switch flexibly between different

tasks and rules (Hughes et al., 2004). Rumsey (1985) found that compared to controls, adults with autism made more errors on the WCST. Several follow-up studies have supported these findings, reporting impairments among individuals with ASDs on the WCST (Geurts, Verté, Oosterlaan, Roeyers, & Sergeant, 2004; Liss et al., 2001; Ozonoff & McEvoy, 1994; Ozonoff & Jensen, 1999; Pennington & Ozonoff, 1996; Prior & Hoffman, 1990; Rumsey & Hamburger, 1988; Verté, Geurts, Roeyers, Oosterlaan, & Sergeant, 2006) and other tasks of cognitive flexibility relative to controls (Kenworthy et al., 2005; Teunisse et al., 2001).

Another area of executive dysfunction in ASDs is planning. Planning ability is typically measured using tower tasks, such as the Tower of Hanoi (Simon, 1975) and the Tower of London tests (Shallice, 1982). In these tests, the participant has to copy a design in as few moves as possible working from a particular starting position (Zelazo & Müller, 2002). Individuals with ASDs have consistently been found to be impaired on tower tasks relative to controls (Bennetto, Pennington, & Rogers, 1996; Geurts et al., 2004; Ozonoff & Jensen, 1999; Ozonoff & McEvoy, 1994; Ozonoff, Pennington, & Rogers, 1991; Pennington & Ozonoff, 1996; Prior & Hoffman, 1990; Verté et al., 2006). Impairments have also been reported on the Stockings of Cambridge Task (SOC; Sahakian & Owen, 1992), which is a computerised planning task based on the Tower of Hanoi test (Hughes et al., 1994; Landa & Goldberg, 2005; Ozonoff et al., 2004).

Although impairments in cognitive flexibility and planning have been reported across several studies, research on other areas of EF is less conclusive. One of these areas is working memory, which involves the capacity to maintain information in the mind while performing another mental operation or activity (Hughes et al., 2004; Joseph, McGrath, & Tager-Flusberg, 2005). Some studies have

found impairments in working memory in individuals with ASDs relative to controls (Bennetto et al., 1996; Luna, Doll, Hegedus, Minshew, & Sweeney, 2007; Verté et al., 2006; Williams, Goldstein, & Minshew, 2006); however, other studies have failed to replicate these results (Griffith et al., 1999; Ozonoff & Strayer, 1997; Russell, Jarrold, & Henry, 1996). Some researchers have suggested that memory ability among individuals with ASDs depends on the demands of the task, with verbal memory typically more affected than visuospatial memory (Bennetto et al., 1996; Ozonoff & Strayer, 2001); however, more research is needed to explore this hypothesis.

One area of EF that appears to be relatively spared in ASDs is response inhibition (Ozonoff, 1997; Ozonoff & Jensen, 1999; Ozonoff & Strayer, 1997; Rumsey & Hamburger, 1988). Although some research has suggested inhibitory impairments are evident on more complex tasks (Minshew & Goldstein, 1998; Rinehart, Bradshaw, Tonge, Brereton, & Bellgrove, 2002), numerous studies have failed to find impairments in inhibition among individuals with ASDs across several different tasks (Bryson, 1983; Eskes, Bryson, & McCormick, 1990; Goldberg et al., 2005; Luna et al., 2007; Ozonoff & Jensen, 1999; Robinson, Goddard, Dritschel, Wisley, & Howlin, 2009; Schmitz et al., 2005).

Given the mixed evidence for EF impairments in ASDs, many have questioned the notion of EF as a core deficit in ASDs. EF impairments do not appear to be universal across ASDs, with several studies failing to find impairments among individuals with ASDs on EF tasks, including tests of planning and cognitive flexibility (Goldberg et al., 2005; Griffith et al., 1999; Minshew, Goldstein, & Siegel, 1997; Nydén, Gillberg, Hjelmquist, & Heiman, 1999; Szatmari, Tuff, Finlayson, & Bartolucci, 1990). Furthermore, EF deficits are not specific to ASDs

and have been reported in many other clinical populations, including ADHD (Geurts et al., 2004; Nydén et al., 1999; Ozonoff & Jensen, 1999), Tourette's syndrome (Bornstein, 1990; Pennington & Ozonoff, 1996; Ozonoff & Jensen, 1999), reading and writing disorders (Nydén et al., 1999), and language disorders (Bishop & Norbury, 2005).

Further investigation of the specificity of EF impairments in ASDs has lead many to propose a unique profile of EF deficits among individuals with ASDs. For example, Ozonoff and Jensen (1999) found that whereas ASDs were associated with difficulties in planning and cognitive flexibility, inhibitory deficits were characteristic of Tourette's syndrome and ADHD. Similar results were reported by Geurts et al. (2004) and Happé, Booth, Charlton, and Hughes (2006). In a parallel line of research, Zelazo and Müller (2002) proposed two subcategories of EF: (a) *hot* EF, which involves emotion regulation, and (b) *cool* aspects of EF that involve abstract reasoning and problem-solving. They argued that ASDs are primarily disorders of hot EF with only secondary impairments in cool EF.

To date, no consensus has been reached about the nature of EF impairments in ASDs, and the EF theory remains vague and poorly defined (Hill & Bird, 2006; Hughes, 2002). The broad nature of the EF theory makes it difficult to map links between EF and autistic symptomatology (Bailey et al., 1996). Although EF impairments have been used to explain a number of symptoms of ASDs, such as repetitive behaviours (Bailey et al., 1996; Turner, 1999) and social-communicative impairments (Gilotty, Kenworthy, Sirian, Black, & Wagner, 2002; Joseph, 1999), empirical research examining these relationships has produced mixed results. More research is needed in order to pinpoint the precise strengths and weaknesses across

executive functions in ASDs and how they relate to the features of autism and Asperger Syndrome (Geurts et al., 2004; Verté et al., 2006).

The two theories discussed so far in this review, WCC and EF, have proposed broad cognitive dysfunctions as central to ASDs. Each of these theories offers a unique perspective on the socio-communicative impairments in ASDs, which can be generalised to humour-related social interactions (Lyons & Fitzgerald, 2004). WCC theory proposes that the social impairments in ASDs are the result of a failure to attend to and integrate social information (Frith & Happé, 1994; Morgan, Maybery, & Durkin, 2003). In contrast, EF suggests social difficulties arise from under-developed executive functions, including planning skills, problem-solving ability, and flexibility (Joseph, 1999). Without these skills, children with ASDs have difficulty behaving in a planned and organised manner, which is essential for social interaction (Hughes, 1998).

In contrast to these broad-band theories, another cognitive theory proposes that ASDs are the result of a specific deficit in social cognition (Mundy & Markus, 1997; Schreibman, 2005). According to this theory, ASDs may be understood in terms of impairment in the area of social cognition referred to as *theory of mind* (Baron-Cohen, Leslie, & Frith, 1985). Since its introduction, the theory of mind hypothesis has received considerable attention, and is perhaps the most influential of the cognitive explanations of ASDs.

3.2.3 Theory of Mind. Theory of Mind (ToM) is defined as the ability to attribute mental states to oneself and to others (Bailey, 2002; Baron-Cohen et al., 1985; Premack & Woodruff, 1978). Without a ToM, children do not understand that others have unique beliefs, feelings, desires, and experiences (Baron-Cohen et al., 1985). Consequently, they have difficulty understanding the perspectives of others,

and predicting others' behaviours and emotions (Brown & Whiten, 2000; Tager-Flusberg, 1992; Myles & Southwick, 1999). A deficit in ToM is often referred to as *mind blindness*, reflecting how problematic children with ASDs find other people's thoughts (Baron-Cohen, 1995; Frith, 2001).

The term *theory of mind* was first used by Premack and Woodruff (1978) in the study of a chimpanzee named Sarah. Following a series of tasks, the researchers concluded that Sarah could identify people's thoughts and intentions, and that humans too possess an intuitive appreciation of others' minds. This study sparked considerable interest in ToM and an ever-growing body of research emerged (Flynn, 2004).

Building on the initial study of ToM, Wimmer and Perner (1983) developed a ToM test called a *false-belief task*; the best known is the Sally-Ann Task (Baron-Cohen et al., 1985). In this task, the child is shown a series of pictures depicting two girls, Sally and Ann. Sally puts her marble in the basket and then goes outside to play. While she is outside, Ann moves Sally's marble into the box. Sally then comes back inside and wants her marble. The child is asked where Sally will look for her marble. In order to successfully pass the false-belief task, the child must be aware that different individuals can have different beliefs about a situation (Baron-Cohen, 1989b; 2001). More specifically, the false-belief tasks measures *first-order belief attribution*, that is, the ability to infer the mental states of *one* person (Baron-Cohen, 2001; Wimmer & Perner, 1983). Typically developing children are able to pass first-order false-belief tasks by age 4 years (Robson, 2006; Flynn, 2004; Wellman, 2004; Wimmer & Perner, 1983).

The first study to explore ToM in children with ASDs was conducted by Baron-Cohen and colleagues using the Sally-Ann Task (Baron-Cohen et al., 1985).

They found that compared to 85% of typically developing children and 86% of children with Down Syndrome, only 20% of the children with autism passed the Sally-Ann Task. Subsequent studies have supported these findings, reporting impairments on false-belief tasks among children with ASDs relative to a variety of matched controls, including typically developing children, children with Down Syndrome, children with intellectual disability, and children with language problems (Happé, 1995; Kleinman, Marciano, & Ault, 2001; LeBlanc et al., 2003; Pellicano et al., 2006; Perner, Frith, Leslie, & Leekam, 1989; Peterson & Siegal, 1999; Yirmiya, Solomonica-Levi, Shulman & Pilowsky, 1996).

Despite this evidence, a large proportion of children with ASDs are able to pass first-order false-belief tasks (Lewis, 2003). This finding has lead to the notion that the ToM impairment in ASDs is a case of developmental delay, as opposed to a complete lack of ToM ability (Baron-Cohen, 1989b; Frith, 2003; Happé, 1994). For example, Happé (1995) found that while typically developing children could pass first-order false-belief tasks at a verbal age of 34 months, children with autism required a verbal mental age of 66 months before they had a chance of passing. Furthermore, most children with ASDs who understand first-order false-belief have difficulties with more advanced ToM tasks, such as those that involve *second-order belief attribution*. Second-order belief requires reasoning about what one person thinks about another person's thoughts; for example, Ann thinks Sally thinks the marble is in the box (Perner & Wimmer, 1985). Several studies have reported impairments among children with ASDs on second-order belief tasks (Baron-Cohen, 1989b; Dahlgren, Sandberg, & Hjelmquist, 2003; Ozonoff et al., 1991).

In addition to second-order false-belief, individuals with ASDs may have difficulty understanding other complex mental states, such as knowledge formation

(Baron-Cohen & Goodhart, 1994; Leslie & Frith, 1988) and intentions (Phillips, Baron-Cohen, & Rutter, 1998). Children with ASDs have been found to have difficulty using mental state terms, such as *think*, *know*, *feel*, and *believe* (Baron-Cohen et al., 1994; Brown & Whiten, 2000; Capps et al., 1998; Rieffe, Terwogt, & Stockmann, 2000). Several studies have also reported impairments in inferring mental states from faces (Back, Ropar, & Mitchell, 2007), particularly the eyes (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Baron-Cohen, Wheelwright, & Jolliffe, 1997; Baron-Cohen, Wheelwright, Spong, Scahill, & Lawson, 2001; Brent, Rios, Happé, & Charman, 2004; Kleinman et al., 2001).

Another area of difficulty related to ToM in ASDs is deception. Several researchers have reported impairments among children with ASDs in both deceit and understanding that they are being deceived (Baron-Cohen, 1992; Oswald & Ollendick, 1989; Sodian & Frith, 1992; Yirmiya et al., 1996). One test of deception is the Strange Stories Test (Happé, 1994), which requires participants to interpret stories where characters say things they do not mean. For example, a person receiving an unwanted birthday gift may say, "It is just what I wanted" to avoid hurting the feelings of the gift giver. Children with ASDs have frequently been found to be impaired on this test relative to controls (Happé, 1994; Heavey, Phillips, Baron-Cohen, & Rutter, 2000; Jolliffe & Baron-Cohen, 1999).

The Strange Stories Test is also a measure of understanding of non-literal language. Several studies have reported that children with ASDs have difficulty understanding non-literal language that requires awareness of others' intentions and beliefs, for example, sarcasm, irony, metaphors (Happé, 1994; Mitchell et al., 1997), and jokes (Emerich et al., 2003; Ozonoff & Miller, 1996). Impairments have also been reported in understanding emotions that are based on beliefs; for example, Kate

is happy because she *thinks* she is getting a present (Baron-Cohen, Spitz, & Cross, 1993; Baron-Cohen, Wheelwright, & Jolliffe, 1997; Rieffe et al., 2000).

The ToM hypothesis can account for a number of features of ASDs. ToM impairments have consistently been linked to joint attention and pretend play. In fact, many researchers have argued that both joint attention (Astington & Barriault, 2001; Baron-Cohen, 1995; Charman et al., 2000; Stone, Baron-Cohen, & Knight, 1998) and pretend play (Leslie, 1987; Mastrangelo, 2009; Rutherford & Rogers, 2003) are important precursors to ToM development. ToM has been used to explain the social and pragmatic features of ASDs, particularly difficulty recognising and responding to others' emotions (Buitelaar & van der Wees, 1997; Heerey, Keltner, & Capps, 2003; Prior et al., 1990). Several studies have also found that individuals ToM impairments have difficulty detecting violations of social norms (Baron-Cohen et al., 1999; Blair & Cipolotti, 2000; Stone, Baron-Cohen, & Knight, 1998), which may account for the socially inappropriate behaviours of individuals with ASD, such as standing too close to others or interrupting others during conversations.

Currently, however, empirical evidence linking ToM to autistic symptomatology is limited, with many studies failing to find associations between ToM and autistic features once language ability has been taken into account (Capps et al., 1998; Joseph & Tager-Flusberg, 2004; Travis, Sigman, & Ruskin, 2001; Turner, 1997). These findings suggest that the features of ASDs may not be directly attributable to an impaired ToM, and that the relationship between ASDs and ToM is mediated by other factors, particularly language ability (Fombonne, Siddons, Achard, Frith, & Happé, 1994; Frith, Happé, & Siddons, 1994). At present, there is strong evidence for a link between ToM and language ability in both typical development (Cutting & Dunn, 1999; Farrar & Maag, 2002; Hughes & Dunn, 1997)

and ASDs. Several studies have reported significant relationships between ToM and language abilities in individuals with ASDs (Capps et al., 1998; Dahlgren & Trillingsgaard, 1996; Ozonoff & McEvoy, 1994; Prior et al., 1990; Tager-Flusberg et al., 2001), with those who pass ToM tasks tending to have superior verbal abilities compared to those who fail (Happé, 1995; Eisenmajer & Prior, 1991; Leekam & Prior, 1994; Prior et al., 1998; Yirmiya et al., 1996). These findings have lead to the suggestion that language may provide children with ASDs with an alternative route or strategy to understanding mental states (Fisher, Happé, & Dunn, 2005; Tager-Flusberg, 1997). More research is needed in order to determine the exact nature of the relationship between ToM and language, including which precise aspects of language are important in ToM development and indeed the extent to which ToM is a linguistic function (Astington & Jenkins, 1999; Fisher et al., 2005).

Another important area for future research is the relationship between ToM and humour. The ToM hypothesis offers a unique perspective on humour and laughter in children with ASDs. Effective use of humour requires knowledge of what other people are thinking and what is required of people in particular social situations, as well as sensitivity to the cues for sharing humour with others (Baron-Cohen, 1997; Kuipers, 2006; Masten, 1986; Winner, Brownell, Happé, & Blum, 1998). Many authors have proposed that ToM skills mediate the use of humour and laughter during social interactions (Lyons & Fitzgerald, 2004; Pellegrini, 1985; Reddy, 1991); however, this area has been largely neglected in humour research to date.

In one set of studies with individuals with autism, Happé (1993, 1994) reported a strong correlation between ToM abilities and the comprehension of figurative language messages, including jokes. Some recent studies also suggest that

ToM is related to processing of jokes and cartoons in adults with alcoholism (Uekermann, Channon, Winkel, Schlebusch, & Daum, 2007), schizophrenia (Corcoran, Cahill, & Frith, 1997) and right hemisphere brain damage (Brownell & Stringfellow, 2000; Happé, Brownell, & Winner, 1999). Studies exploring the role of ToM in social occurrences of humour, however, are lacking.

Overall, there is a high degree of variability in ToM across individuals with ASDs. Although language plays an important role, ToM ability cannot be fully explained by verbal ability (Brent et al., 2004; Kleinman et al., 2001). Some researchers argue that ToM is partially related to intellectual ability (Brent et al., 2004; Dahlgren et al., 2003; Perner et al., 1989), although other studies have found ToM to be independent of intelligence (Baron-Cohen, Jolliffe, et al., 1997; Happé, 1994; Ozonoff et al., 1991). One line of research has suggested that ToM ability is influenced by family and background factors, such as family size (Jenkins & Astington, 1996). Several studies have found that the presence of siblings, particularly older siblings, enhances ToM ability by increasing the quality of early learning experiences (Astington & Barriault, 2001; Bailey, 2002; Bartsch & Estes, 1996).

One interesting line of research has suggested that ToM performance is influenced by gender. Some studies have reported superior performance on ToM tasks among females (Baron-Cohen, Jolliffe, et al., 1997; Buitelaar, van der Wees, Swaab-Barneveld, & van der Gaag, 1999; Happé, 1994). In fact, studies of gender differences have lead to the theory that ASDs are the result of an extreme male brain (Baron-Cohen & Hammer, 1997). According to this theory, the male brain is defined by *systemising*, that is, the ability to analyse and build systems. This capacity explains the preference of males for areas such as mechanics, mathematics,

construction, and engineering (Baron-Cohen, 2002). In contrast, females are superior at *empathising*, which involves the ability to understand other people's thoughts and emotions (Baron-Cohen, 2002). Baron-Cohen and colleagues argue that individuals with ASDs have an extreme form of the male brain characterised by superior systemising ability and poor empathising ability (Baron-Cohen & Hammer, 1997; Lawson, Baron-Cohen, & Wheelwright, 2004). Since its introduction, the extreme male brain theory of ASDs has received considerable attention, and there is a growing body of empirical support. Currently, however, more research is needed in order to clarify this theory and its involvement in ASDs (Baron-Cohen, 2002).

To date, while ToM research has provided direction in attempts to understand ASDs, support for ToM as a core deficit in ASDs is limited. Although accounting for social and communicative features of ASDs, the ToM hypothesis does not readily explain all features, particularly repetitive behaviours and insistence on sameness (Schreibman, 2005). Furthermore, TOM deficits are not unique to ASDs, with difficulties also reported in deaf children (Peterson & Siegel, 1995; 1999), children with schizophrenia (Frith & Corcoran, 1996; Pilowsky, Yirmiya, Arbelle, & Mozes, 2000), children with Fragile X (Cornish et al., 2005; Garner, Callias, & Turk, 1999), and children with mental retardation (Yirmiya & Shulman, 1996; Yirmiya, Erel, Shaked, & Solomonica-Levi, 1998) and Down syndrome (Yirmiya et al., 1996).

The universality of the ToM hypothesis has also been questioned. Many studies have failed to find ToM impairments among individuals with ASDs relative to controls (Dahlgren & Trillingsgaard, 1996; Fombonne et al., 1994; Pellicano et al., 2006; Yirmiya & Shulman, 1996). One explanation for these conflicting results is that ToM is developmental, thus only universal at certain stages of development (Schreibman, 2005). Indeed, researchers have claimed that no individual with an

ASD with a verbal mental age below 6 years or a chronological age below 8 years has been found to pass any ToM task (Baron-Cohen, 1991; Dahlgren & Trillingsgaard, 1996; Sparrevohn & Howie, 1995; Yirmiya et al., 1996). Another possible explanation is that ToM ability is not fully tapped by experimental tasks. Some authors have suggested that while individuals with ASDs may pass ToM tasks, they still have difficulty spontaneously applying ToM skills in real-life social situations (Bowler, 1992; Frith et al., 1994; Happé, 1997). Studies using naturalistic ToM tasks have provided some preliminary support for this notion (Begeer, Rieffe, Terwogt, & Stockmann, 2003; Fine et al., 1994; Serra, Minderaa, van Geert, & Jackson, 1999). For example, Fine et al. (1994) found that even though children with ASDs were able to pass complex ToM tasks, they still had difficulty adjusting their conversations to meet the needs of the listener.

3.3 Summary and Future Directions

Although the exact mechanisms are yet to be determined, the biological basis of ASDs is widely accepted. Most researchers agree that ASDs are under a high degree of genetic control (Dodd, 2005; Yang & Gill, 2007). The genes that have come under closest investigation are those related to neurological functioning and development. Currently, however, no single brain structure or system has been identified as the cause of ASDs, and it is likely that multiple sites are involved (Penn, 2006; Volkar & Lopata, 2008).

Building on neurological studies, many researchers have explored the specific mental functions associated with the neurological impairments in ASDs. Rather than focus on a biological cause of ASDs, these theories have attempted to identify a core cognitive deficit underlying autistic symptomatology. To date, three prominent cognitive theories of ASDs have been proposed: (a) weak central

coherence, (b) executive function, and (c) theory of mind. Each cognitive theory offers a unique perspective on the social deficits of ASDs, which can be generalised to difficulties with humour-related social interactions.

According to weak central coherence theory, the social impairments in ASDs arise from a failure to integrate social information (Morgan, Maybery, & Durkin, 2003). Executive function theory is based on the notion that social functioning is dependent on a variety of executive skills, including planning, problem-solving ability, and flexibility, which are typically impaired in individuals with ASDs (Joseph, 1999). Perhaps the most influential cognitive theory is the theory of mind hypothesis. This theory suggests that social impairments, such as the ability to use humour in social situations, arise out of a difficulty understanding social rules and predicting other people's thoughts and behaviours (Astington & Barriault, 2001; Heerey et al., 2003). Currently, however, direct evidence linking humour to specific cognitive impairments in individuals with ASDs is limited. Most knowledge comes from theory and speculation, rather than empirical studies.

To date, no individual system has emerged conclusively as the primary underlying deficit in ASDs (Prater & Zylstra, 2002). Prominent cognitive theories have failed to provide a complete account of ASDs, leading many to propose the involvement of other cognitive deficits in ASDs, including imitation (Jordan, 2003; Nadel & Pezé, 1993; Rogers & Bennetto, 2000), social motivation (Dawson et al., 2005; Grelotti, Gauthier, & Shultz, 2002), and arousal regulation (Schreibman, 2005; Siegel, 2003). It is now becoming accepted that ASDs involve a combination of cognitive deficits, each capturing some of the core symptoms (Ozonoff & Rogers, 2003; Pellicano et al., 2006; Schreibman, 2005). Currently, more research is needed

to clarify the cognitive deficits in ASDs and how they relate to the features of ASDs (Pellicano et al., 2006).

Despite extensive research, the exact etiology of ASDs remains largely unknown. To date, multiple factors have been implicated and it is likely that ASDs are etiologically heterogeneous, involving several causes and etiological pathways (Hansen & Ozonoff, 2003; Schreibman, 2005). Subsequently, children with ASDs vary considerably in their presentation and functioning. Features of ASDs can cause severe restriction and impairment across multiple areas of development. These impairments are typically lifelong, continuing into adolescence and adulthood (APA, 2000).

ASDs also place considerable strain on parents and families. High levels of stress have been found in many families (Pisula, 2007; Wolf, Noh, Fisman, & Speechley, 1989). Parents frequently report frustration and anxiety in relation to locating appropriate services and education for their child (Fong et al., 1993; Gray, 2002), life sacrifices and restricted personal lives (Fong et al., 1993; Schieve, Blumberg, Rice, Visser, & Boyle, 2007), and fear of discrimination or stigma (McCabe, 2007). Mothers of children with ASDs are often the most directly affected, with many reporting depression (Duarte, Bordin, Yazigi, & Mooney, 2005; Fong et al., 1993; Wolf et al., 1989). Depression and poor psychological adjustment are also common among siblings of children with ASDs relative to siblings of both typically developing children and children with other disabilities (Bågenholm & Gillberg, 1991; Fisman, Wolf, Ellison, & Freeman, 2000; Gold, 1993; Hastings, 2003; Roeyers & Mycke, 1995). Overall, living with and caring for a child with an ASD requires more time and stamina than most families have (Beals, 2003).

Continued research into the impairments of ASDs and possible interventions is essential. One area that has been neglected in ASD research to date is humour and laughter. Children with ASDs commonly face difficulties in building relationships and interacting with others, including their own parents. Parents can give so much to their child, getting so little in return (Beals, 2003). Humour and laughter are important behaviours for socialising and communicating with others (Cunningham, 2005). Studying these behaviours in a social context can greatly improve understanding of the socio-communicative functioning of children with ASDs, and assist in the development of effective interventions.

Chapter 4: Humour and Laughter

In order to study humour it is first important to clarify what it is. Humour is a broad, multifaceted concept, which has long been regarded as difficult to define (Cunningham, 2005; Latta, 1998). Problems in definition derive partly from the fact that humour has been subjected to investigation across a wide range of disciplines, each with its own traditions and methods (Carlson & Peterson, 1995; Lefcourt, 2001). Indeed, researchers have conceptualised it in a number of ways, seeing it variously as a personality trait, an emotional response, a stimulus, and a therapeutic intervention (Martin, 2001).

For the purposes of the current investigation, humour will encompass both productive and responsive aspects and will be defined at its simplest as being manifest by laughter. Thus humour as a response is characterised by laughter (Carson, Skarpness, Schultz, & McGhee, 1986; Southam, 2005), while the productive aspect refers to verbal and behavioural attempts at encouraging laughter, such as telling a joke or making a funny sound (Cunningham, 2005; Masten, 1986). The current review will be limited to laughter as a humour response and will not

include smiling. Although smiling and laughing are related, most theorists agree that they are distinct behaviours occurring in different contexts (Bainum, Lounsbury, & Pollio, 1984; Berlyne, 1972; Sroufe & Waters, 1976).

4.1 Theories of Humour

Humour production and reaction involves many important qualities, including cognitive processing, physiological changes, and socio-emotional influences (Martin, 2000; McGhee, 1979). Not surprisingly, many different approaches have been taken to conceptualising humour and laughter. There are more than 100 theories of humour dating back as far as Plato and Aristotle (Schmidt & Williams, 1971). Prominent theories can be divided along two main theoretical axes: (a) emotional theories, and (b) cognitive theories (Bainum et al., 1984; Bariaud, 1989; Cunningham, 2005).

4.1.1 Emotional theories. Emotional theories of humour focus on the psychological functions and benefits of humour and laughter. These theories have important implications for how and why children use humour and laughter in social situations. Emotional theories can be divided into two broad categories: relief theories and disparagement theories.

Relief or release theories of humour propose that the motivating factor for humour and laughter is release from negative emotions, such as tension and frustration (Dixon, 1980; Keith-Spiegel, 1972; Martin, 2007). One example of a relief theory is the psychoanalytic theory of humour. This theory views humour as a defence mechanism that allows for the partial expression of unacceptable urges in a socially acceptable manner (Freud, 1960; Wolfenstein, 1954). Children adopt humour as a means of coping with biological desires. For preschool and early school-aged children, humour centres around defecation and physical functions. At

around age 6 to 7 years, children begin to use humour to disguise aggressive or sexual impulses (Bariaud, 1989; Freud, 1960). Humour provides a safe, socially acceptable outlet for these impulses, thereby reducing tension and anxiety, and providing potential or partial gratification of the forbidden desires (Freud, 1960; Kline, 1977; Simons, McCluskey-Fawcett, & Papini, 1986). According to this general approach, a child may joke about a particular situation or story, but in actual fact, it is what is most desired (Pinderhughes & Zigler, 1985; Wolfenstein, 1954).

In contrast to psychoanalytic theories, other relief theories of humour focus on the physiological aspects of humour. Humour and laughter are believed to have tension-reducing qualities, serving a calming function when individuals are over-stimulated (Davidhizar & Bowen, 1992; Foot & Chapman, 1976). In fact, humour is increasingly used in health care settings to help people cope with illness (Dowling, Hockenberry, & Gregory, 2003; Herth, 1990) and pain (Kelley, Jarvie, Middlebrook, McNeer, & Drabmen, 1984; Smith, 1986; Weisenberg, Tepper, & Schwarzwald, 1995). Clown doctors and other humour interventions in hospitals have reported considerable success in helping children and adults deal with the anxiety and changes associated with an illness and being in hospital (Erdman, 1991; Schwebke & Gryski, 2003; Vagnoli, Caprilli, Robiglio, & Messeri, 2005).

Dixon (1980) argued that humour may serve as a coping strategy in two ways: (a) as *an emotion-focused* coping mechanism, where laughter has a cathartic effect, serving to release pent-up emotions, and (b) as an *appraisal-focused* coping strategy, in which humour allows the individual to view the situation differently and reappraise it as a less threatening or stressful. Indeed, individuals with a greater sense of humour have been found to view stressful and challenging events more positively than individuals with less humour (Kuiper, Martin, & Olinger, 1993;

Kuiper, McKenzie, & Belanger, 1995). Kuiper and colleagues argue that by promoting positive cognitive evaluations, sense of humour moderates the impact of negative life events, thus having a positive impact on psychological wellbeing (Kuiper, Grimshaw, Leite, & Kirsh, 2004; Kuiper & Nicholl, 2004). In support of this argument, several studies have found individuals with greater sense of humour to have more positive self-concept, higher self-esteem, and lower levels of perceived stress, anxiety, and depression (Abel, 2002; Deaner & McConatha, 1993; Kuiper & Martin, 1993; Kuiper, Martin, & Dance, 1992; Nezlek & Derks, 2001; Overholser, 1992). There is also some evidence to suggest that sense of humour may indirectly contribute to physical health through more positive health-related perceptions (Kuiper & Nicholl, 2004) and improved immune functioning (Martin & Dobbon, 1988).

The second type of emotional theory is disparagement theory, variously known as superiority theory (La Fave, 1972) or dispositional theory (Zillmann & Cantor, 1976). Disparagement theories focus on humour as a form of disparagement or aggression against another person, predicting that individuals are more likely to appreciate humour when it enhances their perception of being superior to others (Keith-Spiegel, 1972; La Fave, 1972; Zillman & Cantor, 1976). Among adults numerous jokes rely on pre-existing prejudices against particular ethnic or national groups, the humour depending critically on the shared stereotypes of the groups' failings. The lack of intelligence in the Irish, the meanness of the Scots; these are two such stereotypical beliefs that underpin most humour directed against these groups.

Available research provides some support for superiority theory (La Fave, 1972; Priest & Abrahams, 1970; Scogin & Pollio, 1980; Zillmann & Cantor, 1972).

In a longitudinal study of school-aged children, McGhee (1980) found that children who laughed more and initiated humour more frequently had a past pattern of assertive behaviours and dominance towards their peers. Studies have also found that children who initiate humour are more often rated as leaders or as having more power compared to children who are not considered humorous (Damico & Purkey, 1978; Masten, 1986; Ziv, 1984).

In adult samples, La Fave and colleagues have repeatedly found that people prefer humour that is at the expense of an out-group (La Fave, 1992; La Fave, Haddad, & Marshall, 1974). In a study of group humour, Scogin and Pollio (1980) found that two-thirds of all humorous remarks were directed at a specific person or situation, and the majority of these remarks were disparaging. Humour is particularly potent if the person being victimised is negatively disposed, for example, a Collingwood supporter will find it funnier if someone puts down an Essendon supporter, while an Essendon supporter will show the opposite preference (McGhee, 1983; Zillmann & Cantor, 1976). Zillmann and Bryant (1980) found that hot tea spilled on an experimenter was viewed as funnier when the experimenter had been rude. Evidence suggests that this pattern of disparagement is also evident in childhood, with children finding greater humour in jokes at the expense of adults (see Zillmann, 1983) and children of the opposite sex (McGhee & Duffey, 1983; McGhee & Lloyd, 1981).

Despite support for emotional theories of humour and laughter, most theorists agree that emotional factors alone are insufficient to explain all aspects of humour and laughter (Boyd, 2004; Cunningham, 2005). One can gain relief from negative emotions and be nasty to others without recourse to humour. There is a general consensus that humour involves both emotional and cognitive components

(Cunningham, 2005; Lefcourt, 2001; Martin, 2000). Cognitive theorists view humour as a complex cognitive process, with changes in humour response and production reflecting underlying developments in intellectual ability (Bergen, 2003; McGhee, 1979; Pinderhughes & Zigler, 1985).

4.1.2 Cognitive theories. Cognitive theories propose that humour is a process involving two stages: incongruity and resolution (McGhee, 1979; Shultz & Robillard, 1980; Suls, 1983). Incongruity is defined as a conflict between what is expected and what actually occurs (Klein, 2003; McGhee, 1979; Owens & Hogan, 1983). In humour, incongruity results when there is an element of unexpectedness or surprise, such as the punch line of a joke (Mallan, 1993; Shultz, 1976). So in a classic illustration: Person A: "My dog has no nose"; Person B: How does he smell?" Upon hearing the punch line, Person A: "Bloody awful!" the expectations of the audience who expect some form of medical or technical answer regarding the capacities of the dog, would not be confirmed, and a brief period of cognitive uncertainty would occur. Humour is not experienced until some form of resolution occurs and the audience discovers a comic relationship between the body and the punch line of the joke (Bariaud, 1989; Klein, 2003; Shultz & Robillard, 1980). Thus "Bloody awful", while unexpected, is a perfectly legitimate answer to the question.

The most thoroughly developed incongruity theory is that of McGhee (1971a, 1979) who proposed a developmental model of humour based on Piagetian stages of cognitive development. Jean Piaget was a widely recognised child psychologist who introduced an influential theory of child cognitive development involving four stages: (a) sensorimotor, occurring up to age 2 years, (b) preoperational, ages 2 to 7 years, (c) concrete operations, from age 7 years to 11 years, and (d) formal operations, 11 years and beyond (Piaget & Inhelder, 1969;

Singer & Revenson, 1978). Within each stage there are interrelated changes in play, language, and cognitive structures (Singer & Revenson, 1978; Wadsworth, 1984).

The sensorimotor stage is characterised by the development of physical knowledge and motor skills. Infants experience the environment by making use of their senses and motor capabilities (Phillips, 1969; Piaget & Inhelder, 1969). As children move into the preoperational stage, their thought processes and vocabulary are developing; they acquire morality and the capacity for symbolic play (Piaget & Inhelder, 1969; Wadsworth, 1984). During the cognitive operations stage, children's thought process become more rational and mature. They gradually develop the ability to *conserve*, or learn that objects are not always the way that they appear to be (Piaget & Inhelder, 1969; Singer & Revenson, 1979). Children also begin to understand *reversibility*, that is, the ability to mentally reverse the direction of their thought. An example of this is a child who can trace his route to school and then follow it back home (Singer & Revenson, 1979).

At around age 11 years, the final stage of cognitive development begins. During this stage, adolescents are able to think abstractly (Singer & Revenson, 1979). Skills such as logical thought, deductive reasoning, and systematic planning emerge, and children are able to solve complex and hypothetical problems (Piaget & Inhelder, 1969). Piaget viewed cognitive development as a continuous process with each new stage in development built upon and integrating previous stages. Although there is some variability in the ages at which children attain each stage, every child passes through all the stages in exactly the same order (Wadsworth, 1984).

Based on Piaget's model of intellectual development, McGhee (1971a, 1979) argued that children need to develop particular cognitive capacities in order to understand specific forms of humour. He proposed a four-stage model of humour

development: (a) incongruous actions towards objects, (2) incongruous labelling of objects and events, (3) conceptual incongruity, and (4) multiple meanings. These stages of humour development parallel the stages of cognitive development outlined by Piaget (McGhee, 1979; Southam, 2005).

The first stage of humour development occurs at approximately 18 months of age and involves incongruous actions towards objects (McGhee, 1979). With the development of symbolic play, toddlers begin to find humour in acting on one object as if it were another; for example, using a banana as a telephone (McGhee, 1989; Schwartz, 1999; Southam, 2005). Laughter is frequently elicited by visual incongruities and surprises, such as a parent wearing a shoe as a hat (Mallan, 1993; McGhee, 2002).

At about 20 months of age, children move into the second stage of humour development, incongruous labelling of objects. The main distinguishing feature between the first two stages is the development of language (McGhee, 1979). The emergence of language opens up new and broad perspectives for humour; children begin to use language to create incongruity, such as mislabelling objects (Bariaud, 1989; McGhee, 2002; Southam, 2005), creating nonsense words or silly rhymes (McGhee, 1979; Poole, Miller, & Church, 2005; Schwartz, 1999), and misnaming people (Mallan, 1993). Children in this stage also frequently find humour in distorted or immature articulation, such as the speech of the cartoon characters like Tweety Bird and Elmer Fudd (Bariaud, 1989; McGhee, 2002).

As children progress into the pre-operational stage of development at about age 2 years, they begin to understand conceptual incongruity (McGhee, 1979). This type of incongruity involves the deliberate violation of one or more aspects of a concept (Jones, 1983; Southam, 2005). Common examples of conceptual incongruity

are (a) distortions of sizes, such as a boy wearing enormous shoes, (b) transfer of features, including animals wearing clothes or humans with animal features, (c) disguises (e.g., clown noses and fake moustaches), and (d) anomalous behaviours or situations, such as a man riding a caterpillar or a cow taking a bath (Bariaud, 1989; McGhee, 2002). Whereas a child in stage two will find it funny to call a ball an apple, a child in stage three will find it funny if the ball has eyes or a nose (McGhee, 1979). Slapstick comedy involving mishaps and pranks is also enjoyable at this stage; for example, someone ringing a doorbell and running away before the door is answered (Bariaud, 1989; Klein, 2003; McGhee, 1989).

By about age 3 years, children become more sociable and enjoy sharing humour with other people (Poole et al., 2005). They commonly engage in clowning and silliness to elicit others' laughter (Bainum et al., 1984; Bergen, 2002). Examples of these behaviours include making funny faces, falling down purposely, altered imitations (e.g., mooing like a cow, but in a high-pitched voice), and other behaviours that involve distortion of usual sounds and appearances (Bariaud, 1989; McGhee & Kach, 1981). Advances in language lead to more sophisticated verbal humour, such as tongue twisters and simple riddles (Shultz, 1972; Shultz & Robillard, 1980). By age 4-5 years, children begin to invent silly stories and use ready-made jokes, such as knock-knock jokes (McGhee, 1979; Jones, 1983; Poole et al., 2005; Spector, 1990; 1992; Southam, 2005). Around this age, children also display a fascination with bathroom or toilet humour that deals with body functions and other taboo references. Many children laugh hysterically at the mention of words such as *underwear* and *poop* (Bergen, 2002; Cunningham, 2005; Poole et al., 2005; Schwartz, 1999).

The final stage of humour development outlined by McGhee (1979) is multiple meanings, which coincides with the concrete operations stage outlined by Piaget. Children who have attained this stage are able to understand advanced forms of humour that involve ambiguous or double meanings (McGhee, 1971a, b; Shultz & Pilon, 1973). Puns are a classic example of how words can be used in a variety of ways (McGhee, 1979). For example, consider the following joke: Person A: "Did you take a bath?" Person B: "No! Why, is one missing?" (McGhee, 1979, p. 76). By the start of stage four, at about age 7 years, children are able to detect the linguistic ambiguity and resolve the incongruity that arises. In contrast, a child in stage three will have difficulty keeping both meanings in mind at the same time, thus the joke is described as making no sense (McGhee, 1979).

In addition to humour based on multiple meanings, children in stage four understand other forms of abstract humour that go beyond incongruity (McGhee, 1979; Schwartz, 1999). For example, Person A: "I see you have a new dog. I thought you did not like dogs." Person B: "I don't. But I bought a lot of dog soap on sale, so I had to get a dog to use it up." The perception of incongruity occurs at the abstract level of behavioural inconsistency; it makes no sense to buy a product that is not needed just because it is on sale. It is also illogical to buy a dog just to use up a product you don't need (McGhee, 1979). Whereas children in stage three cannot understand this joke, children in stage four are able to use logic and reversibility to detect the inconsistencies (McGhee, 1979; Southam, 2005).

Advances in cognitive abilities in stage four are paralleled by significant developments in social and communication skills. Throughout middle childhood and adolescence, children's humour becomes increasingly social (Bergen, 2003; Schwartz, 1999). At around age 9 years, pro-social teasing becomes strong (Krogh,

1985; Southam, 2005). This type of playful teasing serves to maintain and enhance social relationships, as opposed to anti-social teasing, which is associated with bullying (Keltner, Young, Heerey, Oemig, & Monarch, 1998). Children find humour in practical jokes and making fun of others, particularly others' mistakes (Howe, 1993; Keltner, Capps, Kring, Young, & Heerey, 2001; Southam, 2005). Crude behaviour and grossness is also frequently seen as humorous, particularly by boys (Howe, 1993; Socha & Kelly, 1994).

4.1.3 Support for the cognitive model of humour. There is currently a great deal of support for cognitive theories of humour development. Most theorists agree that intellectual ability is an important factor in humour development (Bergen, 2003; Klein, 1987; Pinderhughes & Zigler, 1985). Some theorists, however, have questioned the validity of McGhee's developmental stages (Franzini, 2002; Reddy, 1991). Incongruity theorists maintain that in order to understand incongruity, infants must possess the capacities for symbolic thought, thus humour does not develop until approximately 18 months of age with the emergence of pretend play (Bariaud, 1989; McGhee, 1979; 1989; Shultz, 1976). In contrast, an increasing body of evidence suggests that the capacity for humour is present in the first year of life (Pien & Rothbart, 1980; Reddy, 2001; Sroufe & Wunsch, 1972).

Pien and Rothbart (1980) suggested that infants as young as 4 months are capable of experiencing humour. Parents elicit laughter through exaggerated facial expressions, altered voice quality, or social games, such as peek-a-boo (Stern, 1974). By age 6 months, infants are attentive to others' laughter and show an interest in sharing this laughter (Reddy, 2008). Attempts to initiate others' laughter appear around age 8 months in the form of playful teasing (Reddy, 1991; Legerstee, 2006; Trevarthen, 1988) and clowning (Bates, Benigni, Bretherton, Camaioni, & Volterra,

1979; Reddy, 2001; Trevarthen & Hubley, 1978), which involves the repetition of odd or extreme behaviours, such as pulling a funny face or doing an odd walk (Reddy, Hay, Murray, & Trevarthen, 1997).

Pien and Rothbart (1980) argued that humour in infancy is based on playful interpretations of incongruity, and that symbolic play capabilities are not necessary. Real-life incongruities may be humorous if they occur in a safe and playful context. Infants perceive the playful context of others and respond with smiles and laughter. These early expressions of spontaneous humour and laughter involve primarily socio-emotional, rather than intellectual processes, and reveal an early understanding of others' emotions and intentions (Dunn, 1988; Reddy, 1991), as well as a grasp of social rules and conventions (Pawluk, 1989; Reddy et al., 2002). Laughter in early infancy therefore sets the stage for humour development throughout childhood and adolescence.

Despite some criticism, there has been considerable empirical support for the cognitive model of humour. Several studies have reported a significant relationship between intellectual ability and humour comprehension (Masten, 1986; Pinderhughes & Zigler, 1985; Prentice & Fathman, 1975; Short, Basili, & Schatschneider, 1993). Differences in children's humour have been found as a function of their cognitive functioning (Berry, Parsons, Hyde, & Hilsdon, 1981; Masten, 1986; Zigler, Levine, & Gould, 1966). Zigler et al. (1966) found that children with an intellectual disability displayed more difficulties understanding humorous cartoons compared to typically developing children. Children with intellectual disability have also been found to have difficulty comprehending and telling jokes relative to typically developing children (Bruno, Johnson, & Simon, 1987).

The importance of intellectual ability in children's comprehension and production of humour is well recognised (Masten, 1986), however several authors have questioned the ability of the cognitive model to explain all facets of humour (Bariaud, 1989; Pinderhughes & Zigler, 1985). First, in the fore-mentioned studies, cognitive ability is only moderately correlated with humour comprehension, suggesting other factors are involved (Mallan, 1993; Pinderhughes & Zigler, 1985). Second, cognitive theory does not readily explain laughter or appreciation of humour. Several studies have failed to find a significant relationship between intellectual ability and humour appreciation, as measured by both funniness ratings and laughter (Brodzinsky, 1977; McGhee, 1971a; Prentice & Fathman, 1975; Whitt & Prentice, 1977). These results suggest that humour comprehension is neither a necessary, nor sufficient condition for humour appreciation and laughter. That is, children report funniness and laugh at humour that they do not necessarily understand. Similarly, not all humour that is understood is perceived as funny or elicits laughter (Bariaud, 1989; McGhee, 1971b; Pinderhughes & Zigler, 1985).

One group of researchers have suggested that the relationship between humour appreciation and humour comprehension is mediated by the level of difficulty of the humour stimulus (Brodzinsky, 1975; Zigler et al., 1966). For example, Zigler and colleagues found that whereas comprehension of humorous cartoons increased steadily with age, mirth response increased between ages 7 years to 9 years, then decreased between 9 and 10 years of age (Zigler et al., 1966). These results lead to the introduction of the *cognitive congruency principle*, which proposes that children enjoy humour at an optimal level of difficulty, that is, humour that is not too easy and not too difficult (Zigler et al., 1966).

In a later study, Zigler and colleagues found support for the cognitive congruency principle using cartoons with children aged 8 years to 12 years (Zigler, Levine, & Gould, 1967). McGhee (1976a) also found support using jokes. Appreciation of jokes was greatest for children who had just acquired the necessary concepts, as opposed to those who did not possess these concepts, or had acquired them years earlier. Although support for the cognitive congruency theory is mixed, most researchers agree that the difficulty of the humour stimulus plays an important role in children's expression of amusement (Brodzinsky & Rightmyer, 1980; Masten, 1989; McGhee, 1971a; Pinderhughes & Zigler, 1985).

4.2 Summary and Implications for Humour in ASDs.

Humour is a broad, multifaceted concept, which has been conceptualised in a number of different ways. Prominent theories of humour can be divided into two groups: (a) emotional theories, which focus on the functions of humour, and (b) cognitive theories, which view humour as an intellectual process involving the perception and resolution of incongruity (Bariaud, 1989). Based on Piagetian stages of cognitive development, McGhee (1979) proposed a developmental model of humour, whereby changes in humour reflect underlying developments in intellectual ability. Based on this model, children with ASDs may have difficulty understanding and producing humour in social settings because they are delayed in the acquisition of important cognitive capacities, such as symbolic thought and abstract reasoning.

Despite support for the cognitive model of humour, most researchers agree that cognitive ability is not the only factor involved in humour and laughter. The cognitive-developmental model proposed by McGhee (1989) also emphasises the role of language and social functioning in children's humour development. As

children develop language and social skills, humour becomes more advanced and increasingly social.

As previously mentioned, delays in social and language functioning can affect the ability of children with ASDs to engage in humour-related interactions. For some individuals with ASDs, intellectual ability may mediate their socio-communicative impairments; they are able to develop alternative strategies to understanding and adapting to social situations (Fitzgerald, 2003; Sigman & Capps, 1997). However, this is not universal, and even high-functioning individuals who are able to grasp the cognitive basis of humour, continue to have difficulty with the interpersonal aspects (Lyons & Fitzgerald, 2004).

Although over 100 theories of humour have been proposed, no single theory has yet gained widespread acceptance (Cunningham, 2005; Martin, 2001). Theorists remain divided over the mechanisms and functions of humour and laughter. Currently, the general consensus is that humour is complex and involves the integration of a range of phenomena and functions, including perception of incongruity and feelings of relief and superiority (Cunningham, 2005; Lefcourt, 2001; Martin, 2000). However, theorists are still a long way from formulating a general theoretical framework to satisfactorily explain all aspects of humour and laughter. Each child has a distinct, idiosyncratic sense of humour that can be influenced by many different factors (Cunningham, 2005; Mallan, 1993; Sultanoff, 2002). These factors will be reviewed in the next section.

4.3 Influences on Children's Humour

Influences on children's humour development are complex and numerous (Pinderhughes & Zigler, 1985). To date, research has implicated several individual factors, including personality traits (Brodzinsky & Rightmyer, 1980; Ruch &

Carrell, 1998), early childhood experiences (Bergen, 2003; McGhee, 1980) and situational mood (Carson et al., 1986; Leak, 1974; Schwartz, 1972). One factor that has received considerable attention in humour research is language ability.

4.3.1 Language ability. Most humour depends on language (Jones, 1983; Martin, 2007; Masten, 1986). The production and appreciation of humour requires many facets of communication, including expressive language and vocabulary, understanding word meanings and linguistic ambiguity, and understanding non-literal language (Bernstein, 1986; Lyons & Fitzgerald, 2004; Spector, 1992). Indeed, research supports parallel connections between children's humour development and the development of language (Horgan, 1981; McGhee, 1971b; Shultz & Horibe, 1974). Children with language impairments typically experience difficulties comprehending humour, such as jokes and riddles (Donahue & Bryan, 1984; Nippold, 1985; Spector, 1990). Comprehension of humour has also been linked to metalinguistic skills, that is, the ability to think about language and how it works (de Villiers & de Villiers, 1978; Horgan, 1981; Sotto, 1992; Spector, 1990). For example, to resolve the incongruity in a joke, the listener must be able to tie the punch line and the body of the joke together by reviewing the information in the joke and realising it can be interpreted in multiple ways (Emerich et al., 2003; Suls, 1972).

It has long been assumed that humour and language are connected; however, little direct empirical examination of this connection exists. The majority of research instead has focused on humour as a cognitive process without exploring the contextual features of language use that make it possible to share humour with others. Being able to communicate effectively is essential for social interaction (Lyons & Fitzgerald, 2004); therefore language ability is likely to contribute to

humour development both directly and indirectly through encouraging social interaction (Carson et al., 1986; Masten, 1986). Indeed, research suggests that children who are more competent communicatively are more likely to initiate humour and respond to the humour of others (Carson et al., 1986; McGhee, 1980).

Language ability and social functioning are inextricably linked, each playing a vital role in the social sharing of humour and laughter. Language and social skills are also important for humour comprehension, which can affect the way children respond to the humour of others. However, as previously noted, comprehension is not the only factor involved in children's responses to humour. Many children laugh at humour that they do not necessarily understand. Conversely, not all humour that is understood elicits laughter (Bariaud, 1989). One factor that has been implicated in children's laughter is the social environment. This area of children's humour is primarily linked to Chapman and colleagues Chapman, 1983; Chapman & Chapman, 1974; Chapman & Wright, 1976).

4.3.2 Social influences. Humour is essentially a social phenomenon, since it requires both a producer and an audience (Martin, 2007; Reddy, 2008; Robinson & Smith-Lovin, 2001). An abundance of research suggests that children laugh more when others are present than when alone (Bainum et al., 1984; Chapman, 1973; Chapman & Wright, 1976; Fabrizi & Pollio, 1987; Foot & Chapman, 1976; Leventhal & Mace, 1970). These findings have lead to a *social facilitation* theory of laughter, whereby laughter is enhanced by the presence of others (Chapman, 1976; Chapman et al., 1980).

Chapman and colleagues found that social facilitation of laughter was influenced by several factors, including seating orientation and proximity of the companion (Chapman, 1976), the relationship of the child to the companion

(Chapman et al., 1980), the gender of the companion (Foot & Chapman, 1976; Sherman, 1988; Warnars-Kleverlaan, Oppenheimer, & Sherman, 1996), and the extent to which the companion looks at the child (Chapman & Wright, 1976). The amount of laughter by the companion is also extremely important. Several studies have found that laughter is increased by the presence of other people's laughter (Chapman, 1974; Chapman & Chapman, 1974; Chapman & Wright, 1976; Fuller & Sheehy-Skeffington, 1974; Smyth and Fuller, 1972). For example, Sherman (1975) noted the occurrence of *group glee*, in which laughter has a contagious effect, quickly escalating among children.

Although research is limited, some authors have suggested that social modelling plays a role in humour development (McGhee, 1983; Bergen, 2003; Simons et al., 1986). Research and case studies consistently report that individuals who are rated as humorous recall having parents who frequently used humour (Fisher & Fisher, 1981; Janus, 1975). McGhee and Lloyd (1982) also emphasised the importance of social modelling and reinforcement; they found that the strongest predictor of children's sense of humour was the amount of time spent in social play. Currently, more research is needed before conclusions can be drawn.

One area for future humour research is the interaction between social factors and gender. Preliminary evidence suggests that females are more interested in sharing their laughter with others (Chapman, 1973; 1975), and that their laughter is more influenced by the social environment (Chapman, 1976; Chapman, Smith, & Foot, 1980; Leventhal & Mace, 1970; Masten, 1989; McGhee, 1976b). Anecdotal reports suggest that this may also be true for individuals with ASDs. Several authors have provided accounts of individuals with ASDs who are able to share humour and

laughter with others; the majority of these accounts are based on females (Mesibov, 1992; Van Bourgondien & Mesibov, 1987; Werth et al., 2001).

4.3.3 Gender differences in humour. To date, several studies have reported gender differences in children's humour. One finding is that boys use more hostility and aggression in their humour than girls (Brodzinsky & Rubien, 1976; Cantor, 1976; Chapman & Gadfield, 1976; Groch, 1974; King & King, 1973; McGhee, 1976b). Some reports have suggested that boys are also more likely to use crude or anti-social humour that involves gore and sexual messages (Howe, 1993; Socha & Kelly, 1994). Currently, however, results are largely inconsistent with several studies failing to find gender differences across type of humour (Bergen, 2002; Bryant & Meyer, 1977; Fabrizi & Pollio, 1987).

In terms of comprehension and appreciation of humour, the majority of research has found no significant gender differences (Allen & Zigler, 1986; Prentice & Fathman, 1975; Rothbart, 1975; Shultz, 1972; Shultz & Horibe, 1974; Zigler et al., 1966). Studies on humour production have failed to yield consistent results (Groch, 1974; McGhee, 1976b; 1989). One reason for the inconsistent results could be the different samples used across studies. For example, McGhee (1976b) suggested that gender differences may interact with age. In a sample of preschool and school-aged children, he found that gender differences in humour did not appear until after 6 years of age. Fabrizi and Pollio (1987) also found significant gender differences in humour as a function of age, although differences were small.

Currently, due to variations in research methodology and sampling, it is difficult to draw conclusions about the role of gender in humour. Furthermore, most studies have only examined gender as a secondary issue, leaving many unanswered questions (Brodzinsky & Rightmyer, 1980). One important area for future research

is the role of gender in the humour-related interactions of children with ASDs. Available anecdotal reports suggest that the social sharing of may be less impaired in females with ASDs; however, this is in contrast to research findings of more severe autistic symptomatology in females with ASDs, including socio-communicative functioning (Holtmann et al., 2007). Further research is needed to clarify the exact nature of gender differences in ASDs and the implications for socio-communicative functioning.

4.4 Summary and Implications

Humour is a complex, multifaceted concept, which involves the integration of a range of phenomena and functions, including perception of incongruity, relief from negative emotions, and feelings of superiority. Sharing of humour and laughter in social situations requires well developed socio-communicative skills (Reddy et al., 2002), as well as the cognitive and linguistic capacities necessary to understand and produce humour (McGhee, 1989). Given their difficulties centre around interacting and communicating with others, children with ASDs are expected to have difficulty sharing humour and laughter with others. Some children with ASDs may possess the cognitive and linguistic skills necessary to comprehend and produce humour; however, they continue to have difficulty with the interpersonal aspects of humour and laughter (Lyons & Fitzgerald, 2004).

Currently, there is still a lot to learn about humour in children, particularly children with ASDs. Studying humour and laughter can provide unique insights into the socio-communicative impairments of children with ASDs. Child development research to date has predominantly focused on mental illness and deficits at the expense of positive experiences, such as humour (Lefcourt, 2001). However, humour is a topic worthy of further investigation.

4.4.1 Why study humour? Timely and effective use of humour plays a vital role in the development of social skills and competence (Bell, McGhee, & Duffey, 1986; Masten, 1986; McGhee, 1989; Sletta, Søbstad, & Valås, 1995). Early humour exchanges are believed to be important precursors of joint attention abilities (Bakeman & Adamson, 1984; Mundy, Sigman, & Kasari, 1993). Humour and laughter can promote social interaction and the formation of social bonds and relationships (Buffum & Brod, 1998; Cunningham, 2005; Davidhizar & Bowen, 1992; Morreall, 1997). Indeed, humour has been used effectively as a tool for enhancing social and communicative development in children with ASDs (Mesibov, 1984; Sonders, 2003).

Children and adolescents who use humour and laughter have been found to have more social participation (McGhee & Lloyd, 1982) and to be judged as more popular by peers compared to children and adolescents who are considered non-humorous (Fabrizi & Pollio, 1987; Masten, 1986; Sherman, 1988; Ziv, 1984). Conversely, limited humour skills can lead to children becoming withdrawn and socially isolated. Research suggests that children who offer less humour and laughter are rated as less desirable by their peers, thus they are more socially distant (Masten, 1986; Sherman, 1985; 1988) and lonely (Overholser, 1992).

Humour and laughter have been consistently linked to mental health in terms of helping people deal with negative emotions and stressful life events (Cann et al., 2000; Nezu, Nezu, & Blissett, 1998). Humour is also closely linked to cognitive development (Bernstein, 1986; Jones, 1983). Exposure to humour promotes the development of cognitive skills, such as problem-solving, creativity, cognitive flexibility, memory, and attention (Klein, 1987; Carlson & Peterson, 1995; Hauck & Thomas, 1972; Pinderhughes & Zigler, 1985; Ziv, 1984). Indeed, use of humour in

the classroom has been found to assist learning by encouraging creativity (Isen, Daubman, & Nowicki, 1987; Ziv, 1976) and increasing interest and attention (Davies & Apter, 1980; Hauck & Thomas, 1972; Masten, 1986; Zillman & Bryant, 1983).

Humour plays a vital role in child development and is a topic worthy of investigation. Currently, however, little is known about humour and laughter in children. Available research is outdated and suffers from methodological problems. Even less is known about humour and laughter in special populations, including ASDs. Investigation of humour and laughter can offer a unique perspective on autistic symptomatology, particularly socio-communicative difficulties and impairments in ToM.

Chapter 5: Humour and Laughter in Children with ASDs

Given the requirements for sharing humour and laughter, it has been theorised that children with ASDs have difficulty with the interpersonal aspects of humour. Sharing humour and laughter is an important part of social interaction and may be limited among children with ASDs due to their social impairments and deficits in ToM (St. James & Tager-Flusberg, 1994; Werth et al., 2001). The capacity for sharing certain forms of humour may also be restricted by the language and communication difficulties of children with ASDs (Lyons & Fitzgerald, 2004; Werth et al., 2001). Even children who are not delayed in language, such as those with AS, continue to have difficulties interacting with others, and sharing their emotions and experiences (Liss et al., 2001).

Cognitive development has also been consistently linked to humour. Delays in the acquisition of cognitive skills, such as symbolic thought and abstract thinking, may impair the ability of some children with ASDs to produce and respond to

linguistically based humour during social interactions (McGhee, 1989). Many children with ASDs have been found to have a weak central coherence, which impairs their ability to attend to and integrate social information (Frith & Happé, 1994; Morgan, Maybery, & Durkin, 2003). Furthermore, children with ASDs have under-developed executive functions, including planning skills, problem-solving ability, and flexibility (Joseph, 1999). Without these skills, children with ASDs have difficulty behaving in a planned and organised manner, which is essential for social interaction (Hughes, 1998).

Currently, empirical studies investigating humour and laughter in children with ASDs are very sparse. Comparisons across studies are difficult due to the investigation of various age groups and humour stimuli. Furthermore, most studies have focused on cognitively complex or language based humour, such as comprehension of jokes and cartoons, at the expense of more spontaneous, naturally-occurring humour that occurs in everyday social situations.

In one of the earliest studies, Van Bourgondien and Mesibov (1987) investigated humour in a group of nine adolescents and adults with high-functioning autism. The setting of the study was a social skills group that was held weekly for 15 weeks. During each session, group members were provided with the opportunity to tell jokes. Applying McGhee's (1979) model of humour development, the authors found that all participants with autism were capable of telling jokes, although the majority of jokes were at a developmental level of late-preschool and early school-aged children. Only 16% of jokes were at a level expected of adolescents and adults. Neither the number of jokes told nor the development level of jokes was related to overall IQ or verbal IQ.

The results by Van Bourgondien and Mesibov (1987) were supported in a later study by McCormick (1993). As part of a doctoral dissertation, McCormick (1993) studied joke-telling in a group of adolescent boys with AS. Although the boys were able to tell jokes, the majority of jokes were simple and predictable, and rated as less funny by peers compared to jokes by controls. McCormick (1993) reported that while the boys with AS were able to share jokes, this was not a pleasurable experience. In several cases, joke-telling appeared to promote a high level of anxiety, as opposed to the enjoyment observed in the typically developing adolescents.

In a more recent study, Emerich and colleagues investigated humour comprehension in a group of eight adolescents with HFA and AS. Subjects were required to read cartoons and jokes and select humorous endings. Results showed that compared to a control group of typically developing adolescents, adolescents with ASDs made more errors on both the cartoon task and the joke task. Furthermore, on the cartoon task, participants with ASDs most often chose the straightforward ending that was coherent with the body of the joke, but not humorous. The authors proposed that errors were due to impairments in cognitive flexibility; individuals with ASDs had difficulty re-evaluating the beginning of the joke or cartoon and abandoning their initial impressions (Emerich et al., 2003). Results must be interpreted cautiously, however, as sample size was small and the researchers did not control for cognitive ability.

Despite the study limitations, results from Emerich et al. (2003) are consistent with earlier studies on humour comprehension. Ozonoff and Miller (1996) also found a preference for adults with autism to choose straightforward endings that did not make the joke humorous. Compared to controls, adults with autism were also more likely to choose endings that were incorrect and unrelated to the content of the

joke. Both errors are consistent with a deficit in cognitive flexibility (Emerich et al., 2003). McCormick (1993) also found that compared to controls, boys with AS chose more straightforward, non-humorous endings to jokes. In addition to support for cognitive flexibility, McCormick (1993) interpreted these results in terms of weak central coherence. He suggested that due to a deficit in integrating information, individuals with ASDs may have difficulty making the punch line cohere with the body of the joke.

In contrast to studies of controlled humour stimuli, St. James and Tager-Flusberg (1994) investigated examples of naturalistic humour in a group of six young boys with autism. Children were observed in their homes while they interacted with their mothers in play. Results indicated that control children with Down Syndrome produced significantly more episodes of humour than the children with autism. Children with Down Syndrome also used significantly more humour involving nonverbal incongruity. No other significant differences were found between children with autism and controls on the type of humour used. The authors concluded that simple forms of humour typically occurring in infancy, such as tickling, teasing, and clowning, are relatively unaffected in children with autism.

Although there were no group differences, the humour produced by children with autism was at an earlier developmental level. No child with autism displayed humour at a level above verbal incongruity, even though all children were above 3 years of age. Results showed a trend towards more humour being produced by older children, particularly for children with Down Syndrome, providing some support for McGhee's developmental model of humour. The amount of humour produced by children was not significantly correlated with IQ or language ability.

In a more comprehensive study, Reddy et al. (2002) investigated naturalistic occurrences of humour in a group of 19 preschool children with autism. The control group consisted of 16 children with Down Syndrome matched on gender and nonverbal ability. Data were obtained through parental interviews and observations of children engaged in play. Analysis of information from parental interviews indicated no significant differences between the groups on the frequency of laughter, although there were differences in what the children were reported to laugh at. Compared to children with Down Syndrome, children with autism laughed significantly less frequently at funny faces and at socially inappropriate acts involving violations of conventional codes of behaviour, for example, an adult drinking from a child's bottle. In fact, none of the children with autism were reported by parents to laugh at socially inappropriate acts, compared to 50% of children with Down Syndrome.

Similar to the results reported by St. James and Tager-Flusberg (1994) no significant differences were found between the two groups on laughter at auditory, tactile, or visual stimuli (e.g., clowning and slapstick), however, 88% of children with autism were reported to laugh for no apparent reason, compared to only 16% of children with Down Syndrome. The majority of parents in the autism group also reported that their child laughed at odd or strange things, compared to only one parent in the Down Syndrome group. Finally, children with autism were less likely to attempt to join in with the laughter of others compared to children with Down Syndrome.

Parents were also asked about their child's attempts to make others laugh through clowning and teasing. Children with autism were significantly less likely to engage in clowning. Only 5 of 19 children with autism were reported to have

engaged in clowning, compared to 13 of 16 children with Down Syndrome. Reported incidents of clowning also tended to be simpler among the autism group, primarily involving repetition of imitated phrases. Engaging in clowning was positively related to developmental scores for age, nonverbal ability, and language.

Similar group differences were reported in the frequency of teasing. Teasing was also related to nonverbal and language developmental scores, although only moderately for children with autism. These results support research and anecdotal reports, which suggest that teasing is problematic for children with ASDs (Grandin, 1995; Heerey, Capps, Keltner, & Kring, 2005). In a study of teasing in childhood, Heerey and colleagues found that children with autism initiated less teasing, particularly teasing involving violations of social norms, compared to controls. Children with autism also displayed difficulty understanding why they were being teased, and subsequently, tended to have more negative views of teasing. The authors explained these difficulties in terms of awareness of others' intentions (ToM; Heerey et al., 2005).

The second part of the study by Reddy and colleagues, involved observing children in play interactions. Results from observations suggested that children with autism show problems in joint attention aspects of humorous exchanges. Although no significant differences were reported between the groups on the frequency of laughter, in interactive situations, children with autism were significantly less likely to share the focus of their laughter with their companion. Children with autism were also significantly less likely to respond to the laughter of others, reflecting difficulties in mutual emotional sharing (Dawson et al., 1990; Kasari et al., 1993). Overall, the authors concluded that although children with autism are able to engage in some early forms of humorous interaction, difficulties with interpersonal and

affective aspects of humour are evident compared with developmentally matched children with Down Syndrome, as well as previous examinations of infants within the first year of development (see Reddy, 1991; Sroufe & Wunsch, 1972).

The conclusions by Reddy and colleagues (2002) are consistent with those of Werth and colleagues who analysed humour in Grace, a 29-year-old woman with HFA. While Grace was skilled at producing complex humour, such as jokes and puns, she displayed difficulty sharing this humour with others. The majority of Grace's humour tended to be produced for herself, focusing on her own obsessional interests, without the intention to share it with others (Werth et al., 2001).

Despite early suggestions of a lack of humour in individuals with autism and ASDs (Asperger, 1944/1991; Wing, 1996), available research and anecdotal reports suggest that humour is something that can be enjoyed by many people with ASDs (Howlin, 1997; Van Bourgondien & Mesibov, 1987; Werth et al., 2001). Difficulties however, are apparent with more cognitively complex humour, such as jokes and riddles. Understanding and production of this type of humour in individuals with ASDs is limited and tends to occur at an inappropriate developmental level (Van Bourgondien & Mesibov, 1987; Werth et al., 2001). Although early forms of humour, such as tickling and funny sounds, tend to be unimpaired in children with ASDs (St. James & Tager-Flusberg, 1994), they clearly have difficulties sharing emotional experiences with others and engaging in humour and laughter-related interactions (Reddy et al., 2002). In particular children with autism have difficulty with humour that relies on detailed knowledge of social situations and what others may be thinking.

In summary, little is known about humour and laughter in children with ASDs. Empirical studies are scarce and available research is methodologically

flawed; small sample sizes, lack of adequate controls, and failure to control for cognitive and language ability are just some of the problems seen in studies of humour in ASDs. Furthermore, examination of how humour is tied to social functioning is limited. Study of humour and laughter in actual interactions has been neglected in favour of studies of controlled stimuli, such as jokes and cartoons (Emerich et al., 2003; St. James & Tager-Flusberg, 1994). The investigation of naturally-occurring, social episodes of humour and laughter can provide unique insights into ASDs, particularly given their deficits centre around interacting and communicating with other people.

The aim of the current study was to explore the interpersonal aspects of humour and laughter in a sample of primary school-aged children with ASDs by examining spontaneous episodes of humour and laughter that arose during children's everyday social interactions. More specifically, the aims were: (a) to examine the frequency of laughter in children with ASDs and a control group of children without ASDs; (b) to examine the types of events and conditions that give rise to, or fail to give rise to, laughter among children with ASDs; (c) to examine the frequency and type of humour production by children with ASDs during social interactions; (d) to examine the ability of children with ASDs to share and respond to humour within social interactions; and (e) to examine how humour and laughter are related to developmental indices, including intellectual ability, language, and theory of mind.

The current study built upon the research of Reddy et al. (2002) who examined humour-related social interactions among preschool children with autism. At the time, the study by Reddy and colleagues was the only study to explore humour in ASDs from a socio-affective perspective. The current study adopted a similar design to investigate humour in an older sample of school-aged children with

ASDs. The study was divided into two parts: Part 1 focussed on information obtained from parent questionnaires; Part 2 explored data from direct observations. Chapter 6 will review the hypotheses and procedure for Part 1, including results and a brief discussion. Part 2 of the current study will be discussed later in Chapter 7.

Chapter 6: Study Part 1

6.1 Participants

Participants in the current study included 16 children with an autism spectrum disorder (ASD) and a control group of 15 children. The groups were matched on chronological age, $t(29) = .32$, $p = .75$, and nonverbal cognitive ability, $t(27) = -1.60$, $p = .12$. Children in the ASD group had significantly lower receptive language scores, $t(27) = -3.16$, $p < .01$ and expressive language scores, $t(27) = -2.82$, $p < .05$. Characteristics of the two groups are presented in Table 1. Cognitive and language scores could not be obtained for two children from the ASD group who were recruited from interstate.

Table 1

Participant Characteristics by Group

	ASD		Control	
Variable	*M* (*SD*)	Min – Max	*M* (*SD*)	Min – Max
Age (months)	95.00 (28.27)	51 – 150	91.80 (27.54)	49 - 145
Cognitive ability	81.14 (26.23)	47 – 135	95.00 (20.36)	46 – 127
Receptive language	80.57 (22.35)	55 – 126	100.87 (9.20)	83 - 113
Expressive language	80.29 (22.78)	54 – 126	98.73 (9.39)	78 - 111

Theory of mind ability (ToM) was assessed using a false-belief task. Significantly more children from the control group passed the ToM task compared to

children from the ASD group, $\chi^2(1, N = 29) = 7.99, p < .01$. Five children (36%) from the ASD group passed the ToM task, compared to 13 children from the control group (87%). For both groups, ToM was significantly correlated with cognitive ability and expressive language. A significant correlation was found between ToM and receptive language for the ASD group, but not the control group. Correlations are presented in Table 2.

Table 2

Spearman Correlations Between ToM Score and Developmental Indices

	ASD	Control
Cognitive score	-.57*	-.59*
Expressive language	-.61*	-.60*
Receptive language	-.67**	-.50*

* $p < .05$. ** $p < .01$.

6.1.1 Autism Spectrum Disorder (ASD) group. The ASD group consisted of 12 boys and 4 girls ranging in age from 5 years to 12 years. All children had received a primary clinical diagnosis of Autism ($N = 11$) or Asperger Syndrome ($N = 5$) from a child health professional. The presence of autistic symptomatology was verified using the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988). The CARS is a 15-item rating scale used to identify children on the autism spectrum. The CARS was completed by the researcher based on direct behavioural observations of the children. All children scored higher than 30, confirming the presence of an ASD. Diagnosis could not be confirmed for the two children with AS located interstate.

6.1.2 Control group. The control group consisted of eight boys and seven girls ranging from age 4 years to 12 years. Of these children, 13 were typically

developing and 2 had Down Syndrome. The two children with Down Syndrome were included on a case-by-case basis to match children with ASDs who had an intellectual disability. Parent reports indicated that all children were developing typically, with no evidence of a genetic or neurological disorder. The CARS was used to screen for the presence of an ASD. All children in the control group scored below 30, and were therefore classified as not autistic.

6.1.3 Recruitment. Participants were recruited through advertisements placed in school newsletters and local newspapers. Advertisements were also displayed on community notice boards located in supermarkets, community centres, and child health services. Parents expressed interest by contacting the researcher via phone or email. These parents were provided with a plain language statement describing the study in more detail (see Appendix A). Parents who wished to participate in the study returned a signed consent form (see Appendix B). A follow-up phone call was then made to arrange a convenient time for the researcher to visit the family's home.

Children with an ASD were recruited primarily through Autism Victoria, a non-profit organization dedicated to providing information and support for individuals with ASDs and their families. Parents were contacted from the Research Participant Register, a list of families willing to participate in autism research. The study was also advertised on the Autism Victoria online discussion board.

6.2 Materials

As noted in the literature review, humour and laughter are partially influenced by cognitive ability and language development. In order to control for these as possible confounding variables, allowing an uncontaminated look at humour and laughter as social behaviours, each child was administered a cognitive and language assessment. A false-belief task was also completed with each child to

assess theory of mind ability. Theory of mind has been previously neglected in humour research, however, it has important implications for the ability of children to share humour and laughter with others.

6.2.1 Cognitive assessment. Cognitive ability was assessed using the fourth edition of the Wechsler Intelligence Scale for Children (WISC-IV; Wechsler, 2003). The WISC-IV is used as a measure of intellectual abilities in children aged 6 years to 16 years. Materials are child-friendly and engaging, with colourful and play-like tasks (Strauss, Sherman, & Spreen, 2006). The WISC-IV is widely used with children with ASDs (Goodlin-Jones & Solomon, 2003) and has excellent psychometric properties (see Wechsler, 2003).

The full version of the WISC-IV contains 10 subtests and 5 supplemental subtests. To reduce administration time, a short form of the test was used. The short form involved three subtests: (a) Block Design, which requires children to copy geometric patterns using blocks; (b) Picture Concepts, where the child is presented with rows of pictures and required to select pictures with a common characteristic; and (c) Matrix Reasoning, in which the child must complete a missing piece of a picture matrix by selecting one of five response options (Strauss et al., 2006). The short form of the WISC-IV is a quick and reliable way to measure cognitive ability in both typically developing children (Sattler & Dumont, 2004) and children with ASDs (Minshew, Turner, & Goldstein, 2005).

For participants under 6 years of age, the preschool form of the WISC-IV was used. The Wechsler Preschool and Primary Scale of Intelligence - Third Edition (WPPSI-III) has excellent psychometric properties and validity studies have found the test to be suitable for children with ASDs (Wechsler, 2002). Once again, a short

form was used involving three subtests: Block Design, Picture Concepts, and Matrix Reasoning.

The short forms of the WISC-IV and the WPPSI-III were administered individually by the researcher. Administration time was approximately 20 minutes. Raw scores were converted to standardised scores with a mean of 100 and a standard deviation of 15 (Strauss et al., 2006). Although normed on an American Sample, Australian Language Adaptations were used for the current study.

6.2.2 Language assessment. Language was assessed using two tests: the Expressive One-Word Picture Vocabulary Test - 2000 Edition (EOWPVT-2000; Brownell, 2000a) and the Receptive One-Word Picture Vocabulary Test - 2000 Edition (ROWPVT-2000; Brownell, 2000b). The EOWPVT-2000 assesses spoken vocabulary by asking the child to name objects, actions, and concepts pictured in illustrations. The ROWPVT-2000 is a measure of receptive language or hearing vocabulary. During administration, the child is required to identify an illustration that depicts the meaning of a word presented orally by the examiner. Raw scores are converted to standard scores with a mean of 100 and a standard deviation of 15 (Brownell, 2000a, b).

The EOWPVT-2000 and ROWPVT-2000 are both individually administered, taking approximately 10-15 minutes to complete. The EOWPVT-2000 is administered first as learning may take place in the administration of the ROWPVT-2000 that could affect expressive vocabulary performance. The tests are designed for use with individuals aged 2 years to 18 years, and have been used widely for children with ASDs (Goodlin-Jones & Solomon, 2003). Both tests have established reliability and validity (see Brownell, 2000a, b).

6.2.3 Theory of Mind. Theory of Mind (ToM) was assessed using a false-belief test adapted from the Sally-Ann Task (Baron-Cohen et al., 1985). The test was created by the researcher to measure first-order belief attribution, that is, the ability to infer the mental states of one person (Wimmer & Perner, 1983). Although no psychometric data are available, the Sally-Ann Task is widely recognised in the literature as a useful measure of ToM ability (Baron-Cohen et al., 1985; Happé, 1995; Kleinman et al., 2001; Pellicano et al., 2006).

Two trials of the false-belief test were administered to lessen the possibility that children were correct by chance alone. Each trial took approximately five minutes to complete. The first trial involved two girls, Beth and Sally (see Appendix C). Beth places her ball in a bag and then leaves the room. While she is away, Sally moves the ball into a box. In the second trial, Sue and Amy are playing together in the sandpit; Sue then leaves the sandpit with her mother. While she is away, Amy hides behind a tree (see Appendix D).

For each trial, the child is asked a false-belief question, requiring them to infer the thoughts of the persons in the scenarios. For trial 1, the child is asked where Beth will look for her ball. In trial 2, the child must answer where Sue will look for Amy. Each trial also involves two control questions: (a) a reality control question, to check that the child recalls where the object or person really is at the end of the story, and (b) a memory control question, asking them to recall where the object or person was at the beginning of the scenario. All children were required to pass the control questions before their false-belief question was scored. The false-belief test was scored as 1 for *pass* or 2 for *fail*. Children were awarded pass if they answered both false-belief questions correctly.

6.3 Procedure

The current study involved two home visits with each participant. Each visit occurred approximately 7 days apart. During visits, assessments were completed and children were observed engaged in play. Between visits, parents were asked to complete a questionnaire about their child's humour and laughter. Parents provide invaluable information about their child's behaviour; they have observed their child in many different situations over a long period of time (Goodlin-Jones & Solomon, 2003). The parental report is particularly important in the current study, given that humour and laughter are low frequency behaviours for many children with ASDs. Parent reports can capture aspects of humour and laughter that may not occur during observations and would otherwise be missed.

Due to time constraints, a parent questionnaire was chosen over an interview. Parents reported that they preferred to complete the questionnaire between visits when they had more time to think about their responses and discuss them with a partner or family member. Questionnaires also gave parents the opportunity to record any humour-related episodes that occurred between the visits by the researcher. Parents who had not completed the questionnaire by the last visit were provided with a self-addressed prepaid envelope to return the questionnaire to the researcher at a later date. Follow-up phone calls and emails were required for some parents as a reminder, however, all questionnaires were eventually returned.

The parent questionnaire used in the current study was adapted from the interview used by Reddy et al. (2002). A copy of the questionnaire is provided in Appendix E. While most questions required a *yes* or *no* response, parents were encouraged to elaborate by providing examples. During visits by the researcher, the majority of parents voluntarily offered information about their child's humour and

laughter. These discussions were recorded and later added to questionnaires for coding.

The parent questionnaire was divided into five main parts: (a) laughter by the child, (b) sharing of laughter, (c) response to others' laughter, (d) making others laugh, and (e) playful teasing. Responses to each question were coded as *yes* or *no*. Part 1 consisted of questions about specific elicitors of the child's laughter, including tactile events (e.g., tickling, blowing raspberries, chasing), auditory events (e.g., funny noises, silly rhymes), visual events (e.g., funny faces, slapstick humour), jokes and riddles, and socially inappropriate events involving violation of social norms (e.g., mother walking like a penguin or drinking from a baby's bottle).

Part 2 of the questionnaire explored the social aspects of the children's laughter, including their attempts to share laughter with others and the presence of odd or inappropriate laughter. Part 3 consisted of questions about the children's responses and reactions to others' laughter, including their attempts to join in with the laughter of others. Humour production was explored in part 4; parents were asked about their child's attempts to make others laugh, including clowning or acting in a silly way, and telling jokes and riddles. The final section of the parent questionnaire focused on children's attempts to playfully tease others. Parents were also asked to describe their own attempts to playfully tease their child, including their child's reactions to this teasing.

6.4 Aims and Hypotheses

Part 1 of the current study explored the types of events that elicit laughter among children with ASDs, as well as how children with ASDs shared and responded to humour within social interactions. While the study was largely exploratory, a number of tentative hypotheses were offered. Based on past research

(Reddy et al., 2002; St James & Tager-Flusberg, 1994; Van Bourgondien & Mesibov, 1987), it was expected that, compared to controls, children with ASDs would display difficulties with the socio-affective aspects of humour, reflected in less sharing of laughter with others, fewer attempts to join in with others' laughter, and fewer attempts to make others laugh. Children with ASDs were also expected to have difficulty with humour and laughter that involves social knowledge and understanding of others' mental states (theory of mind). It was hypothesized that, compared to controls, children with ASDs would display less laughter in response to socially inappropriate humour, offer more laughter that is considered odd or inappropriate, and make fewer attempts to playfully tease others. In contrast, no group differences were expected across early forms of humour involving tactile, auditory, or visual stimuli. However, due to the cognitive and linguistic demands, children with ASDs were expected to display less laughter in response to jokes and riddles, and fewer attempts to tell jokes and riddles compared to controls.

6.5 Results

Responses to questionnaire items were coded as dichotomous, categorical variables with 1 indicating *yes* and 2 representing *no*. Groups were compared using chi square analysis, a non-parametric technique for examining categorical data. To examine the relationship between questionnaire responses and developmental scores, Spearman correlations were used. For dichotomous developmental variables, theory of mind and gender, the phi correlation coefficient was used as a measure of association. An alpha level of .05 was used for all statistical tests. Results from the parent questionnaires are presented below.

6.5.1 Laughter by the children. The first item on the parent questionnaire was an open-ended question about the frequency of children's laughter. All children were

reported to laugh frequently throughout the day. Four parents from the ASD group stated that mood was a significant factor in their child's laughter. Two of these children were reported to have significant health problems that negatively affected their mood and subsequently reduced the frequency of their laughter.

Parents were also asked an open-ended question about the types of events that elicited laughter from their child. Both groups of parents reported similar elicitors of laughter, including slapstick humour, funny faces, tickling, and "toilet" humour. The most common elicitor of laughter among children with ASDs was slapstick humour, specifically television shows such as "Australia's Funniest Home Videos", "The Goodies", and "Mr. Bean."

Following the open-ended items, parents were asked a series of questions about specific elicitors of children's laughter, including tactile events, auditory events, visual events, jokes and riddles, and socially inappropriate events. A tactile event was any humorous action involving touching, for example, tickling, chasing, and bouncing on the knee. Auditory events included funny noises and silly rhymes, whereas visual events focused on funny faces and slapstick humour. Socially inappropriate events were defined as any event involving violation of social norms, such as a person walking like a duck or wearing pants on their head. Responses were coded as 1 for *yes* or 2 for *no*. The percentage of children in each group reported to laugh at each event is presented in Table 3.

Table 3

Percentage of Children in Each Group Reported to Laugh at Various Events

Group	Tactile	Auditory	Visual	Jokes and riddles	Socially inappropriate*
ASD	100%	94%	100%	50%	69%
Control	100%	100%	100%	73%	100%

* $p < .05$.

All children were reported to laugh at tactile events, including tickling, chasing, rough-and-tumble play, and blowing kisses on the skin. Tickling games were also common, including "This Little Piggy" and "Round and Round the Garden." One child in the ASD group was reported to be sensitive to touch and did not like tickling. Another child with autism only liked "hard" tickling and became annoyed if tickled softly. For one girl with autism, laughter at tactile events was primarily dependent on her mood. She would sometimes laugh when tickled, but only if it was not prolonged and she knew it was coming.

All children were reported to laugh at visual events, including funny faces, clowning, and slapstick humour. Two children in the ASD group were reported to laugh at their own funny faces in reflections. Examples of clowning behaviours eliciting laughter included silly walks, funny dances, and exaggerated movements. Slapstick humour was a common elicitor of laughter for both groups, particularly people falling over or getting hurt. Subsequently, many children were reported to enjoy the television show, "Australia's Funniest Home Videos." The slapstick humour of television shows "Mr. Bean" and "The Simpsons" was also mentioned by several parents.

No significant differences were found between the groups for auditory events, $\chi^2(1, N = 31) = 0.97$, $p = .33$. Correlational analysis was used to determine the relationship between questionnaire responses and developmental test scores. No significant correlations were reported between laughter at auditory events and developmental indices.

Examples of auditory events included funny songs, odd noises, and people using silly voices, such as a high-pitched tone or a foreign accent. Rude noises involving burping or flatulence were particularly popular with children from both groups. Many children were also reported as enjoying simple verbal incongruities created by parents; for example a "shoe sandwich" or "vinegar ice-cream." One parent in the ASD group described a game in which she made up sentences from the number plates of cars. For example, a car with the number plate ZKC could be called "Zebra Kicks Camel." The odder the combinations, the more laughter they elicited from her child.

Only one child from the ASD group was reported not to laugh at auditory events; her parents reported that she had sensitive ears. One other girl with autism was also irritated by many noises and would only laugh at high-pitched sounds. The same girl was irritated by any auditory humour involving rhyming, such as riddles or poems.

Children in both groups were reported to laugh at jokes and riddles. No significant difference was found between the groups, $\chi^2(1, N = 31) = 1.78$, $p = .18$. Sources of jokes and riddles included joke books, cartoons, and peers. Many children were also reported as laughing frequently at their own made-up jokes, although these jokes were not perceived as humorous by adults. For example, one

boy with AS made up the following joke: “Why did the dog eat the food? Because it was hungry!”

Among the children with ASDs reported to laugh at jokes and riddles, parents stated that jokes tended to be simple or repetitive. One young girl with AS would laugh at jokes only after they were explained to her. Two parents in the ASD group reported that their children appeared to laugh at jokes only because others laughed, rather than because they found the joke humorous. One boy with autism was reported to interrupt jokes by laughing early and then adding his own ending.

The cognitive-developmental theory of humour proposed by McGhee (1979) states that children are able to appreciate simple and ready-make jokes as early as 4 years of age. However, understanding of the linguistic ambiguity involved in more complex jokes and puns does not develop until around age 6 to 7 years (McGhee, 1979; Shultz & Pilon, 1973). To control for the confounding effects of age, children under 6 years were removed from the analysis of laughter at jokes and riddles.

In the remaining sample of 24 children, 46% of the children with ASDs were reported to laugh at jokes and riddles compared to 91% of children from the control group. This result was significant, $\chi^2(1, N = 24) = 5.37$, $p = .02$. Partial correlations were used to further explore the effects of confounding variables. Results showed that laughter at jokes and riddles was significantly correlated with group ($r = -.47$, $p = .02$). This correlation was no longer significant after controlling for receptive language ($r = -.12$, $p = .62$), expressive language ($r = -.20$, $p = .39$), or ToM ($r = -.34$, $p = .14$).

Correlational analysis revealed significant correlations between laughter at jokes and riddles and the developmental indices. The results are presented in Table 4. For both groups, laughter at jokes and riddles was significantly correlated with

cognitive ability, receptive language, expressive language, and theory of mind. Children who laughed at jokes and riddles tended to have higher cognitive and language skills, and were more likely to pass the ToM task.

Table 4

Correlations Between Developmental Scores and Laughter at Jokes and Riddles

	ASD	Control
Chronological age	-.14	-.10
Cognitive score	-.72*	-.81**
Expressive language	-.84**	-.80**
Receptive language	-.84**	-.69*
ToM	.83**	.92**
Gender	-.39	-.24

* $p < .05$. ** $p < .01$.

The greatest difference between the ASD group and the control group was in laughter at socially inappropriate events. Significantly more children in the control group were reported to laugh at socially inappropriate events, $\chi^2(1, N = 31) = 5.59$, $p = .02$. One parent stated that her child with autism did not laugh at socially inappropriate events because he did not understand that they were silly or inappropriate. Another young boy with autism was reported to want to correct socially inappropriate events. He would highlight what was wrong with a particular action or situation rather than seeing it as humorous.

Among the children reported to laugh at socially inappropriate events, examples included odd walks, putting clothes on the wrong way, and children wearing adult clothes that were too big. Similar to jokes, the majority of children in both groups had a preference for acts performed by themselves. For example, one

boy with AS was reported to laugh hysterically while running around the garden naked. Another young boy in the control group enjoyed pretending to be fat by stuffing a pillow up his t-shirt.

Analysis of developmental scores revealed no significant correlations between developmental indices and laughter at socially inappropriate events for either group. Partial correlations were used to further explore the effects of confounding variables. Laughter at socially inappropriate events was significantly correlated with group (r = -.42, p = .02). This group difference remained significant after controlling for cognitive ability, receptive language, expressive language, and chronological age separately. However, the group difference was no longer significant after controlling for ToM (r = -.34, p = .08) or for receptive and expressive language together (r = -.37, p = .06). Although not significant, the R^2 values were 0.12 and 0.14 respectively, indicating that 12% of the variance in laughter at socially inappropriate events was explained by diagnostic group above ToM, and 14% was explained by group above language ability.

The final item in part 1 of the parent questionnaire asked parents if their child preferred a certain type of humour stimulus. Compared to the control group, a significantly higher number of children with ASDs were reported to have a humour preference, $\chi^2(1, N = 31) = 9.76$, $p < .01$. Only one child from the control group was reported to have a humour preference; all other control children enjoyed a variety of humour stimuli, including tactile humour, jokes, and slapstick events. For the ASD group, 69% of children were reported to have a humour preference. Of these children, 82% preferred visual humour, particularly slapstick humour seen on television shows. Having a humour preference was not significantly correlated with any of the developmental indices for either group.

6.5.2 Sharing laughter with others. The second part of the parent questionnaire focused on children's attempts to share their laughter with others. All children from the control group were reported to share their laughter with others, compared to 75% of children in the ASD group. This difference was significant, $\chi^2(1, N = 31) = 4.31, p = .04$. One parent reported that their child with AS did not share her laughter with others because she was "happy with her own company." Another girl with autism would only share her laughter with others if prompted to do so. Sharing laughter with others was not correlated with any developmental indices for either group.

Analysis using partial correlations revealed that sharing laughter with others was significantly correlated with group ($r = -.37, p = .04$). The group difference remained significant after separately controlling for chronological age, cognitive score, receptive language score, and expressive language score. The correlation between sharing of laughter and group was no longer significant after controlling for ToM ($r = -.31, p = .11$) or receptive language and expressive language together ($r = -.37, p = .06$). Although not significant, the R^2 value was 0.14, indicating that 14% of the variance in reported sharing of laughter was explained by diagnostic group when the effect of language was removed.

In order to explore further children's sharing of laughter, parents were asked whether their child ever laughed while alone. In the control group, 40% of children were reported to engage in solitary laughter, compared to 87% of children with ASDs. This difference was significant, $\chi^2(1, N = 31) = 7.62, p < .01$. The most common conditions for solitary laughter were watching television and reading a book. In fact, all children in the control group who engaged in solitary laughter were reported to do so while watching television or reading a book. Within the ASD

group, one girl was reported to laugh while talking to herself and replaying the day's conversations. Another child with autism would laugh while playing peek-a-boo with himself using his bed sheets. Two parents from the ASD group reported that they frequently heard their child laughing when alone, however they did not know what they were laughing at. Although episodes of solitary laughter were reported by both groups, several parents noted that these episodes were very rare.

A significant correlation was found between solitary laughter and age for the control group ($r = .58$, $p = .02$). Children from the control group who engaged in solitary laughter tended to be younger than those reported not to engage in solitary laughter. For the ASD group, moderate correlations were reported between solitary laughter and cognitive score ($r = .45$, $p = .11$), receptive language ($r = .45$, $p = .11$), expressive language ($r = .45$, $p = .11$), and ToM ability ($r = -.48$, $p = .06$). Children in the ASD group who engaged in solitary laughter tended to have lower intellectual ability and language skills, and less advanced ToM skills, however, these correlations failed to reach statistical significance.

Correlations revealed a significant relationship between solitary laughter and group ($r = .50$, $p < .01$). Significantly more children in the ASD group were reported to engage in solitary laughter. The correlation remained significant after separately controlling for chronological age, cognitive score, receptive language score, and expressive language score. Correlation with group was no longer significant after controlling for ToM ($r = .37$, $p = .05$). Although not significant, the R^2 value was 0.14, indicating that 14% of the variance in solitary laughter was explained by diagnostic group above that explained by ToM.

Parents were also asked about odd or inappropriate laughter by their child. Odd or inappropriate laughter was reported in 60% of control children, compared to

81% of children with ASDs. The difference was not significant, $\chi^2(1, N = 31) = 1.7$, $p = .19$. Among the control children, inappropriate laughter was reported to occur primarily in response to someone falling over or hurting themselves; however, the majority of these parents also noted that their child only laughed if the other person was not seriously hurt. Four parents from the control group stated that their child would occasionally laugh for no apparent reason, or in response to something considered non-humorous by others. One parent described an instance when her child laughed hysterically at a hole in his toast. Another boy found it hilarious that his mother cleaned the toilet with vinegar.

Parents in the ASD group reported a wide range of examples of inappropriate or odd laughter. Laughter at others' expense was common, including people getting hurt or getting into trouble. Four parents reported that their child often laughed at odd things that did not appear humorous to others. One boy with AS was reported to laugh hysterically following a news report about Lindy Chamberlain, specifically the mention of a dingo with a baby in its mouth. Two children in the ASD group were reported to use laughter to break silences. One parent described an instance when her son broke out into laughter during the one-minute silence at a football match.

Odd or inappropriate laughter was significantly correlated with chronological age for the ASD group ($r = .54$, $p = .03$), but not the control group ($r = .50$, $p = .06$). Children in the ASD group who engaged in odd or inappropriate laughter tended to be younger than those reported not to laugh at odd or inappropriate times. For children in the ASD group, odd or inappropriate laughter was also moderately correlated with receptive language ($r = .46$, $p = .09$), expressive language ($r = .46$, $p = .08$), and ToM ($r = -.34$, $p = .21$). Children who engaged in odd or inappropriate laughter tended to have lower language skills and less developed ToM skills than

those reported as not engaging in odd or inappropriate laughter, however, these correlations failed to reach statistical significance. No significant correlations were reported between odd or inappropriate laughter and any developmental indices for the control group.

The final item in part 2 of the parent questionnaire was about the effect of different people on children's humour and laughter. No clear patterns emerged for either group. The majority of children were reported to limit humour-related interactions to those they knew well or were comfortable with. Two children from the ASD group were reported to prefer sharing their humour and laughter with adults rather than other children. One parent stated that their child preferred to share her humour with her grandfather over other family members.

6.5.3 Response to laughter. The third part of the parent questionnaire focused on children's responses to others' laughter. The first item was an open-ended question about children's reactions to the laughter of others. All of the control children were reported to join in with others' laughter, either by asking what was funny or laughing themselves. However, several parents noted that if the laughter was directed at their child in a derogatory manner, their child would become upset or angry.

Among the ASD group, children's reactions to laughter were more varied. Some children were reported as attempting to join in with others' laughter, whereas others paid no attention. One young boy was reported to become very excited when other people laughed; he would giggle loudly and clap his hands. For some children, their reaction depended on the situation. One boy with autism would join in only if the topic involved one of his interests, otherwise he would become angry that people were being noisy and interrupting his activity. Two other boys with autism were also

reported to frequently become irritated by others' laughter if the noise interrupted their activity or television show.

In terms of derogatory laughter directed at the child, reactions were also varied. Although some children with ASDs were reported not to notice or care if they were being laughed at, others would become angry and upset. One parent stated that their child loved laughter and would always join in, even if people were laughing at him.

Parents were then asked a yes/no question about whether their child ever attempted to join in with others' laughter, even if they did not understand what the laughter was about. All children from the control group were reported to attempt to join in with others' laughter, compared to 81% of ASD group. This difference was not significant, $\chi^2(1, N = 31) = 3.11, p = .08$. No significant correlations were reported with developmental indices for either group.

The majority of children in the ASD group were reported to join in with others' laughter despite not knowing why they were laughing. Two parents reported that, while their children regularly joined in with others' laughter, they rarely understood why they were laughing. Certain children in the control group were also reported to laugh in response to others' laughter when they did not understand what the laughter was about; however, parents reported that this laughter was infrequent, typically occurring only in response to adult's laughter.

6.5.4 Attempts to make others laugh. Part 4 of the parent questionnaire consisted of questions about children's attempts to make others laugh. The section began with an open-ended question about the types of humour used by children to make others laugh. All children from both groups were reported to make others laugh. Examples included pulling funny faces, tickling, making funny noises, telling

jokes and funny stories, toilet humour, and clowning. One child with AS enjoyed making up funny songs, including a version of "Highway to Hell" by AC/DC which involved lyrics about the death of lead singer Bon Scott.

The frequency of attempts to make others laugh was reported as rare by five parents in the ASD group. One child would occasionally engage in clowning, however she typically required prompting before doing so. Another parent reported that her child had to be in a "playful mood" before attempting to make others laugh. In contrast, attempts to make others laugh were reported as frequent by all but one parent in the control group.

Parents were then asked whether their child had ever repeated an act that had previously elicited laughter. Results revealed that 87% of children in the control group had repeated such an act compared to 56% of children from ASD group. This difference just failed to reach statistical significance, $\chi^2(1, N = 31) = 3.48, p = .06$. No significant correlations were reported with developmental indices for either group.

Parents in the control group reported a range of acts, including telling jokes, singing funny songs, or performing silly dances. For some children, these acts had been made up and later repeated for different audiences. For other children, acts were copied from siblings or television shows. For ASD group, the majority of children were reported to repeat acts of television, including funny songs and slapstick humour.

The final two questions in part 4 focused on two specific humorous behaviours: clowning and telling jokes. All children from the control group were reported to clown compared to 81% of children from the ASD group. This difference

was not significant, $\chi^2(1, N = 31) = 3.11$, $p = .08$. No significant correlations were reported between clowning and developmental indices for either group.

Examples of clowning included doing funny walks, putting clothes on the wrong way, pulling funny faces, pretending to be an animal, and performing silly dances. One young boy with autism enjoyed running around the house naked to make his mother laugh. Another parent reported that her son with autism often tried to make her laugh by pretending to be a film star accepting an award.

In terms of joke-telling, 44% of children with ASDs were reported to tell jokes or riddles, compared to 73% of children from the control group. This difference was not significant, $\chi^2(1, N = 31) = 2.78$, $p = .09$. Once again, to control for the effects of age, children under 6 years were removed from the analysis. In the remaining sample of 24 children, 46% of the children with ASDs were reported to tell jokes and riddles compared to 91% of children from the control group. This result was significant, $\chi^2(1, N = 24) = 5.37$, $p = .02$. Partial correlations revealed that telling jokes and riddles was significantly correlated with group ($r = -.47$, $p = .02$); however, this correlation was no longer significant after controlling for receptive language ($r = -.12$, $p = .62$), expressive language ($r = -.20$, $p = .39$), or ToM ($r = -.34$, $p = .14$).

Correlations were used to determine the relationship between telling jokes and the developmental indices. The analysis revealed a number of significant correlations. Results are presented in Table 5.

Table 5

Correlations Between Developmental Scores and Telling Jokes and Riddles

	ASD	Control
Chronological age	-.14	-.10
Cognitive score	-.72*	-.80**
Expressive language	-.88**	-.80**
Receptive language	-.87**	-.69*
ToM	.83*	.87*
Gender	-.36	-.24

* $p < .05$. ** $p < .01$.

For both groups, telling jokes and riddles was significantly correlated with cognitive ability, receptive language, expressive language, and ToM. Children who told jokes and riddles tended to have higher intellectual and language skills, and were more likely to pass the ToM task than those reported not to tell jokes and riddles. For the ASD group, telling jokes was moderately correlated with gender, with girls more likely to tell jokes and riddles. However, this correlation failed to reach statistical significance ($r = -.39$, $p = .19$).

Children from both groups were reported to use jokes from books or television. Many children also enjoyed making up their own jokes, although these jokes typically made no sense and were not considered humorous by adults. For example, one young boy with autism made up the joke, “Is Dad fat or thin? Fat!” After telling the joke he would laugh hysterically. Another girl in the control group enjoyed making up rude jokes, “Knock Knock. Who’s there? Ernie. Ernie who? Ernie is a poo head!”

Only four children from the control group did not use jokes or riddles. Three of these parents reported that their child had not yet reached the stage of joke telling, however they often enjoyed other verbal humour, such as word plays and making up silly songs and rhymes. For example, one young boy frequently put an "oo" sound on the end of his words. In contrast, seven children from ASD group were reported not to use jokes or riddles. Three parents stated that their child did not understand jokes; a further two reported that their child lacked the language skills required to tell jokes.

Among the children with ASDs reported to tell jokes, jokes were often simple or not humorous. Only two children in the ASD group were reported to use riddles or puns. Some children were able to memorise complex jokes from books or newspapers. One boy with AS was reported to love telling jokes from his large collection of joke books; for example, "What do you call a man with a seagull on his head? Cliff." He also enjoyed making up his own jokes, "What do you get when you cross Homer Simpson and food? A Doh-nut!"

6.5.5 Playful teasing. The final section in the parent questionnaire focused on playful teasing. Examples of playful teasing included: (a) teasing by offering someone an object and then taking it away, (b) teasing by obstructing someone, (c) teasing by making deliberate mistakes, and (d) teasing by being deliberately disobedient. All children from the control group were reported to playfully tease others, compared to 75% of the ASD group. This difference was significant, $\chi^2(1, N = 31) = 4.31, p = .04$. No significant correlations were reported between playful teasing and developmental indices for either group.

The group difference for playful teasing remained significant after separately controlling for all the developmental indices. After *simultaneously* controlling for

receptive language, expressive language, and cognitive ability, the correlation with group also remained significant. However, the group difference was no longer significant after simultaneously controlling for receptive language, expressive language, cognitive ability, and ToM (r = -.37, p = .06). Although no longer significant, the R^2 value was 0.14, indicating that 14% of the variance in playful teasing was explained by group above that explained by language ability, cognitive functioning, and ToM.

Parents reported a wide range of teasing behaviours from both groups. Examples of playful teasing included obstructing others' view of the television, touching forbidden objects, hiding objects from parents or siblings, jumping out and scaring people, and being deliberately naughty by throwing objects or saying rude words. One little boy with autism enjoyed turning the volume down on the television while his mother was trying to watch. Making deliberate mistakes was also common to both groups, specifically mixing up people's names, misnaming objects, and pretending not to know things. One little boy with autism found it funny to miscount objects when doing his maths homework with his mother.

All children from the control group were reported to tease in a playful manner, stopping before the recipient became upset or angry. Four parents in the ASD group reported that their child occasionally took teasing too far. This was particularly true when the recipient of the teasing was a sibling. One young boy with autism was reported to deliberately tease and annoy his brother; the more negative reaction he received, the more he would laugh.

The final item in the questionnaire asked parents if they ever playfully teased their child. In the control group, 93% of parents were reported to tease their child, compared to 50% of parents in the ASD group. This difference was significant,

$\chi^2(1, N = 31) = 7.06, p < .01$. Examples of playful teasing by parents included peek-a-boo, changing words in a story, hiding objects, blocking activities, and misnaming objects. One child with autism was reported to love being teased. While in the car his mother would playfully tease him by repeatedly stopping his CD. He would join in, turning it back on and laughing.

Eight parents from the ASD group stated that they did not playfully tease their child. The majority of children were reported to become upset or angry because they did not understand that the teasing was playful. One parent reported that his child had "no patience" for teasing. Another parent wrote that her child thought people were "out to get her" and therefore, teasing was "not a great idea!" For three children in the ASD group, playful teasing was enjoyable as long as it did not disrupt their play or activity.

No significant correlations were reported between playful teasing by the parent and developmental indices for the control group. For the ASD group, being playfully teased was significantly correlated with cognitive score ($r = -.68, p < .01$), receptive language ($r = -.76, p < .01$), expressive language ($r = -.79, p < .01$), and ToM ($r = .65, p = .02$). Children who were teased by their parents tended to have higher cognitive ability and language skills, and were more likely to have passed the ToM task. Partial correlations revealed that the group difference remained significant after controlling for all developmental variables, both separately and simultaneously.

6.6 Summary of Results and Brief Discussion

Part 1 of the current study explored parent reports of humour and laughter in children with an autism spectrum disorder (ASD). ASDs are characterised by marked impairments in social interaction, including difficulty communicating nonverbally, limited sharing of emotions and experiences with others, and difficulty

reading others' social cues and emotions (APA, 2000; Schreibman, 2005). Given their social impairments, it was hypothesized that, compared to a control group, children with ASDs would have difficulty with the interpersonal aspects of humour, including sharing of laughter with others, joining in with others' laughter, and producing humour in order to make others laugh.

6.6.1. Hypothesis 1: Sharing laughter with others. As expected, significantly more children in the control group were reported to share their laughter with others compared to children with ASDs. These findings are consistent with the study of Reddy et al. (2002) who observed a lower rate of shared laughter in children with autism compared to a control group of children with Down Syndrome. Furthermore, Reddy et al. (2002) found a higher rate of non-shared laughter among children with autism, indicating that they were less likely to share their laughter with others during interactive situations compared to controls.

Partial correlations revealed that the group difference in sharing of laughter in the current study was largely attributable to ToM and language ability. Indeed, both language and ToM have been found to be important skills in social interactions, such as sharing of humour and laughter (Carson et al., 1986; Masten, 1986; McGhee, 1980). Effective use of humour requires knowledge of what other people are thinking and what is required of people in particular social situations, as well as the ability to use language and communicate effectively with others (Lyons & Fitzgerald, 2004).

Also consistent with the hypothesis, significantly more children with ASDs were reported to laugh while alone compared to control children. These results support the findings of Reddy et al. (2002) who observed a higher frequency of solitary laughter in children with autism compared to children with Down Syndrome.

Once again, the difference between groups was no longer significant after controlling for ToM ability, highlighting the important role that ToM plays in the social sharing of laughter.

The current study reported no differences between groups on joining in with others' laughter. These findings are in contrast to the study by Reddy et al. (2002) who found that significantly more children with Down Syndrome were reported to join in with others' laughter compared to children with autism. Reddy et al. (2002) also noted qualitative group differences in children's responses to others' laughter. Many children with autism were reported to use a false or artificial laugh that appeared to be an imitation of the other person's laughter, rather than an attempt to join in with the laughter.

It is likely that the broad nature of the question in the current study masked differences between the groups. Group differences may have emerged in response to a more narrow focused question, such as, "Does your child show an interest in what other people are laughing at?" Children with ASDs may laugh in response to others' laughter, however, this laughter is echoic rather than an attempt to join in. What then is the purpose of this imitative laughter? Is it simply imitation, or is the child trying to communicate? This is an interesting area for future research to explore.

Another explanation for the contrasting results between the current study and the investigation by Reddy et al. (2002) is the age of the participants. The participants in the present study were substantially older than those used by Reddy et al. (2002). Current research indicates that the severity of autistic symptoms tends to abate with age (Esbensen et al., 2009; Fecteau et al., 2003; Seltzer et al., 2003; Shattuck et al., 2007). Given the links between humour and socio-communicative functioning, it is possible that difficulties with humour among children with ASDs

also decrease with age as social and language impairments become less severe. Thus any differences in sharing humour between ASDs and controls may be less pronounced among older samples.

No differences were observed between groups on making other people laugh. All children from both groups were reported to make others laugh. Once again, the question may have been too broad. Children with ASDs may be similar to other groups in terms of quantity of humour attempts, however, differences emerge in the type of humour produced.

Previous research suggests that while children with ASDs produce humour, they do so at a developmental level lower than expected (Emerich et al., 2003; Lyons & Fitzgerald, 2004; Van Bourgondien & Mesibov, 1987). Indeed, qualitative analysis in the current study revealed a broader range of humour produced by control children compared to children with ASDs. Parents in the ASD group reported that while their children produced humour, it was limited to early developmental forms, such as tickling, funny sounds, and silly or slapstick behaviour. No significant group differences were found for clowning behaviours, which typically emerge in infancy, however, differences in humour production are likely to emerge for more complex forms of humour that involve cognitive and linguistic demands or social understanding.

6.6.2. Hypothesis 2: Humour involving social knowledge and awareness. Research shows that many children with ASDs have impairments in social cognition and understanding, specifically theory of mind (ToM) (LeBlanc et al., 2003; Pellicano et al., 2006; Peterson & Siegal, 1999). ToM involves the ability to understand the perspectives of others, and predict others' behaviours and emotions (Brown & Whiten, 2000; Myles & Southwick, 1999). Lacking a ToM, children with

ASDs were expected to have difficulty with humour involving social knowledge and understanding of other people's mental states. It was hypothesized that, compared to controls, children with ASDs would display less laughter in response to socially inappropriate events, more laughter that was considered odd or socially inappropriate, and fewer attempts to playfully tease others.

As expected, significantly more children in the control group were reported to laugh at socially inappropriate events. This finding supports the results of Reddy et al. (2002) who found that none of the children with autism in their study laughed at socially inappropriate events, compared to 50% of control children with Down Syndrome. St. James and Tager-Flusberg (1994) also found that compared to children with Down Syndrome, children with autism engaged in significantly less humour episodes involving social incongruity, such as pretending to drink a toy syringe full of blood.

The group difference in the current study was no longer significant after controlling for language ability, consistent with past research findings of strong link between language and ToM (Capps et al., 1998; Dahlgren & Trillingsgaard, 1996; Tager-Flusberg et al., 2001). Partial correlations revealed that the group difference was also partially attributable to ToM. In individuals with ASDs, ToM impairments have a definite impact on their ability to understand social rules and norms (Tager-Flusberg, 1999). Lacking this understanding, children with ASDs may have difficulty appreciating events as socially incongruent, and therefore humorous. Indeed, several parents from the ASD group reported that their child did not laugh at socially inappropriate events because they did not understand that they were silly or inappropriate.

In contrast to the hypothesis, no group differences were found for odd or inappropriate laughter. This result is inconsistent with the results of Reddy et al. (2002) who reported odd or inappropriate laughter in all but one of the children with autism. In comparison, only one child from the control group was reported to engage in laughter at strange things or odd times. Reddy et al. (2002) also found that 88% of the children with autism were reported to laugh for no apparent reason, compared to only 6% of the control group.

The lack of a significant group difference in the current study may have been the result of the ambiguous question. The terms "odd" and "socially inappropriate" were not clearly defined. The question was trying to tap the social awkwardness and lack of social awareness among children with ASDs, however, many parents reported inappropriate laughter as laughter in response to someone getting hurt, as long as the person was not seriously hurt. It could be argued that this laughter forms the basis of most slapstick humour, and is therefore not inappropriate (Martin, 2007; Schwebke & Gryski, 2003). Similarly, many parents reported odd laughter when their child laughed at things considered non-humorous by adults. Given the developmental nature of humour, children and adults frequently laugh at different things (Southam, 2005). Therefore, once again, the question was not really tapping into social awareness as intended.

Children in the ASD group who engaged in odd or inappropriate laughter tended to be younger than those reported not to laugh at odd or inappropriate times. The same pattern was observed for the control children, although the correlation just failed to reach statistical significance ($p = .06$). This pattern may reflect the more advanced socio-communicative skills of older children, though, as previously discussed, it is more likely to be the result of how parents interpreted the question.

For example, many parents reported laughter in response to slapstick events (people being hurt) as inappropriate. Laughter at slapstick events is typically more prevalent in younger children (Klein, 2003). Results therefore, may reflect age differences in children's humour preferences rather than social inappropriateness.

The final part of hypothesis 2 focused on playful teasing. It was hypothesized that, compared to controls, fewer children with ASDs would engage in teasing. The hypothesis was supported; all children from the control group were reported to tease others, compared to only 75% of the ASD group. Qualitative differences were also reported between the groups. All children from the control group were reported to tease in a playful manner. In contrast, several parents in the ASD group reported that their child took teasing too far, thus displaying a limited awareness of others' mental states and emotions.

Parents were also asked if they ever teased their child. Significantly more parents from the control group were reported to tease their child compared to the ASD group. Indeed, several parents from the ASD group stated that they did not tease their children because they did not understand that the teasing was playful and would become upset or agitated. These results support the hypothesis that children with ASDs do not engage in playful teasing interactions because they have difficulty reading socio-communicative cues and others' intentions.

The findings of the current study support the study by Reddy et al. (2002) who found that, compared to children with Down Syndrome, significantly fewer children with autism were reported to engage in playful teasing and be playfully teased by their parents. Reddy et al. (2002) found that playful teasing was significantly correlated with measures of cognitive ability and language for both groups. The current study found no significant correlations between playful teasing

and any of the developmental indices. However, partial correlations did reveal that the group difference in playful teasing was largely attributable to a combination of language ability, cognitive functioning, and ToM. Language ability, cognitive functioning, and ToM were also significantly correlated with being playfully teased, with children who were teased by their parents typically having lower cognitive and language skills. These results support the findings of Reddy et al. (2002) in highlighting the importance of both language and cognitive functioning in humour-related interactions involving playful teasing.

6.6.3. Hypothesis 3: Early forms of humour. As expected, children with ASDs in the current study displayed difficulties with the socio-affective aspects of humour. In contrast, no group differences were expected across early forms of humour typically seen in infancy. The hypothesis was supported, with no differences found between groups on laughter at tactile events, auditory events, or visual events. These results are consistent with the findings of Reddy et al. (2002) and St. James and Tager-Flusberg (1994) who also found no differences between children with autism and controls on early forms of humour involving tickling, funny sounds and songs, and clowning or slapstick behaviour. The findings of the present study support current beliefs that laughter is present in the lives of children with ASDs in response to simple events (Lyons & Fitzgerald, 2004; Reddy et al., 2002).

In contrast, due to the cognitive and linguistic demands, children with ASDs were expected to display less laughter in response to jokes and riddles, and fewer attempts to tell jokes and riddles compared to controls. This hypothesis was supported for children over 6 years of age. Group differences were no longer significant after controlling for expressive and receptive language ability, as

expected given the linguistic demands of associated with telling and understanding jokes.

Results of the current study support past research findings of delayed appreciation and comprehension of jokes among individuals with ASDs in comparison to age-matched controls (Emerich et al., 2003; McCormick, 1993; Van Bourgondien & Mesibov, 1987). Indeed, many parents in the ASD group reported that children's laughter at jokes and joke-telling was generally limited to jokes that were simple or repetitive. Van Bourgondien and Mesibov (1987) reported a similar pattern of results among adults with autism. While all participants told jokes, only 16% of jokes were at an appropriate developmental level.

In addition to language, ToM was found to be an important factor in joke-related interactions. ToM was correlated with both laughter at jokes and telling of jokes for both groups, with children who told or laughed at jokes typically having more advanced ToM skills. Indeed, a joke relies on the teller knowing that the expectations of the listener will be confounded. Furthermore, successful telling of a joke requires knowledge of social rules, including knowing when it is acceptable to tell a joke, telling jokes that are appropriate for a particular audience, and perceiving and dealing with audience reactions (Kuipers, 2006; McGhee, 1989; Pellegrini, 1985). ToM is also important for appreciation of jokes. To perceive a joke as funny requires knowledge that the joke-teller intends to be humorous (Baron-Cohen, 1997; Winner et al., 1998).

In summary, part 1 of the current study explored humour and laughter in children with ASDs through use of parent questionnaires. Contrary to early claims, humour and laughter is present in the lives of children with ASDs, particularly in response to simple events, such as those involving tactile or auditory stimuli.

However, as hypothesized, children with ASDs were found to have difficulties with the interpersonal aspects of humour, including laughter at socially inappropriate events, sharing laughter with others, and playful teasing. They also have difficulty with humour involving advanced cognitive and linguistic skills, namely the appreciation and telling of jokes. Overall, while humour can be enjoyed by many children with ASDs, findings support past research findings of difficulties with humour-related social interactions among children with ASDs (Reddy et al., 2002). These difficulties are exacerbated by the language impairments in this population as well as delays in social understanding (ToM). Humour and laughter among children with ASDs will be explored further in chapter 7 using direct observations.

Chapter 7: Study Part 2

Chapter 7 provides an overview of Part 2 of the current study, which explores children's humour and laughter through observation. Direct observation is essential in investigating spontaneous, naturally-occurring episodes of humour and laughter that arise during children's everyday social interactions. Chapter 7 will include the aims and methodology for part 2, followed by a results section and brief discussion.

7.1 Participants

Participants in part 2 of the current study were the same as those used in part 1, excluding two children in the ASD group who lived interstate and could not be observed. The total number of children in the ASD group was 14, including 11 boys and 3 girls. Within the ASD group there were 11 children with autism and 3 children with AS. Children ranged in age from 51 months to 150 months, with an average of 92.36 months. The ASD group and the control group did not differ significantly in age, $t(27) = .05$, $p = .96$.

7.2 Procedure

Observations occurred across two home visits approximately one week apart. Children were observed engaged in solitary play and in social play with a parent or sibling. Each child was observed for between 55 and 90 minutes across the two visits. The mean observation time for the ASD group was 68.21 minutes, compared to 66.40 minutes for the control group; this difference was not significant, $t(27) = .51$, $p = .62$.

Observations were videotaped to ensure a complete and accurate record of humour and laughter episodes. The current study was designed to be naturalistic, allowing children to play and interact as they would ordinarily, rather than create contrived stimuli and situations. However, in any case in which laughter was minimal, parents were asked to elicit humour and laughter from their child by providing toys or stimuli that typically lead to humour.

The researcher aimed to be present as an observer only, however the majority of children attempted to involve the researcher in humorous interactions. Subsequently, humorous interactions between the researcher and child were also coded. Although this resulted in more obvious experimenter effects, it offered additional insight into how children share humour with non-family members.

7.3 Coding of Observations

The coding procedure used in the current project was adapted from the study by Reddy et al. (2002). Coding began with the occurrence of laughter, either by the child or by another person in the same room as the child, such as a parent, sibling, or the researcher. Attempts were made not to overstate the frequency of laughter, therefore repeated laughs occurring within the same event were counted as only one episode. Examples of coding of laughter episodes are provided in Table 6.

Table 6

Examples of Coding of Laughter Episodes

Event	No. of Episodes
Mother tickles child, child laughs.	1 episode
Child pulls a funny face, mother laughs.	1 episode
Child tickles mother, mother laughs, and then child laughs.	1 episode
Mother tickles child, child laughs. Mother tickles child again, child laughs.	1 episode
Mother tickles child, child laughs. Mother pulls a funny face, child laughs.	2 episodes
Mother tickles child, child laughs. Mother looks away to speak to the researcher; mother turns back to child and tickles, child laughs.	2 episodes
Mother tickles child, child laughs. Mother looks away to speak to the researcher, researcher laughs. Mother turns back to child and tickles, child laughs.	3 episodes

7.3.1 Children's laughter. Following identification of a laughter episode, laughter by the child was coded as either *child-initiated*, when the child was the first to laugh, or *responsive*, when the child laughed following another person's laughter. Child-initiated laughter was further coded into one of two categories: (a) *shared* laughter, or (b) laughter that was *not shared*. Shared laughter was defined as laughter by the child that occurred in response to a shared event. This laughter could occur following an act by another person (e.g., tickling), in response to an external target (e.g., a funny picture), or following the child's own act. In each case, the object of

the laughter was either the focus of the interaction, or was bought into joint focus by the child after the laugh.

Laughter that was not shared was sub-divided into two categories: (a) *solitary laughter*, and (b) *non-shared laughter*. Solitary laughter was laughter that occurred while the child was playing alone. Non-shared laughter occurred during an interaction with another person, but was not the result of that interaction and was not shared with the other person through looking, pointing, or speaking. Examples of laughter episodes from each category are provided in Table 7.

Table 7

Examples of Laughter Episodes in Coding Categories

Category	Example
Act by another	Parent tickles child, child laughs.
External target	Child and mother are reading a book together, child sees a funny picture and laughs.
	Child is watching television with mother; television character makes a funny noise, child laughs and looks at mother.
Following own act	Child kicks the door, mother scolds child, and child laughs.
	Child shows "rude" finger to the camera; researcher ignores child, child laughs.
	Child pulls a funny face in the mirror, mother does not react; child laughs and looks at mother.
Solitary	Child is watching television with mother in the room; television character makes a funny noise, child laughs but does not look up or show mother.
Non-shared	Child and mother are playing with a toy, the toy makes a funny noise; child laughs but does not look up at mother.
	Child and mother are playing together, child laughs for no apparent reason; child does not look at mother or share focus of laughter with mother.

Part 1 of the current study explored the types of humour stimuli eliciting laughter in children. To build on these findings, observations of child-initiated laughter interactions were coded as one of six categories: (a) *tactile*, including tickling, rough-and-tumble play, and other simple interactive games that were likely to involve physical contact, such as chasing and hide-and-seek; (b) *auditory*, such as funny sounds, rhymes, and word-plays; (c) *visual*, including slapstick humour, funny faces, clowning, and other incongruous behaviour; (d) *playful teasing*, for example, blocking someone or being deliberately noncompliant; (e) *verbal*, namely jokes, puns, and riddles; and (f) *negative humour*, that is, humour and laughter used in a derogatory manner, such as name-calling or laughing at someone who is upset or hurt. Only shared episodes of laughter were coded using these categories as it was often not possible to determine the cause of the child's laughter during solitary and non-shared episodes. Similarly, child laughter in response to others' laughter was not classified into these categories; this type of laughter was analysed separately.

7.3.2 Children's responses to others' laughter. To analyse responsiveness to laughter, children's reactions to other people's laughter were coded. Four categories were used: (a) *no attention,* (b) *attention* to the laughter by looking or smiling, (c) *laughter*, and (d) a *negative reaction*, such as distress or anger. Reactions were analysed for two types of laughter: laughter involving the child and laughter not involving the child. Laughter involving the child occurred when others shared their laughter with the child. For example, the child and mother are playing together and a toy makes a funny noise; the mother looks at child and laughs. Laughter not involving the child was defined as laughter not directed to the child. This laughter could occur during an interaction with the child; for example, the child and mother are playing together, the child makes a funny noise, the mother looks at researcher

and laughs without interacting or making eye contact with the child. Laughter could also occur when the child was playing alone; for example, the child is playing with a toy, the mother is interacting with the researcher on the other side of the room, and the mother laughs.

Reliability was calculated from the video data of eight children, four from the ASD group and four from the control group, by two observers. Cohen's Kappa values ranged from 0.72 to 0.92, indicating satisfactory observer agreement. Correlation coefficients were all statistically significant at p values below .001.

7.4 Aims and Hypotheses

Part 2 of the current study explores children's laughter interactions through direct observations, specifically how children with ASDs share and respond to laughter within social interactions. Based on past research and theory, it was hypothesized that, compared to controls, children with ASDs would have impairments in the social sharing of laughter, as shown by a lower frequency of shared laughter, and higher rates of solitary laughter and non-shared laughter. Given their impairments in ToM, it was also expected that children with ASDs would have difficulty with laughter-related interactions that require social understanding. Compared to controls, it was hypothesized that children with ASDs would have a lower frequency of laughter episodes involving teasing, and a higher rate of negative laughter. The final part of the current study explored how children with ASDs respond to the laughter of others. Given their social impairments, it was hypothesized that children with ASDs would display less attention to the laughter of others, and fewer attempts to join in with others' laughter relative to matched control children.

7.5 Results

Prior to analysis, observational data were screened for errors in data entry and deviations in variable distributions. Results revealed that the assumptions of normality and homogeneity of variance were violated for many variables, therefore non-parametric techniques were used for analyses. Group differences were analysed using the Mann-Whitney U Test; Spearman correlations were used to determine the relationship between observational variables and developmental indices. Results are presented below.

7.5.1 Frequency of laughter. The mean rate of laughter per hour for the ASD group was 32.73 (*SD* = 11.52), compared to 27.12 for the control group (*SD* = 14.31). This difference was not significant, $U = 75.00$, $p = .20$. For the control group, rate of laughter per hour was significantly correlated with gender ($r = .68$, $p < .01$), with a higher rate of laughter observed among females. A moderate correlation was also reported between gender and rate of laughter for the ASD group, however this correlation failed to reach statistical significance ($r = .45$, $p = .10$).

7.5.2 Child-initiated laughter. Groups were compared on the percentage of child-initiated laughter, that is, episodes in which the child was the first to laugh. For the ASD group, the mean percentage of child-initiated laughter was 86.72% (*SD* = 8.65), compared to 71.24% for the control group (*SD* = 10.52). This difference was significant, $U = 53.50$, $p = .02$. Percentage of child-initiated laughter was significantly correlated with ToM failure for the control group ($r = .57$, $p = .03$). A higher percentage of child-initiated laughter was observed among children who failed the ToM task. A moderate correlation was also reported between percentage of child-initiated laughter and ToM for the ASD group, however this association failed to reach statistical significance ($r = .45$, $p = .11$).

To explore the effects of confounding variables, partial correlations were employed. A significant correlation was reported between the percentage of child-initiated laughter and group (r = -.43, p = .02), with a higher rate of child-initiated laughter reported for the ASD group. This correlation was no longer significant after controlling for cognitive score (r = -.37, p = .06), expressive language (r = -.27, p = .17), receptive language (r = -.24, p = .21), or ToM (r = -.15, p = .46).

7.5.3 Shared laughter. Groups were analysed for differences across laughter shared with others. This included laughter following an act by another person, laughter in response to an external target, and laughter following the child's own act. Groups were compared across each category of shared laughter, as well as the total percentage of shared laughter. Descriptive statistics are presented in Table 8.

Table 8

Means and Standard Deviations for Percentage of Shared Laughter

	Total shared laughter	To an external target	Following an act by another	Following own act
Group	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
ASD	87.01 (14.24)	11.94 (12.49)	48.45 (24.08)	26.61 (21.02)
Control	96.41 (5.28)	16.71 (18.08)	44.33 (19.78)	35.25 (18.26)

No significant differences were reported between the groups on any type of shared laughter, or on the total percentage of shared laughter, U = 65.60, p = .09. The percentage of laughter following own act was significantly correlated with age for the control group (r = -.57, p = .03), but not the ASD group (r = -.17, p = .57). No other significant correlations were reported between shared laughter and the

developmental indices. For the control group, total percentage of shared laughter was moderately correlated with cognitive score (r = -.44, p = .10), receptive language (r = -.33, p = .24), and expressive language (r = -.44, p = .10); however, these correlations failed to reach statistical significance.

Observations of shared laughter episodes were similar for both groups. Children enjoyed watching parents and siblings pull faces or perform funny dances. Many children asked to use the camera themselves, which typically elicited more laughter episodes than when the researcher was filming. Rude actions by siblings were particularly amusing to children, such as saying rude words or showing the "rude" finger to the camera.

In terms of laughter at an external target, the majority of episodes for both groups occurred in response to humour on television. One young boy with autism found it hilarious to the see the "butt-crack" of the character in a cartoon. Another boy with autism enjoyed the character Reg Reagan from the "NRL Footy Show." There was a particular 5-second part on the DVD he would keep rewinding and watching over and over, giggling uncontrollably every time. This happened over a dozen times during observations, both with this DVD and with several other DVDs.

Pets were also a common elicitor of laughter. One boy with autism laughed at the dog trying to bite his brothers while they were wrestling. Other children found humour in their dogs "excreting" on the lawn, particularly when this act was caught on camera by the researcher.

The majority of laughter following the child's own act occurred in response to clowning. Children enjoyed performing for the camera by dancing, singing, and making funny faces. Once again, bathroom humour was common. One boy with autism found it funny to show the dog's penis to the camera. Another boy from the

control group used a straw to pretend to wee on his sister. For children who used the camera, filming the toilet was a frequent elicitor of laughter.

7.5.4 Laughter not shared with others. In addition to shared laughter, groups were analysed for differences across laughter that was not shared with others. Two types of laughter were explored: laughter that occurred when the child was alone (solitary laughter), and non-shared laughter, occurring during an interaction but not shared with the other person in the interaction. Descriptive statistics for solitary laughter and non-shared laughter are presented in Table 9.

Table 9

Means and Standard Deviations for Percentage of Laughter Not Shared with Others

	Solitary laughter		Non-shared laughter	
Group	*M*	*SD*	*M*	*SD*
ASD	9.86	13.53	3.14	7.98
Control	2.60	4.03	1.11	4.30

Surprisingly, no significant differences were reported between the groups on the percentage of solitary laughter, $U = 66.00$, $p = .09$, or the percentage of non-shared laughter, $U = 96.00$, $p = .72$. For the control group, the percentage of solitary laughter was significantly positively correlated with cognitive score ($r = .59$, $p = .02$), receptive language ($r = .52$, $p < .05$), and expressive language ($r = .59$, $p = .02$). No significant correlations were reported between percentage of solitary laughter and developmental indices for the ASD group. The percentage of non-shared laughter was not significantly correlated with any of the developmental indices for either group.

7.5.5 Type of laughter episode. To explore the types of humour stimuli eliciting laughter in children, child-initiated laughter episodes were coded into types. Average percentages for each laughter episode are presented in Figure 1. No significant differences were reported between the groups on the percentage of laughter for any type of laughter episode.

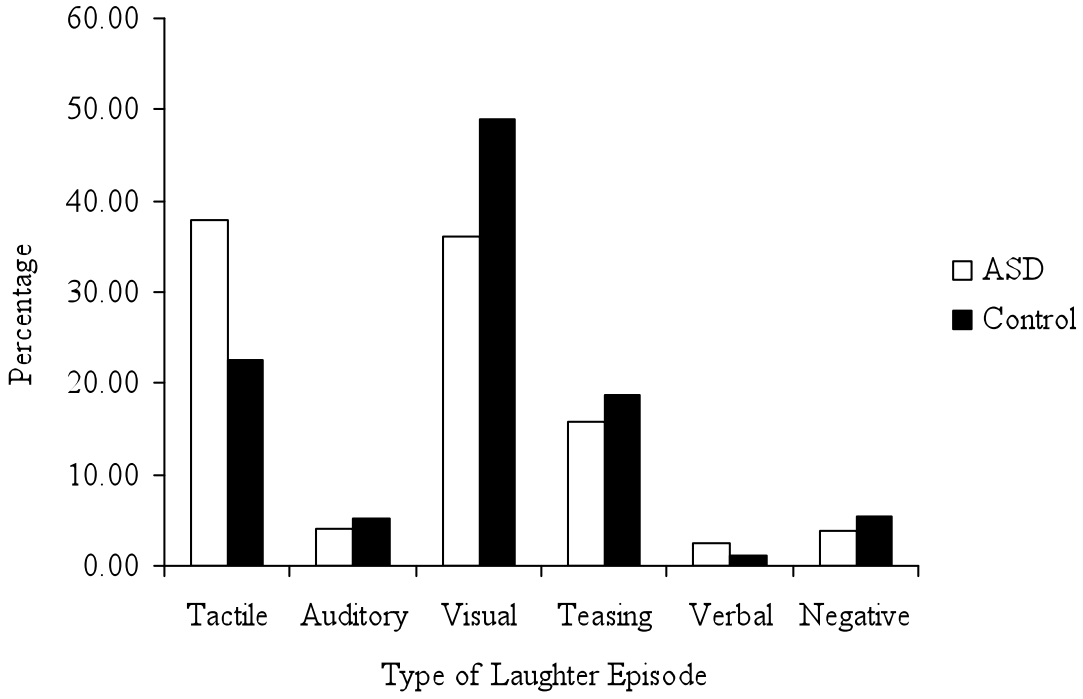

Figure 1. Mean percentages for different types of laughter episodes by both groups.

During observations, the majority of tactile episodes involved tickling and rough-and-tumble play. One child with autism enjoyed being tickled by his mother's eyelashes. Another mother held her son with autism under her arm and pretended to spray him with "armpit gas." One girl with AS played a game with her sister in which they dragged each-other around the floor. This game resulted in fits of laughter by both the dragger and the person being dragged.

A wide range of auditory laughter episodes were observed for both groups. Bodily noises were a common elicitor of laughter. Two boys from the ASD group

enjoyed funny stories made up by their parents. One mother made up a story about going to the pub and chasing away all the men; her son with autism found this hilarious. The other boy enjoyed a story about a man named Tom who got stung by a bee, causing his head to swell up until it popped. The boy enjoyed hearing this story over and over, laughing every time.

Children from both groups were observed to laugh during episodes of playful teasing. The most common type of playful teasing was non-compliance. Episodes recorded during observations included turning the lights off and on, slamming doors, throwing objects around, and running away when told to come inside. For the majority of children, non-compliance was playful, however, two boys with autism continued to laugh despite their parents being very angry. One episode involved the boy deliberately urinating all over the toilet; the other boy took chocolates out of the researcher's bag without asking.

One memorable example of non-compliance occurred following a tactile episode. A mother had tickled her son with autism so much that he had wet his pants. Despite being told to change his pants, the boy returned moments later completely pants-less, and proceeded to throw his wet pants at the researcher, an act which he thought was extremely funny. Needless to say, neither his mother nor the researcher shared his humour and he was sent to his room, prematurely ending that visit by the researcher.

The final type of laughter episode occurring during observations involved negative humour. Types of negative humour included name-calling, laughing at others' mistakes, and laughing when others were hurt. Although this humour occurred at the expense of another person, it was not malicious, occurring primarily during playful interactions.

Many children enjoyed making up funny names for their siblings, such as "Mrs. Pooface" and "sooky sooky lah lah." During a discussion with the researcher about exercise, one boy with autism proceeded to tell his mother that she was "too fat" to touch her toes. Another boy in the control group took great pleasure in telling the camera that his mother snored at night, much to the embarrassment of his mother.

Other episodes of negative humour included people falling over, people dropping things, siblings falling off chairs, and people making mistakes. One child with autism thought it was hilarious when the researcher dropped her bag causing the contents to spill all over the floor. Several children also enjoyed scaring their parents and siblings by jumping out at them unexpectedly. One boy with autism had a toy spider that made a loud scream when it was squeezed. The boy enjoyed running up behind his mother and squeezing the toy; she would act scared, causing him to laugh. The boy repeated this act over and over during observations, bursting out into laughter after each occurrence.

7.5.6 Response to laughter. The final area of analysis was children's responses to other people's laughter. The mean rate of others' laughter for the ASD group was 28.55 episodes per hour (SD = 7.42) compared to 29.09 for the control group (SD = 11.42). This difference was not significant, U = 102.00, p = .91. Children's reactions to laughter were coded into one of four categories. Results are presented in Table 10.

Table 10

Descriptive Statistics for Percentages of Children's Responses to Others' Laughter

	No attention*	Look or smile	Laugh*	Negative
Group	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
ASD	40.75 (26.71)	39.10 (22.34)	16.42 (21.78)	1.54 (3.98)
Control	19.39 (15.35)	49.58 (12.02)	29.59 (16.04)	1.42 (2.32)

* $p < .05$.

No significant differences were reported between the groups on the percentage of attention responses, $U = 70.00$, $p = .13$. The percentage of negative responses also did not differ between groups, although this response was extremely rare for both controls and children with ASDs. Neither variable was significantly correlated with any of the developmental indices. The percentage of attention responses was moderately correlated with gender for the ASD group, with males typically having a higher percentage of attention responses than females, however, this association failed to reach statistical significance ($r = -.45$, $p = .10$).

A significant difference was reported between the groups on the percentage of no attention responses to other people's laughter, $U = 56.00$, $p = .03$. The percentage of no attention responses was significantly correlated with ToM for the ASD group ($r = .72$, $p < .01$), but not the control group ($r = .18$, $p = .52$). Children in the ASD group who failed the ToM task tended to have higher percentage of no attention responses than those who passed the ToM task. A significant correlation was also reported between percentage of no attention responses and gender for the control group ($r = -.53$, $p = .04$), but not the ASD group ($r = -.11$, $p = .71$). Males in the control group tended to have a higher percentage of no attention responses compared to females.

Partial correlations were used to control for the effects of confounding variables. A significant correlation was reported between percentage of no attention responses and group (r = -.49, p = .03). The correlation remained significant after controlling for age, gender, and cognitive ability. The group difference was no longer significant after controlling for receptive language (r = -.31, p = .11), expressive language (r = -.32, p = .09), or ToM (r = -.20, p = .30).

Significantly more children from the control group were reported to laugh in response to others' laughter, U = 59.00, p < .05. The percentage of laughter responses was significantly correlated with ToM for the control group (r = -.55, p = .04), but not the ASD group (r = -.37, p = .19). Children in the control group who passed the ToM task typically had a higher percentage of laughter responses than those who failed the ToM task. A significant correlation was also found between percentage of laughter responses and gender for the control group (r = .53, p < .05), but not the ASD group (r = .50, p = .07). A higher percentage of laughter responses was observed among females in the control group compared to males.

Partial correlations were used to control for the effects of confounding variables. A significant relationship was found between percentage of laughter responses and group (r = .38, p < .05). This correlation was no longer significant after controlling for age (r = .35, p = .07), gender (r = .23, p = .23), cognitive ability (r = .23, p = .25), receptive language (r = .15, p = .46), expressive language (r = .03, p = .89), and ToM ability (r = -.20, p = .31).

To explore the social sharing of laughter further, responses were analysed for two types of laughter: laughter involving the child and laughter not involving the child. The mean percentage of laughter involving the child was 71.47% (SD = 20.38) for the ASD group and 86.24% (SD = 9.70) for the control group. The difference

was significant, $U = 55.00$, $p = .03$. Responses to laughter involving the child are presented in Table 11.

Table 11

Descriptive Statistics for Percentages of Children's Responses to Laughter Involving the Child

	No attention*	Look or smile	Laugh	Negative
Group	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
ASD	35.55 (25.14)	41.38 (25.27)	21.29 (24.84)	1.86 (4.94)
Control	11.23 (16.01)	53.26 (14.50)	33.92 (17.38)	1.58 (2.62)

* $p < .01$.

A significant difference was found between the groups on the percentage of no attention responses, $U = 40.50$, $p < .01$, that is, the percentage of responses where the child paid no attention to the laughter of others. The percentage of no attention responses was significantly correlated with ToM for the ASD group ($r = .76$, $p < .01$), but not the control group ($r = .51$, $p = .05$). A higher percentage of no attention responses was observed among children who failed the ToM task compared to those who passed the ToM task. For the ASD group, percentage of no attention responses was also moderately correlated with cognitive score ($r = -.37$, $p = .19$), receptive language ($r = -.46$, $p = .10$), and expressive language ($r = -.38$, $p = .18$), however these associations failed to reach statistical significance.

Among the control children, the percentage of no attention responses to others' laughter was significantly correlated with cognitive score ($r = -.68$, $p = .01$) and receptive language ($r = -.52$, $p = .04$). Children with a higher percentage of no attention responses tended to have lower intellectual ability and receptive language skills. For the control group, the percentage of no attention responses was also

moderately negatively correlated with expressive language (r = -.45, p = .09) and age (r = -.48, p = .07), however these correlations did not reach statistical significance.

Partial correlations revealed a significant correlation between percentage of no attention responses and group (r = -.52, p < .01). The correlation remained significant after controlling for age (r = -.53, p < .01), gender (r = -.47, p = .01), and cognitive ability (r = -.44, p = .02). The group difference was no longer significant after controlling for receptive language (r = -.29, p = .13), expressive language (r = -.32, p = .10), and ToM (r = -.20, p = .31).

No significant group differences were found on the percentage of attention responses, U = 75.00, p = .20, or the percentage of negative responses, U = 90.00, p = .53. A higher percentage of laughter responses was found for the control group compared to the ASD group, however the difference just failed to reach statistical significance, U = 60.50, p = .05. The percentage of laughter following others' laughter was significantly correlated with ToM for the control group (r = -.55, p = .04), but not the ASD group (r = -.30, p = .30). Children in the control group who passed the ToM task tended to laugh more in response to others' laughter compared to those who failed the ToM task. No other significant correlations with developmental indices were found. For laughter not involving the child, no significant group differences emerged across the types of responses (see Table 12). Correlational analysis revealed no significant associations with any developmental indices.

Table 12

Descriptive Statistics for Percentages of Children's Responses to Laughter Not Involving the Child

	No attention	Look or smile	Negative
Group	*M* (*SD*)	*M* (*SD*)	*M(SD)*
ASD	73.84 (27.87)	25.56 (27.80)	0.60 (2.23)
Control	63.59 (36.15)	36.41 (36.15)	-

During the analysis of laughter responses, it was noted that a large percentage of laughter involving the child was a direct response to an act by the child. Although it is not possible to determine the intent of the child, and therefore whether these acts represent genuine humour attempts, it is interesting to note that children from both groups engaged in a wide range of behaviours that elicited laughter from others. These behaviours included tickling, making funny noises, telling jokes, bathroom humour, playful teasing, and clowning. These behaviours were observed in all children from the control group, and all but one of the children in the ASD group.

7.6 Summary of Results and Brief Discussion

Part 2 of the current study used direct observations to explore the laughter interactions of children with ASDs. No significant differences were reported between groups on the overall frequency of laughter. This result is consistent with the study of Reddy et al. (2002) who found no difference between children with autism and controls on the rate of laughter per hour. This finding also supports parental reports from part 1 of the current study. All children from both groups were reported to laugh frequently throughout the day.

Results of the current study support the conclusion by Reddy et al. (2002) that laughter is regularly present in the lives of children with ASDs. This conclusion is consistent with past research showing appropriate levels of emotional expressiveness in children with ASDs (Capps et al., 1993; Dawson et al., 1990; Yirmiya et al.,1989). However, while children with ASDs are able to express laughter, they have difficulty with the interpersonal aspects of laughter (Reddy et al., 2002). Children with ASDs have impairments in social interaction, including reading social cues, predicting others' emotions and intentions (LeBlanc et al., 2003; Pellicano et al., 2006; Peterson & Siegal, 1999), and sharing emotions with others (Dawson et al., 1990; Joseph & Tager-Flusberg, 1997; Scambler et al., 2007).

Based on past research, it was expected that children with ASDs would have impairments in the social sharing of laughter, as indicated by a lower frequency of shared laughter, and higher rates of solitary and non-shared laughter relative to controls. Given their impairments in ToM, it was also expected that children with ASDs would have difficulty with laughter-related interactions that required social understanding. Compared to controls, it was hypothesized that children with ASDs would have a lower frequency of laughter episodes involving teasing, and a higher rate of negative or derogatory laughter.

7.6.1 Hypothesis 1: Social sharing of laughter. Shared laughter was defined as laughter by the child that occurred in response to a shared event. This laughter could occur following an act by another person (e.g., tickling), in response to an external target (e.g., a funny picture), or following the child's own act. Contrary to the hypothesis, no significant differences were reported between the groups on any type of shared laughter or on the total percentage of shared laughter. A higher total

percentage of shared laughter was observed for control children, however this difference failed to reach statistical significance.

These results are inconsistent with the findings from part 1 of the current study. Compared to control children, significantly fewer children with ASDs were reported by parents to share their laughter with others. It should be noted, however, that although the group difference was significant, a large percentage of children with ASDs (75%) were still reported to share their laughter with others. Therefore, it is not surprising that no differences emerged in observations of shared laughter.

This statistic raises the issue of sampling bias. Parents may have volunteered for the current study because their child regularly laughs and shares humour with others. In fact, many parents expressed to the researcher that they chose the study because their child always laughed and had a great sense of humour. In contrast, for children who rarely engage in laughter-related interactions, parents may have felt that their child was inappropriate for the study and therefore, they did not volunteer to participate. In any case, the results of the current study suggest that some children with ASDs do share their laughter with others in a variety of interactions.

In accordance with impairments in sharing laughter, children with ASDs were expected to have higher rates of laughter that was *not* shared. Laughter that was not shared was classified as either solitary (laughter while alone) or non-shared, that is, laughter that occurred during an interaction, but was not the result of that interaction and was not shared with the other person. Consistent with the hypothesis, the percentage of non-shared laughter was higher for children with ASDs compared to control children, however, this difference failed to reach statistical significance. This finding is in contrast to the study of Reddy et al. (2002) who reported a significantly higher percentage of non-shared laughter among children with ASDs

compared to control children. The lack of a statistically significant result in the current study may simply be due to the extremely low rates of non-shared laughter observed in both groups.

In contrast to the hypothesis, no significant group difference was found in the percentage of solitary laughter. However, an expected trend emerged, with a higher percentage of solitary laughter observed among children with ASDs compared to control children. Once again, low rates of laughter may be the cause of the non-significant result, with solitary laughter accounting for less than 10% of the total average laughter for both groups. Indeed, parental reports from part 1 of the current study support the rare nature of solitary laughter. Reddy et al. (2002) also described solitary laughter as "unusual" (p. 238). Their finding of a higher percentage of solitary laughter for children with autism did not reach statistical significance.

7.6.2 Hypothesis 2: Laughter-interactions involving social understanding. Consistent with past research (Reddy et al., 2002; St. James & Tager-Flusberg, 1994), no significant group differences were found for laughter interactions involving early forms of humour, including tickling and funny sounds. However, given their impairments in ToM, it was expected that children with ASDs would have difficulty with laughter-related interactions that require social understanding. Specifically, it was hypothesized that, compared to control children, children with ASDs would have a lower percentage of laughter episodes involving teasing, and a higher percentage of negative laughter, that is, laughter used in a derogatory manner, such as laughing when someone is hurt or upset.

Inconsistent with the hypothesis, there was no group difference for laughter episodes involving playful teasing. A higher percentage of playful teasing was observed in the control group, however the difference did not reach statistical

significance. This finding is in contrast to the findings of Reddy et al. (2002) and results from part 1 of the current study, where differences were found between groups on parental reports of playful teasing. Qualitative data provided some evidence for impaired social awareness in children with ASDs, with certain children taking playful teasing too far, however, given the low frequency of playful teasing episodes, it is difficult to draw strong conclusions from these results. Occurrences of playful teasing primarily involved non-compliance, therefore other forms of teasing could not be explored. Furthermore, the majority of playful teasing was performed by the child, leaving few opportunities to observe children's reactions to being teased.

Also inconsistent with the hypothesis, there was no significant difference between groups on negative humour, however, once again, episodes of this type of humour were extremely rare. Furthermore, this type of humour was difficult to code as it relied on interpretation of the child's intent. Although this humour occurred at the expense of another person, it was typically not malicious, occurring primarily during playful interactions. Observed episodes were therefore not a true indication of negative humour, thus not a reflection of social awareness as intended.

Overall, there was no significant difference between groups on the total frequency of laughter. This result is consistent with the findings of Reddy et al. (2002) who also found no difference between children with autism and children with Down Syndrome on the total rate of laughter. However, with further exploration of different types of laughter, a significant group difference emerged. Relative to controls, children with ASDs had a significantly higher percentage of child-initiated laughter episodes, that is, episodes where the child was the first to laugh.

There are several explanations for the group difference in child-initiated laughter. Partial correlations revealed that this difference was largely attributable to group differences in cognitive ability, language ability, and ToM. Furthermore, moderate correlations were reported between the percentage of child-initiated laughter and ToM, with a higher percentage of child-initiated laughter observed among children who failed the ToM task. These results suggest that child-initiated laughter is linked to social functioning and understanding. Due to their difficulties in language and ToM, children with ASDs may not understand the rules of humour-related exchanges, such as waiting for others to laugh and not laughing at one's own jokes (Morreall, 1997). This explanation fits with the pragmatic impairments of ASDs, such as turn-taking and violation of social rules (Wilkinson, 1998). In light of their social and pragmatic difficulties, children with ASDs may use laughter as a way of sustaining informal interactions, in the same way people with hearing impairments dominate conversations to avoid the difficulties associated with listening (Alpiner & McCarthy, 2000).

Children with autism also have trouble understanding the needs of their conversational partner. Conversations are typically one-sided, focusing on the child's interests (Mesibov et al., 2004; Schreibman, 2005). Considering these impairments, it is possible that children with ASDs have different motives for sharing their humour and laughter. In typical development, humour is used to promote social interaction and the formation of social bonds and relationships (Cunningham, 2005). However, children with ASDs may use humour for their own amusement, explaining why they are typically the first to laugh in humour-related interactions. Indeed, Werth et al. (2001) reported that the subject of their study

appeared to use humour as a kind of "mental self-stimulation" (p. 121) rather than to promote shared enjoyment.

Another explanation is that the difference in child-initiated humour reflects differences in the way parents interact with their children, with parents of children with ASDs making more attempts to elicit laughter from their children. This may have been an effect of the experiment, with parents attempting to increase the amount of laughter for the experimenter to observe. Alternatively, this behaviour may be an everyday occurrence, as a way for parents to interact with their children who would otherwise play alone. Whatever the explanation, the results of the current study suggest that there are some abnormalities in the sharing of laughter of children with ASDs relative to typically developing children and children with Down Syndrome.

The final explanation for the group difference in child-initiated laughter is an impairment in responding to others' laughter. Analysis of the total frequency of laughter revealed no difference between groups, however, when laughter as a response was removed from the analysis, a significant group difference emerged. These results suggest that children with ASDs may be impaired in their ability to respond to others' laughter. This area will be explored in the following section.

7.6.3 Hypothesis 3: Response to others' laughter. The final part of the current study explored how children with ASDs respond to the laughter of others. Research shows that children with ASDs have difficulty with joint attention and sharing social experiences with others. This includes seeking others' attention, as well as responding to social bids of others (Leekam et al., 2000; Warreyn et al., 2005). Children with ASDs have also been found to show limited response to the emotional displays of others, making them appear in a world of their own (Dawson

et al., 2004; Scambler et al., 2007; Schreibman, 2005). Due to their difficulties in sharing others' emotions and experiences, it was hypothesized that children with ASDs would display less attention to the laughter of others, and make fewer attempts to join in with others' laughter relative to matched control children.

Consistent with the hypothesis, children with ASDs were more likely to pay no attention to the laughter of others compared to controls. Correlational analysis suggested that ToM plays an important role in children's responses to others' laughter. Percentage of no attention responses was significantly correlated with ToM, with a higher percentage of no responses among children who failed the ToM task, compared to those who passed. Furthermore, partial correlations showed that the group difference in percentage of no attention responses was largely attributable to a combination of ToM and language ability.

When laughter not involving the child was removed from the analysis, a similar pattern of results emerged. Even if the other person's laughter was shared with the child, children with ASDs were still significantly less likely to respond compared to controls. These results are consistent with Reddy et al. (2002) who also found a significantly higher percentage of no-attention responses to others' laughter for children with autism compared to children with Down Syndrome.

Results for laughter as a response were also consistent with the hypothesis. Compared to controls, children with ASDs were less likely to laugh in response to others' laughter. This finding is in contrast to Reddy et al. (2002) who observed no difference between children with autism and children with Down Syndrome on the percentage of laughter responses, however, the authors noted that laughter as a response was very rare for both groups. Furthermore, they found a significant group difference in their interview results, with significantly more children with Down

Syndrome reported to join in with others' laughter compared to children with autism. No significant differences emerged in parental reports from part 1 of the current study, although the dichotomous nature of the question may have masked group differences in frequency of laughter responses.

Overall, results of the current study support the hypotheses that children with ASDs have impairments in responding to the laughter of others. While the results support the hypotheses, they do not shed any light on the cause of these impairments. Do children with ASDs have a specific deficit in awareness of the social environment, or is it simply that they are not interested in or motivated to interact with the world around them? No significant differences were reported between the groups on the percentage of attention responses, that is, looking or smiling. This suggests that children with ASDs are interested in the laughter of others, but perhaps lack the knowledge and skills necessary to successfully join in the interactions. Indeed, correlational analysis of *no attention* and *laughter* responses revealed significant relationships with both language and ToM, two important skills in interacting with others.

In the social interactions of children with ASDs, ability and motivation are likely to be inextricably linked. Lacking the knowledge and skills required in social interactions, children with ASDs may have little interest in engaging in such interactions (Bellini, 2009). Alternatively, a lack of motivation may result in underdeveloped skills in sharing and interacting with others. By avoiding social interactions, the child with ASD becomes more and more removed from the social environment and the crucial learning experiences that shape their socio-communicative development (Dawson et al., 2005).

It is also important to note that while children with ASDs as a group have difficulty responding to the laughter of others, there are some occasions where they do attempt to join in. Does it depend on the topic of the laughter episode? This theory supports one parental report from the current study that a boy with autism would only join in with others' laughter if the topic involved one of his interests. Werth et al. (2001) also noted the importance of obsessional interests in the sharing of humour by their subject with autism.

For laughter not involving the child, no significant group differences emerged for any type of response. The most common response for both groups was no attention. This does not imply that children with ASDs are reacting appropriately in these situations. Rather, their typical response of no attention has become the appropriate response because the laughter episode does not involve them. In any case, abnormalities are evident in social interactions where there are expectations for them to respond.

In conclusion, part 2 of the current study explored humour and laughter in children with ASDs through direct observations. Overall, results failed to the hypotheses for children's sharing of laughter. These results are in contrast to previous reports of difficulties with humour-related social interactions among children with ASDs (Reddy et al., 2002). While the hypotheses were not supported, results showed expected trends, with children with ASDs having lower rates of shared laughter and higher rates of solitary and non-shared laughter relative to controls. The lack of statistically significant findings may simply be due to the small number of participants in the current study, as well as the low rates of observed laughter, particularly for solitary and non-shared laughter, which accounted for less than 10% of the total average laughter for both groups. Contrasting results between

the current study and the study by Reddy et al. (2002) may also be explained by the older age of the participants in the present study, given that the social and communicative impairments in ASDs tend to be less severe in older rather than younger individuals (Esbensen et al., 2009; Fecteau et al., 2003; Seltzer et al., 2003; Shattuck et al., 2007).

Results of the current study do support the hypotheses for responses to other people's laughter. Compared to controls, children with ASDs were significantly more likely to give no attention to others' laughter, and significantly less likely to try to join in with others' laughter. These results are consistent with past research on joint attention and sharing of emotions and laughter (Dawson et al., 2004; Leekam et al., 2000; Reddy et al., 2002; Scambler et al., 2007; Warreyn et al., 2005). Group differences in responses to others' laughter were linked to language functioning and social understanding (ToM).

Overall, the current study provides some evidence for difficulties with sharing of humour and laughter in children with ASDs. A pattern of uni-lateral laughter emerged for children with ASDs across both giving and receiving in humour-related interactions. In drawing conclusions, however, it is important to consider the limitations of the study design, specifically experimenter effects and sampling bias. It is also important to mention other factors that were not controlled for in the current study, but which may influence sharing of humour among children with ASDs, such as executive functioning and history of intervention. These issues will be discussed further in Chapter 8.

Chapter 8: General Discussion

The aim of the current study was to explore the humour-related social interactions of children with autism spectrum disorders (ASDs). Humour is an

important social behaviour. Humorous interactions facilitate the development of social and communication skills, and provide children with opportunities to form social bonds and relationships (Cunningham, 2005; Martin, 2007). Investigation of humour in children with ASDs is of particular importance, given their deficits centre around interacting and communicating with other people (Beals, 2003). Studying humour and laughter can provide unique insights into the socio-communicative impairments of children with ASDs, and aid in the development of effective interventions.

Currently, empirical studies investigating humour in individuals with ASDs are sparse. Most studies have adopted a cognitive approach to studying humour, exploring the ability of individuals to produce and comprehend jokes and cartoons (Emerich et al., 2003; McCormick, 1993; Van Bourgondien & Mesibov, 1987). The current study sought to make a unique contribution to the current literature by exploring spontaneous, naturally-occurring episodes of humour and laughter that arise during children's social interactions. To date, only one other study has examined humour in ASDs from a socio-affective perspective (Reddy et al., 2002). The aim of the current study was to replicate these results in a sample of school-aged children with ASDs. The current study overcame limitations of previous humour studies by including a control group matched on chronological age and nonverbal cognitive ability. Unlike previous studies, the current study also incorporated measures of language and theory of mind (ToM) thought to be linked to impairments in sharing humour and laughter.

The current study was divided into two related parts. Part 1 used parent questionnaires to investigate children's laughter and production of humour. Part 2 explored children's laughter interactions through direct observations, specifically

how children with ASDs share and respond to laughter within social interactions. Based on theory and past research, it was expected that children with ASDs would have difficulty with the interpersonal aspects of humour, particularly sharing humour and laughter with others. The major findings of the two study parts are considered together below, followed by a presentation of the study limitations. Implications of the findings and directions for future research will then be discussed.

8.1 Main Findings

The current study used parent questionnaires and naturalistic observations to explore the humour and laughter of children with ASDs. Four main areas were investigated: (1) the type of events eliciting laughter, (2) sharing of laughter, (3) humour involving social knowledge and awareness, and (4) responses to the laughter of others. Findings are presented below.

8.1.1 Types of events eliciting laughter. Based on past research, no group differences were expected across early forms of humour involving tactile, auditory, or visual stimuli. Consistent with the hypothesis, no significant group differences emerged across early forms of humour, from either the parent questionnaires or direct observations. A wide range of humour episodes were recorded for both groups, including tickling games, slapstick humour, funny songs, and rude noises. These results are consistent with the findings of Reddy et al. (2002) and St. James and Tager-Flusberg (1994) who also found no differences between children with autism and controls on early forms of humour involving tickling, funny sounds and songs, and clowning or slapstick behaviour. The findings of the present study support current beliefs that laughter is present in the lives of children with ASDs in response to simple events (Lyons & Fitzgerald, 2004; Reddy et al., 2002).

In contrast, due to the cognitive and linguistic demands, children with ASDs were expected to display less laughter in response to jokes and riddles, and fewer attempts to tell jokes and riddles compared to controls. Results from the parent questionnaires supported the hypotheses once age was removed from the analysis. Qualitative data provided further support, with many children with ASDs reported to not understand jokes and riddles. Several parents in the ASD group also reported that their child only told and laughed at jokes that were simple and repetitive. These results support past research findings of delayed appreciation and comprehension of jokes among individuals with ASDs in comparison to age-matched controls (Emerich et al., 2003; McCormick, 1993; Van Bourgondien & Mesibov, 1987). No significant differences emerged from observational data, although the percentage of verbal humour was extremely low for both groups (less than 5% of the total laughter episodes).

For both groups, children who told and laughed at jokes tended to have more advanced cognitive and language skills, and were more likely to pass the ToM task. In fact, partial correlations revealed that the group differences were largely attributable to language and ToM for both telling of jokes and laughter at jokes. These results are not surprising given that jokes and riddles depend on language (Jones, 1983; Martin, 2007; Masten, 1986). Appreciation and use of jokes also requires knowledge of what other people are thinking and what is required of people in particular social situations, as well as sensitivity to the cues for sharing humour with others (Baron-Cohen, 1997; Kuipers, 2006; Masten, 1986; Winner et al., 1998). For example, anticipating the audience will adopt a particular perspective, knowing when it is acceptable to tell a joke, telling jokes that are appropriate for a particular audience, and perceiving and dealing with audience reactions (Kuipers, 2006;

McGhee, 1989; Pellegrini, 1985). Indeed, verbal humour, such as jokes and puns, has been linked to ToM in both ASDs (Happé, 1993; 1994) and other populations (Brownell & Stringfellow, 2000; Corcoran et al., 1997; Happé et al., 1999; Uekermann et al., 2007).

8.1.2 Sharing of laughter. ASDs are characterised by marked impairments in social functioning. Even individuals with ASDs who possess average intellectual ability lack basic social awareness and have difficulty interacting with other people (Howlin et al., 2000; Liss et al., 2001). One feature of ASDs is an impairment in joint attention, that is, the ability to seek the attention of another person through eye contact, pointing, or gestures. Children with ASDs have consistently been found to have difficulties with joint attention, particularly for declarative acts, where the child seeks to share an interest or experience (Mundy et al., 1994; Sigman & Ruskin, 1999; Warreyn et al., 2007). Joint attention deficits also impair the ability of children with ASDs to share their affective experiences with others (Keltner & Haidt, 1999; Vismara & Lyons, 2007; Warreyn et al., 2007). In fact, children with ASDs are often described as being emotionally "flat" because of their limited display of emotions in social interactions (Myles & Simpson, 2002; Schreibman, 2005).

Given their difficulties sharing experiences and emotions with others, it was expected that children with ASDs would have impairments in the social sharing of laughter. Specifically, it was hypothesized that, compared to controls, children with ASDs would be less likely to share their laughter with others, and more likely to engage in solitary laughter. Children's sharing of laughter was explored through parent questionnaires and observations. Only the questionnaire data supported the hypotheses, with no significant group differences emerging in observations of shared laughter, solitary laughter, or non-shared laughter.

On the parent questionnaires, significantly more control children were reported to share laughter with others compared to children with ASDs. This group difference was largely attributable to language and ToM. Indeed, both language and ToM have been found to be important skills in social interactions, such as sharing of humour and laughter (Carson et al., 1986; Masten, 1986; McGhee, 1980). Effective use of humour requires knowledge of what other people are thinking and what is required of people in particular social situations, as well as the ability to use language and communicate effectively with others (Lyons & Fitzgerald, 2004). Parent questionnaires also revealed that significantly more children with ASDs engaged in solitary laughter compared to controls. This group difference was largely attributable to ToM, again highlighting the important role that ToM plays in the social sharing of laughter.

Findings from the current study are consistent with the study of Reddy et al. (2002) who observed a significantly higher rate of non-shared laughter in children with autism compared to controls, indicating that they were less likely to share their laughter with others during interactive situations. Furthermore, children with ASDs were less likely to laugh in response to a shared external target, indicating difficulties with exchanges involving triadic attention (Reddy et al., 2002). No significant group differences emerged in the current study on observations of laughter at an external target, although rates of this laughter were very low for both groups.

The final aspect of sharing of laughter involved children's production of humour and attempts to make others laugh. Unfortunately, this area was difficult to examine through observations. On the parent questionnaires, no significant differences emerged between groups. All children from both groups were reported to

make others laugh. It is possible that while children with ASDs display an appropriate quantity of humour production, differences emerge in the quality of their humour, in terms of the type of humour produced, as well as the motives for producing humour. This is an interesting area for future studies to explore.

8.1.3 Humour involving social knowledge and awareness. Research shows that many children with ASDs have impairments in social cognition and understanding, specifically theory of mind (ToM) (LeBlanc et al., 2003; Pellicano et al., 2006; Peterson & Siegal, 1999). Lacking a ToM, children with ASDs were expected to have difficulty with humour involving social knowledge and understanding of other people's mental states. Four specific areas were explored in the current study, including laughter at socially inappropriate events, odd or inappropriate laughter, playful teasing, and negative or derogatory laughter. It was hypothesized that, compared to controls, children with ASDs would display (a) less laughter in response to socially inappropriate events, (b) more laughter that was considered odd or socially inappropriate, (c) fewer attempts to playfully tease others, and (d) higher rates of negative laughter.

Results from the parent questionnaires supported the hypotheses for laughter episodes involving socially inappropriate events and playful teasing. These results are consistent with previous research findings on humour in children with ASDs (Reddy et al., 2002; St. James & Tager-Flusberg, 1994). Further support for the hypotheses came from reports of playful teasing by parents. Parents from the ASD group were significantly less likely to tease their child compared to controls, stating that their child did not perceive the teasing as playful and would therefore become upset or agitated. These results support the theory that children with ASDs do not engage in teasing interactions because they have difficulty reading others' intentions.

Partial correlations revealed that the group difference in laughter at socially inappropriate events was largely attributable to ToM and language. The role of ToM was not as pronounced for teasing, with partial correlations implicating a combination of factors, including language ability, cognitive functioning, and ToM. These results support the findings of Reddy et al. (2002) in highlighting the importance of both language and cognitive functioning in humour-related interactions involving playful teasing.

Overall, the current study provides some evidence that children with ASDs have difficulty with humour that requires social knowledge and understanding, specifically interactions involving socially inappropriate events and playful teasing. These results are consistent with past research findings on socially inappropriate humour (Reddy et al., 2002; St. James & Tager-Flusberg, 1994) and playful teasing in children with ASDs (Reddy et al., 2002). While some findings failed to support the hypotheses, these results are likely due to methodological issues as previously discussed.

8.1.4 Response to laughter. The final part of the current study explored how children with ASDs respond to the laughter of others. Research shows that children with ASDs have difficulty with joint attention, including both seeking others' attention and responding to the social bids of others (Leekam et al., 2000; Warreyn et al., 2005). Children with ASDs have also been found to show limited response to the emotional displays of others, making them appear in a world of their own (Dawson et al., 2004; Scambler et al., 2007; Schreibman, 2005). Due to their difficulties in sharing others' emotions and experiences, it was hypothesized that children with ASDs would display less attention to the laughter of others, and fewer attempts to join in with others' laughter relative to controls.

Results from observations supported the hypotheses and were consistent with the findings of Reddy et al. (2002). Compared to controls, children with ASDs were less likely to laugh in response to others' laughter and more likely to pay no attention to the laughter of others, even if the laughter directly involved them. Once again, ToM and language were important factors in children's attention to others' laughter. Parental reports failed to support the hypothesis, with no difference in the number of children reported to attempt to join in with others' laughter. However, the broad nature of the question may have masked more subtle differences in children's responses.

8.1.5 Factors associated with humour. To control for factors that could influence the humour-related interactions of children with ASDs, the current study included assessments for language and ToM. Groups were also matched on chronological age and cognitive ability to control for confounding effects of these variables. Results showed that language and ToM were linked to most aspects of sharing humour and laughter, including telling and laughing at jokes, laughter at socially inappropriate events, interactions involving playful teasing, sharing laughter with others, and responding to the laughter of others. In fact, partial correlations revealed that for the majority of group differences in humour and laughter, ToM and language were important intervening variables.

Findings for language ability support past research linking language to the social and emotional impairments in ASDs (Ben-Itzchak & Zachor, 2007; Dissanayake et al.,1996; Hauck et al., 1995; Lord & Pickles, 1996), including joint attention (Charman, 2003; Mundy et al.,1990; Sigman & Ruskin, 1999) and ToM (Capps et al., 1998; Dahlgren & Trillingsgaard, 1996; Ozonoff & McEvoy, 1994; Tager-Flusberg et al., 2001). Most humour depends on language (Jones, 1983;

Masten, 1986), thus limited communication skills may constitute the absence use of humour and laughter by children with ASDs. Pragmatic difficulties in particular may impair the ability of children with ASDs to use humour appropriately in social situations (Schreibman, 2005). Responses to other people's humour may also be impaired in children with ASDs due to difficulties understanding humour that involves symbolic thought (McGhee, 1989) and non-literal language (Landa, 2000; Ozonoff & Miller, 1996).

The link between ToM and humour reported in the current study is also consistent with past research and literature on ASDs. ToM has been linked to the social impairments of ASDs, including joint attention (Astington & Barriault, 2001; Baron-Cohen, 1995; Charman et al., 2000; Stone et al., 1998), pretend play (Leslie, 1987; Rutherford & Rogers, 2003), and difficulty recognising and responding to others' emotions (Buitelaar & van der Wees, 1997; Heerey et al., 2003; Prior et al., 1990). Many theorists have proposed that ToM skills amount to the same deficit obvious in being unable to generate humour and laughter during interactions (Lyons & Fitzgerald, 2004; Pellegrini, 1985; Reddy, 1991). Humour requires anticipation that the audience will adopt a particular perspective, which will be disrupted by the punch-line with no serious implications. The listener must also be able to recognise the other person's intentions to construct a humorous exchange (Baron-Cohen, 1997; Kuipers, 2006).

Overall, there is large variability in the presentation of ASDs. No two children are exactly alike, with symptoms manifesting in a number of different ways (Hamaguchi, 2001; Prior, 2005). Indeed, high standard deviations were recorded for children with ASDs across most areas of analysis. As a result, it is difficult to draw conclusions about the children with ASDs as a group, as well as generalise findings

to the larger population. Furthermore, quantitative group analysis masked important qualitative differences between the groups in sharing of humour and laughter. For example, one boy with autism was recorded to laugh frequently during an observation, however the majority of laughs were in response to the same act being continuously repeated. Many parents in the ASD group also reported an idiosyncratic sense of humour in their child. One child had to be tickled at a particular pressure. Another child laughed at funny sounds, but only sounds that were high-pitched. In these cases, parents used elicitors of laughter that were highly specific to their child with an ASD.

In summary, the current study explored humour-related interactions in children with ASDs. Due to their social and communicative impairments, it has been theorised that children with ASDs have difficulty understanding humour and using it appropriately in social situations (Howlin, 1997; Lyons & Fitzgerald, 2004). The current study provides some support for this theory, with impairments reported in children's sharing of laughter and responses to other people's laughter. Children with ASDs were also reported to have difficulty with laughter-related interactions involving social awareness and understanding, including socially inappropriate humour and playful teasing. Consistent with past research, the humour difficulties of children with ASDs were found to be related to impairments in language and ToM. It is important to note, however, that some results in the current study failed to support the hypotheses. Conclusions, therefore, must be drawn tentatively, and with consideration of the study limitations. These limitations will be discussed further below.

8.2 Limitations of the Current Study

Despite support for the hypotheses, the results of the current study must be interpreted cautiously due to methodological limitations. Two issues previously mentioned are sampling bias and experimenter effects. Experimenter effects were particularly problematic in the current study. While the experimenter tried to remain unnoticed, many children from both groups appeared to "show off" for the camera. In fact, some parents noted that their child was acting very differently in the presence of the camera, compared to their everyday interactions.

A further limitation of using observations was producing the same experimental conditions for all children. In the current study, some children were observed interacting with their parents, while others engaged with siblings or friends. Qualitative analysis of parent questionnaires in the current study revealed some differences in the way children interact with different people. Some children preferred to share their humour with adults rather than other children, while other children preferred a particular family member. Children's willingness to engage in laughter-related interactions may have been influenced by the people around them during the observation periods. Indeed, familiarity of the other person involved in the interaction has been linked to increases in joint attention (Hobson & Lee, 1998) and social facilitation of laughter (Chapman et al., 1980).

Another limitation of the current study was the use of correlational analysis. First, the current study used non-parametric statistics to analyse group differences. However, there is no non-parametric equivalent for partial correlations. Use of a parametric correlation coefficient for the partial correlations may have influenced the results of the analysis. A second problem is that the use of correlations does not permit conclusions about causality. Is sharing of laughter limited among children

with ASDs because of their ToM impairments, or is it the case that children with ASDs do not engage in humour-related interactions, thus lack the early social experiences necessary for ToM development? There is also the possibility that both acts are manifestations of the single ability.

A further limitation of the current study is the presence of individual factors not controlled for in the current study, which may have influenced results. For example, history of intervention. For children who had received therapy or intervention, particularly in social skills, observations of humour and laughter may not have captured the true severity of their impairments. Comorbidity has also been linked to the functioning of children with ASDs (Hansen & Hagerman, 2003). The presence of comorbid conditions, such as anxiety and low self-esteem may have influenced children's social functioning, thus their ability to share humour and laughter.

8.3 Recommendations for Future Research.

The results of the current study provide some insight into the humour and laughter of children with ASDs. Currently, however, this area of research is still relatively new and there is much more to learn. One important area for future research is the factors involved in children's sharing of humour and laughter. Results from the current study suggest that language and ToM play an important role in children's humour-related interactions. However, there is still more to learn about these relationships, such as what specific areas of language are involved, and what is the role of second-order false belief.

ToM has also been linked to family and background factors, such as family size (Jenkins & Astington, 1996). Several studies have found that the presence of siblings, particularly older siblings, enhances ToM ability by increasing the quality

of early learning experiences (Astington & Barriault, 2001; Bailey, 2002; Bartsch & Estes, 1996). Do siblings play a role in children's humour development? Children with siblings may be more advanced in social skills and understanding, thus more adept at sharing humour and laughter. This area is worthy of future investigation. Several studies have reported positive outcomes following social skills interventions using peers as trainers (Brady, McEvoy, Wehby, & Ellis, 1987; McHale, 1983). Siblings could be an equally powerful tool for teaching children with ASDs everyday skills.

Despite evidence for the role of language and ToM, partial correlations suggest that other factors are involved in children's sharing of humour and laughter. Indeed, other factors have been linked to the social-communicative impairments in ASDs, including weak central coherence (WCC) and executive functions (EF). The WCC theory proposes that the socio-communicative impairments in ASDs result from specific problems with integrating social or environmental cues (Frith & Happé, 1994; Morgan, Maybery, & Durkin, 2003; Schreibman, 2005). In the same way, a failure to account for social context may impair children's ability to share humour and laughter during social interactions (Lyons & Fitzgerald, 2004). Social difficulties may also arise from under-developed executive functions, including planning skills, problem-solving ability, and flexibility (Joseph, 1999). Without these skills, children with ASDs have difficulty behaving in a planned and organised manner, which is essential for social interaction (Hughes, 1998).

In their study of humour in autism, Werth et al. (2002) raised the issue of how other autistic symptoms influence humour-related interactions, specifically circumscribed interests. The authors reported that while their subject with autism was able to tell complex jokes and puns, the majority of these jokes focused on her

own obsessional interests, and appeared to be a form of self-stimulation rather than to promote shared enjoyment. In the same way, it is possible that individuals with ASDs only respond to humour that is related to their special interests. Furthermore, their insistence on sameness may result in humour that is repetitive or follows a particular script. Indeed, within the current study, there is some evidence of repetition and obsessional interests within the humour and laughter of children with ASDs.

The results by Werth et al. (2001) also raise the question as to whether laughter has a different function for children with ASDs. Indeed, children with ASDs have been found to communicate using unconventional or idiosyncratic means, such as arm-flapping (Keen, 2003; Meadan et al., 2008) or self-harming Schreibman, 2005; Vitkus, 1996). Moreover, research suggest that behaviours once thought to be meaningless, such as echolalia, may actually be purposeful behaviours used to communicate a protest or request (Wetherby, 1986; Prizant & Duchan, 1981; Schreibman, 2005). Further exploration of the functions of humour has important implications for understanding how children with ASDs communicate and interact with others.

Another interesting area for future research is gender. Some research suggests that gender plays a role in humour, with females being more interested in sharing their laughter with others (Chapman, 1973; 1975), and their laughter being more influenced by the social environment (Chapman, 1976; Chapman et al., 1980; Leventhal & Mace, 1970; Masten, 1989; McGhee, 1976b). Anecdotal reports suggest that this may also be true for individuals with ASDs. Several authors have provided accounts of individuals with ASDs who are able to share humour and laughter with others; the majority of these accounts are based on females (Mesibov,

1992; Van Bourgondien & Mesibov, 1987; Werth et al., 2001). Gender differences in sharing of humour were explored in the current study. While no significant differences emerged for the ASD group, some trends were observed for joke telling and laughter. Any conclusions must be drawn tentatively however, due to the low number of females in the ASD group. Further analysis would be interesting to explore gender differences in humour among children with ASDs. Would a different pattern of results emerge for females with ASDs, considering ASDs in females are typically associated with more severe autistic symptomatology (Holtmann et al., 2007)? Furthermore, to what extent does ToM account for gender differences in sharing of humour, given that females typically perform better on ToM tasks (Baron-Cohen, Jolliffe, et al., 1997; Buitelaar, van der Wees, Swaab-Barneveld, & van der Gaag, 1999; Happé, 1994)?

One initial aim of the current study was to explore differences in humour between children with autism and children with Asperger Syndrome (AS). Unfortunately due to the small sample size, comparisons could not be made. There has been considerable debate for many years over the diagnostic distinction between autism and AS (Macintosh & Dissanayake, 2004; Volkmar et al., 2004). The main differentiating criterion between autism and AS is the development of language (APA, 2000; Bloch-Rosen, 1999). Although it may be odd in nature, the language of children with AS is typically better developed than in children with autism (Dissanayake, 2004; McLaughlin-Cheng, 1998). Based on the findings for language in the current study, it is likely that differences would emerge between AS and autism on the sharing of humour and laughter. Such an investigation could improve understanding of differentiation between autism and AS, and is a topic worthy of further examination.

The ultimate goal for future research into ASDs is to pinpoint the underlying impairment associated with sharing humour and laughter. Is there an underlying joint attention deficit or is it a specific impairment in sharing emotions? One theory proposes that the limited interactions of individuals with ASDs are related to *social motivation* (Dawson et al., 2002; 2005; Grelotti et al., 2002). Mundy (1995) proposed that joint attention impairments in ASDs are linked to motivation, specifically declarative joint attention bids, where the reward is less salient and reinforcing. Indeed, results of the current study show that some children with ASDs are capable of engaging in humour interactions. Reddy et al. (2002) also noted the ability of children with autism to engage in some humour-related interactions, supporting the notion that they *can* demonstrate these skills, but do not normally do so without purpose or elicitation. These findings have important implications for understanding the socio-communicative impairments of ASDs and the development of effective social skills interventions.

Humour and laughter are important social behaviours that facilitate the development of social and communication skills, and provide children with opportunities to form social relationships (Cunningham, 2005; Martin, 2007). The current investigation of humour and laughter offers a unique perspective on the socio-communicative difficulties in children with ASDs. While there is still much to learn, the current findings have some important implications for children with ASDs and their families.

8.4 Implications of the Current Research

Results from the current study indicate that many children with ASDs cannot join in or engage with others' laughter, or respond to it with interest. This inability to share or desire other's laughter can have severe implications for children with ASDs

and their families, and has the capacity to influence their quality of life, connectedness to others, and mental health (Carbelo & Jáuregui, 2006). Carbelo and Jáuregui (2006) stress the importance of laughter and sense of humour in positive psychology. Child development researchers to date have predominantly focused on mental illness and deficits at the expense of positive experiences and assets, such as humour and happiness (Lefcourt, 2001).

Humour and laughter have been consistently linked to mental health in terms of helping people deal with the negative emotions and stressful life events that directly impact on quality of life (Cann et al., 2000; Carbelo & Jáuregui, 2006; Nezu et al., 1998). Sense of humour promotes good mood, which in turn helps people to get through periods of illness and depression. The positive emotional states of love, hope, joy, and happiness that accompany laughter and humour help to neutralize negative emotions (Carbelo & Jáuregui, 2006). As children with ASDs may not have this higher level of social support, they in turn will not benefit from the inhibitory effects on stress and stimulatory effects on health that others with a sense of humour enjoy.

Humour also has important implications for learning and development. Humour is closely linked to cognitive development (Bernstein, 1986; Jones, 1983) and learning within the classroom (Davies & Apter, 1980; Isen et al., 1987; Masten, 1986). Laughter stimulates positive behaviours such as play and social interaction. Play, through the practice of future skills, is instrumental in children's growing and development as a person and as a member of society. Children play with their environment and their family and, in doing so, learn how to move, how to perceive, how to relate, how to communicate, and how to carry out all the routines and activities of their society (Carbelo & Jáuregui, 2006). Learning through play also

extends to linguistic competence. Indeed, research supports parallel connections between children's humour development and the development of language (Horgan, 1981; McGhee, 1971b; Shultz & Horibe, 1974). Children enjoy 'playing with words' to test meanings. They laugh at their own and others inaccurate use of words, and use this as a means to check whether they have understood the proper meaning (Carbelo & Jáuregui, 2006).

Laughter is a predominantly social phenomenon. Humorous interactions facilitate the development of social skills, and provide children with opportunities to form social relationships (Cunningham, 2005; Martin, 2007). Research suggests that people with a strong sense of humour are more socially competent and attractive, leading to closer and more satisfying social relationships (Fabrizi & Pollio, 1987; Masten, 1986; Sherman, 1988; Ziv, 1984). Conversely, limited humour skills can lead to children becoming withdrawn and socially isolated (Carbelo & Jáuregui, 2006; Overholser, 1992; Sherman, 1988). The inability to share or desire other's laughter can have negative implications for the development of relationships among children with ASDs (Reddy et al., 2002). Carbelo and Jáuregui (2006) expand this theory to include that laughter can actually help to build the interpersonal and group links that all individuals need for survival, self-development and self- realisation as a person and as a member of society.

Living with a child with an ASD also has negative implications for families and carers. Parents may feel isolated and not become involved in activities as they are conscious of their child's inappropriate humour and laughter. Parents may experience high levels of stress as they attend to the needs and well being of their child (Fong et al., 1993; Gray, 2002; Pisula, 2007) and cope with feelings of discrimination and stigmatization (McCabe, 2007). Poor psychological adjustment is

also common among siblings of children with ASDs, with many siblings facing feelings of depression and resentment (Fisman et al., 2000; Gold, 1993; Hastings, 2003; Roeyers & Mycke, 1995). Overall, living with and caring for a child with an ASD requires more time and stamina than most families have (Beals, 2003).

The current research highlights the implications for everyday life for the ASD child and their family. Humour and laughter are unique capacities of human beings that are highly valued by society and impairment to these will present new challenges in each phase of life. Continued research into the impairments of ASDs and possible interventions is essential. Studying humour and laughter in a social context can greatly improve understanding of the socio-communicative functioning of children with ASDs and assist in the development of effective interventions.

8.5 Summary and Conclusions

Autism spectrum disorders (ASDs) are common childhood conditions characterised by impairments across three areas of functioning: social development, language and communication, and imagination (APA, 2000; Ozonoff & Rogers, 2003). Social impairments are considered the hallmark feature of ASDs (Jobe & White, 2007; Schreibman, 2005). Children with ASDs typically have difficulty interacting with others and reading social cues. They rarely share their emotions and interests with others, tending to prefer solitary activities (Barnhill, 2001; Schreibman, 2005). Due to their social impairments, it has been theorised that children with ASDs have difficulty understanding humour and using it appropriately in social situations (Howlin, 1997; Lyons & Fitzgerald, 2004). Currently, empirical studies investigating humour in individuals with ASDs are sparse.

The current study explored spontaneous, naturally-occurring episodes of humour and laughter that arise during children's social interactions. The findings of

the present study support current beliefs that laughter is present in the lives of children with ASDs in response to simple events (Lyons & Fitzgerald, 2004; Reddy et al., 2002). However, difficulties emerge for more complex forms of humour that involve cognitive and linguistic demands or social understanding, such as jokes, playful teasing, and socially inappropriate humour. Furthermore, children with ASDs displayed difficulties sharing their laughter with others and responding appropriately to others' laughter.

Although the hypotheses of the current study were supported, conclusions must be drawn tentatively with many results failing to support the hypotheses. Moreover, the current study was largely exploratory and suffered a number of methodological limitations. Despite limitations, the current study offers some valuable insights into the humour and laughter of children with ASDs. Currently, however, there is still a lot to learn about humour in this population, including the factors that contribute to impairments in sharing humour and laughter with others. Humour is a topic worthy of further investigation. Humour and laughter have important implications for children's development and wellbeing, and can offer a unique perspective on the socio communicative impairments of children with ASDs.

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Appendix A

Plain Language Statement

University of Ballarat
School of Behavioural and Social Sciences and Humanities

Information for Participants

Project Title: Humour and Laughter in Children with Autism Spectrum Disorders

Principal Researcher: Dr Angus McLachlan (Senior Lecturer, Psychology)
Student Researcher: Errin Jones (Doctor of Psychology student)

My name is Errin Jones and I am completing a Doctor of Psychology degree at the University of Ballarat. You are invited to participate in a research project into children's use of humour, being conducted as part of my doctoral program. This information sheet describes the project so that you can make an informed choice as to whether or not to participate. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate.

What is the purpose of the project?

The purpose of this project is to investigate responses to humour in children in order to determine what makes them laugh. The project also plans to examine the production of humour in children by studying their attempts to make others laugh. A wide range of children will be involved in the project, including children with autism or Asperger syndrome, children with Downs Syndrome, and children with typical development.

If I decide to participate, what will I be required to do?

The project will involve observing children in their homes. Children will be videotaped whilst playing alone and with a parent. An observer will note occurrences of laughter by the child and any attempts by the child to make the parent laugh. Observations will occur across two separate visits by the researcher. These visits will occur approximately 7 days apart. Between visits, parents will be asked to complete a questionnaire about their child's humour and laughter.

Children will be observed for approximately 30 minutes on each visit. During visits, children will be asked to complete four short tests. The first test is a 5-minute task to assess social understanding. This task requires the child to answer questions about two short stories. Children will also be asked to complete two 10-minute tests to measure their language ability. These tests require the child to provide names for pictures and select pictures that match spoken words. The final test for the child to complete is a measure of intelligence. During this test the child will be asked to complete three tasks that involve forming designs with blocks, matching pictures, and completing patterns. This test takes between 20 and 25 minutes to complete.

Continued over page.

Are there any risks or disadvantages involved?

Completing tests can lead to frustration or distress for some children. In order to reduce the likelihood of children becoming upset, the tests in this project are short in duration and are suitable for children with a wide range of abilities, including children with autism, Asperger Syndrome, and intellectual disabilities. Some children may also react negatively to the presence of a stranger in their home. Parents are welcome to be present during all observations and tests with their child, and if there is any concern for the child's well being at any stage, the procedure will be immediately stopped.

What are the benefits of participating in the project?

There are no direct benefits to the child or their family as a result of participation in this project. The study however, has important value in the understanding of children with autism and Asperger Syndrome. Children with autism and Asperger's disorder commonly face difficulties in building relationships and communicating with others, including their own parents. Parents can give so much to their child, getting so little in return.

Humour and laughter are important behaviours for socialising and communicating with others. Studying these behaviours can improve understanding of the functioning of children with autism and Asperger's disorder, thus helping parents to communicate with their children. Further understanding of autism and Asperger's disorder can also aid in the development of effective treatments to help children with these conditions.

What will happen to the information I provide?

Information collected will only be used for the purposes of research. Results may be reported in academic journals, however your family will not be identified in any publication arising from the research. Videotapes, audiotapes, tests, diaries, and any notes by the researcher will be kept securely at the University office of the principal researcher. Only the principal researcher and student researcher will have access to this information. All information will be kept securely for a period of 5 years after the completion of the report, after which time it will be destroyed.

How will the information be kept confidential?

Your child will be allocated an identification number that appears on any corresponding tests, questionnaires, diaries, and notes by the researcher. No identifying details will be displayed on any information provided by your family. A list of children and their identification numbers will be available only to the principal researcher and the student researcher. This information will be kept securely and separate from the information provided by your family.

As observations will be recorded, you and your child will be identifiable on the tapes. However, no identifying details, such as your names or address, will be recorded on the tapes. The exterior of the tapes will be marked only with your child's identification code. All tapes will be kept securely, and accessed only by the principal and student researchers.

What are my rights as a participant?

As participants in the project, you and your child have the right to withdraw participation at any time. In such an event, any information collected will be withdrawn and destroyed. Once all information has been collected, it is no longer possible to withdraw consent.

Continued over page.

Who do I contact to ask questions?

Should you develop any concerns about your child's behaviour after the observation sessions we recommend you consult your GP, local health service, or specialist child service with whom you are dealing.

Any general questions about this project can be directed to:

Errin Jones (Student Researcher)
Phone: 0409 799 039
Email: ejones@students.ballarat.edu.au.

Angus McLachlan (Principal Researcher)
Phone: (03) 5327 9666
Email: a.mclachlan@ballarat.edu.au.

Any correspondence can be directed to:

Angus McLachlan
School of Behavioural and Social Sciences and Humanities
University of Ballarat
PO Box 663
Ballarat, VIC 3353.

Should you have any concerns about the conduct of this research project, please contact the Executive Officer, Human Research Ethics Committee, Research & Graduates Studies Office, University of Ballarat, PO Box 663, Ballarat, VIC 3353. Phone (03) 5327 9765.

Appendix B

Consent Form

UNIVERSITY OF BALLARAT
SCHOOL OF BEHAVIOURAL AND SOCIAL SCIENCES AND HUMANITIES
INFORMED CONSENT

Project Title:
Humour and Laughter in Children with Autism Spectrum Disorders.

Researchers:
Dr Angus McLachlan (Principal Researcher)
Errin Jones (Student Researcher)

The research project in which I am being asked to participate has been explained fully to me, and any matters on which I have sought information have been answered to my satisfaction. A written copy of the information sheet describing the project has been given to me to keep.

I understand that:

- My child will be videotaped.
- All the information I provide will be stored securely and separately from any listing that includes my name and address.
- All the information I provide will be treated with the strictest confidence and is available only to the primary researcher and supervising researcher.
- Results will be used only for research purposes and may be reported in scientific and academic journals.
- My child will not be identified in any publication arising from the research.
- I am free to withdraw my consent at any time during the collection of information in which event my participation in the project will immediately cease and any information obtained from it will not be used.
- Once information has been obtained it is not possible to withdraw consent to participate.

Consent of Parent/Guardian:

I, _____, parent/guardian of _____(minor's name)

of _____

(address)

hereby consent to _____(minor's name) participation in the above project.

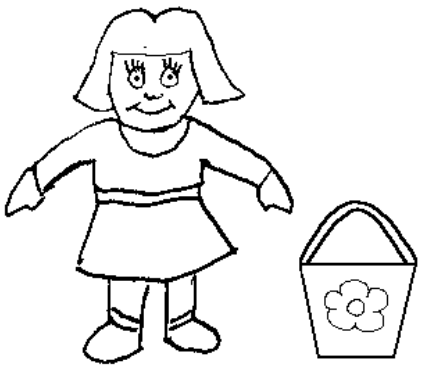
Signed: _____

Date: _____

Appendix C

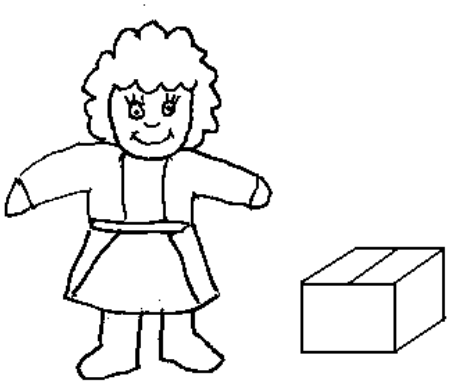
False-Belief Task: Trial 1

Trial 1: Beth and Sally



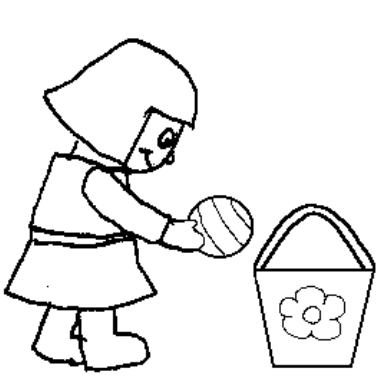
This is Beth.

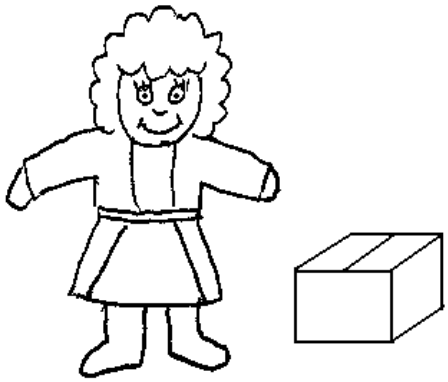
Beth has a bag.



This is Sally.

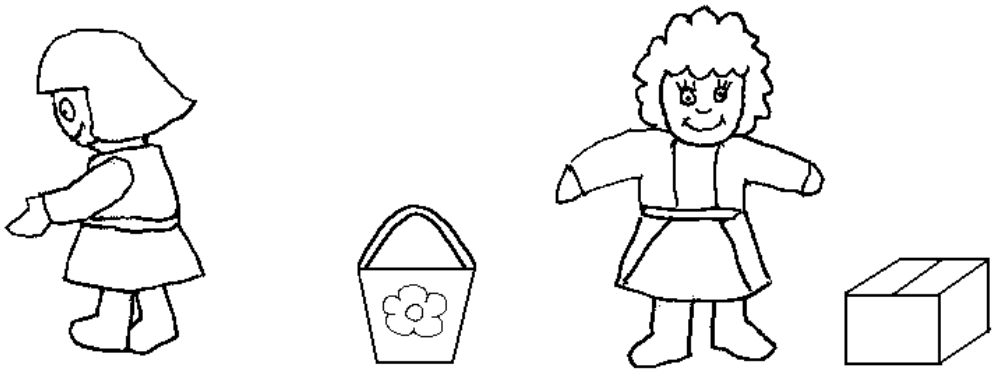
Sally has a box.



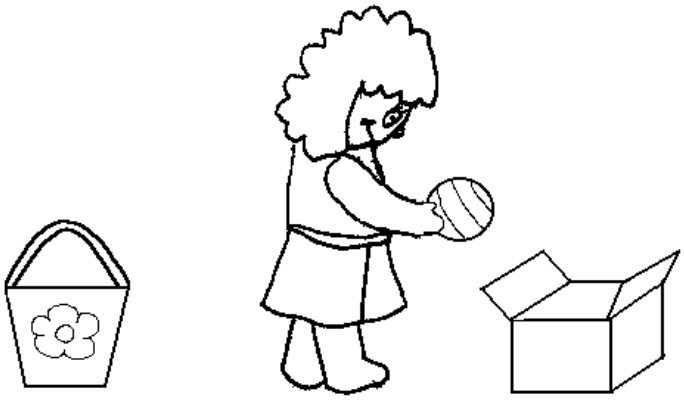


Beth has a ball.

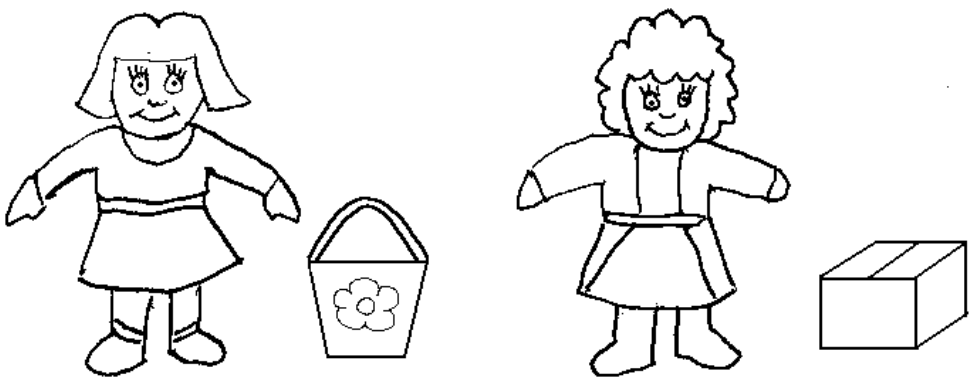
She puts the ball in her bag.



Beth goes for a walk.



Sally takes the ball out of the bag and puts it into the box.



Now Beth comes back.
She wants to play with her ball.

Identification number:
Date:

Trial 1: Beth and Sally

Questions

Where will Beth first look for her ball?

Response _____

Correct: Yes ☐ No ☐

Reality control question:

Where is the ball now?

Response _____

Correct: Yes ☐ No ☐

Memory control question:

Where did Beth put the ball in the beginning?

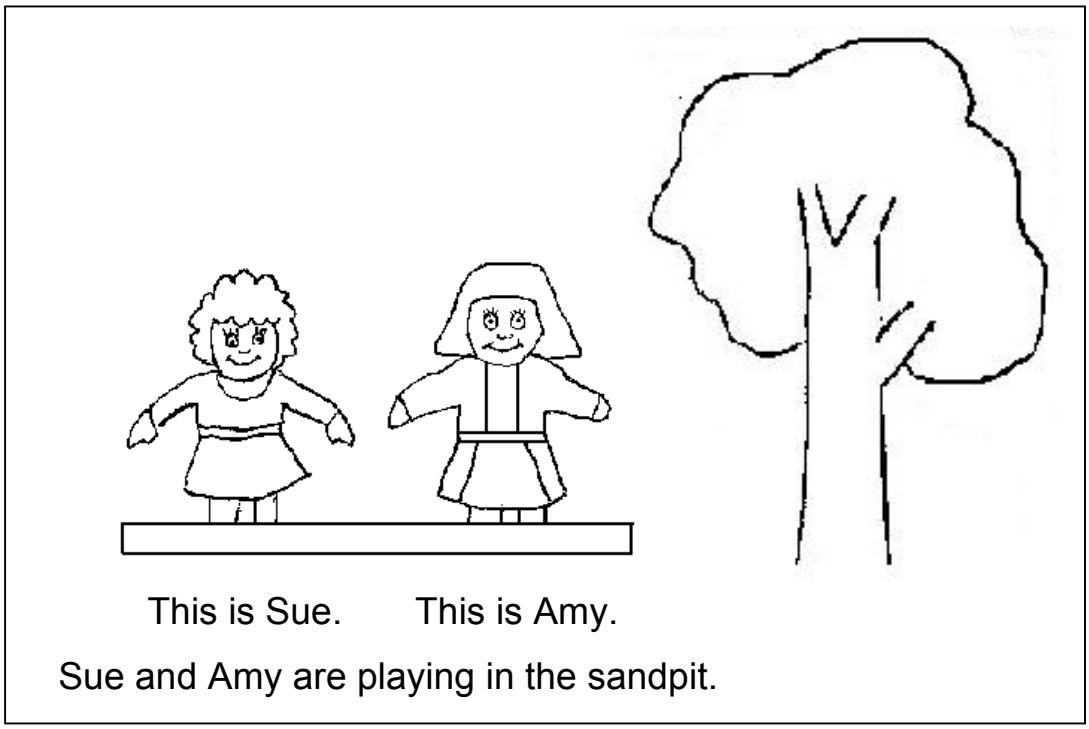
Response _____

Correct: Yes ☐ No ☐

Appendix D

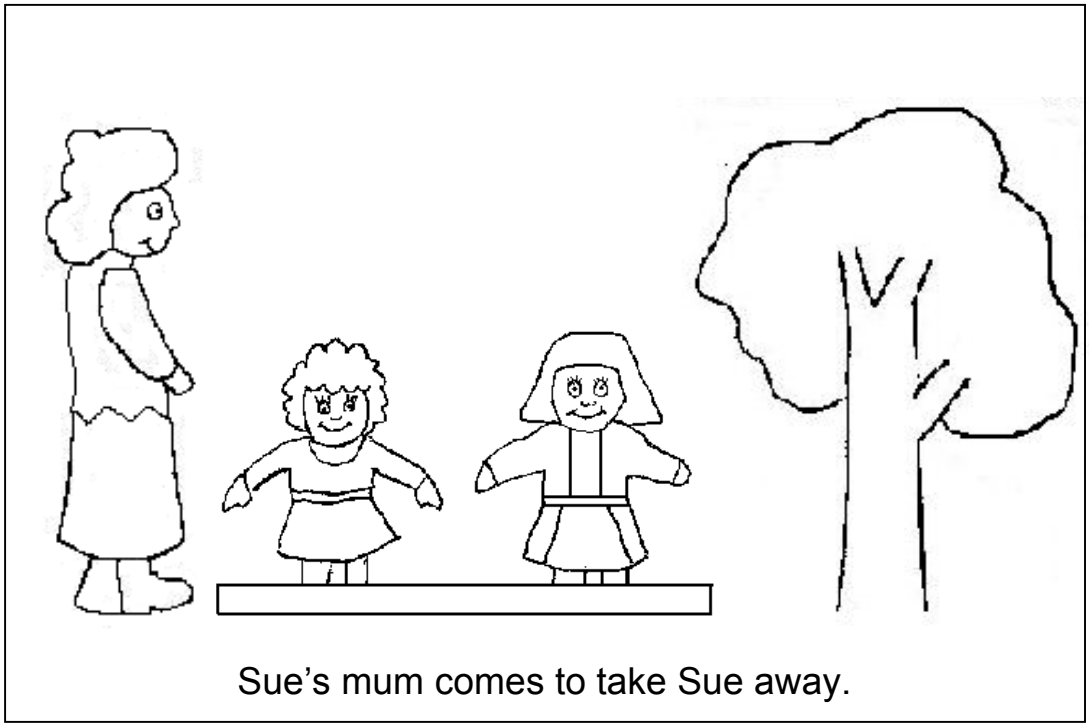
False-Belief Task: Trial 2

Trial 2: Sue and Amy

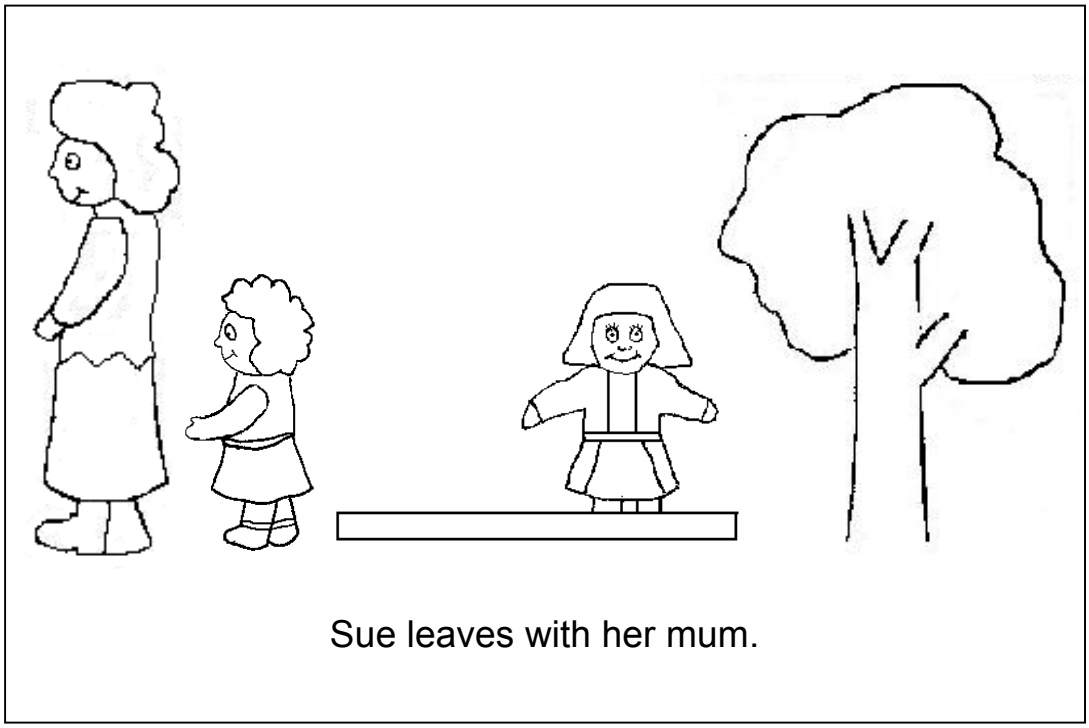


This is Sue. This is Amy.

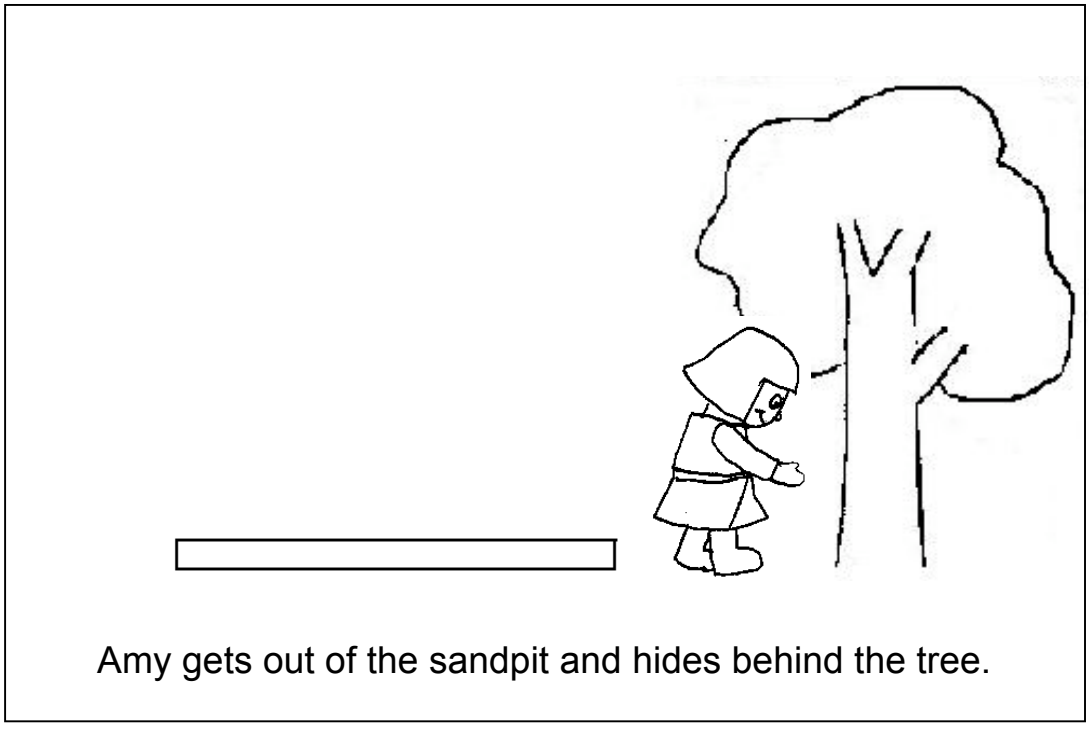
Sue and Amy are playing in the sandpit.



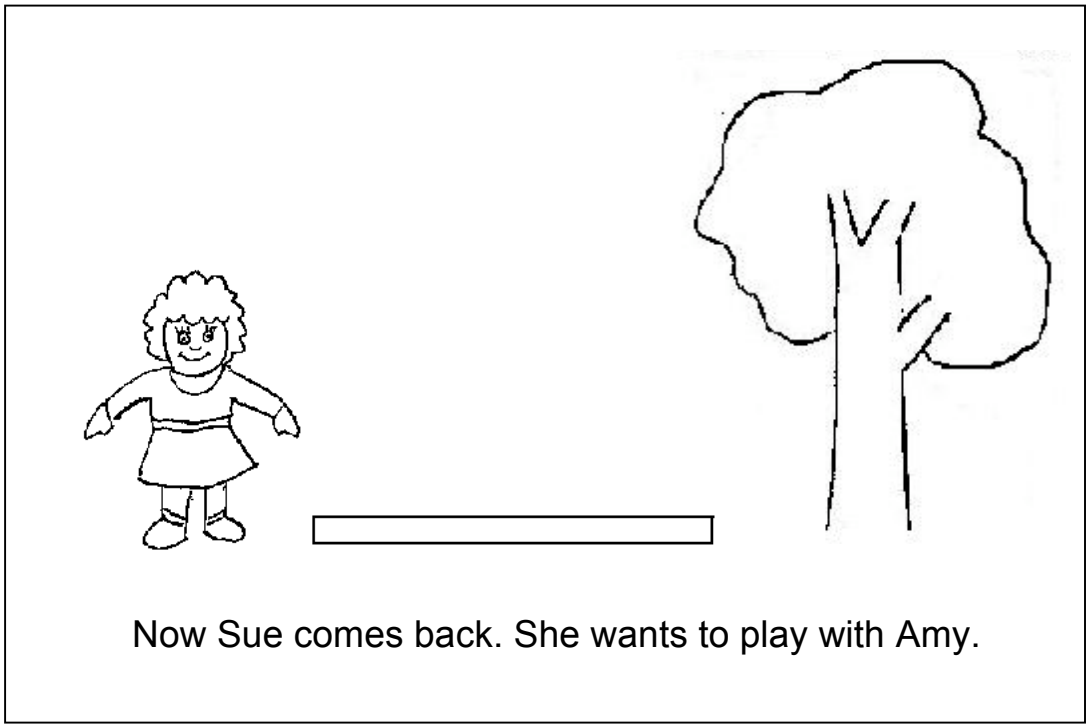
Sue's mum comes to take Sue away.



Sue leaves with her mum.



Amy gets out of the sandpit and hides behind the tree.



Now Sue comes back. She wants to play with Amy.

Identification number:
Date:

Trial 2: Sue and Amy

Questions

Where will Sue first look for Amy?

Response _____

Correct: Yes ☐ No ☐

Reality control question:

Where is Amy now?

Response _____

Correct: Yes ☐ No ☐

Memory control question:

Where was Amy in the beginning?

Response _____

Correct: Yes ☐ No ☐

Appendix E

Parent Questionnaire

Parent Questionnaire

Part 1: Laughter by your child

How often does your child laugh?

What sorts of things does he/she normally find funny or laugh at?

Does he/she have a preference for certain types of humour?

Does he/she laugh at events that involve touching?

Examples: Tickling, blowing kisses on the tummy, bouncing on the knee, chasing.

Please provide examples.

Does he/she laugh at things you can hear (including both mechanical noises and sounds made by other people)?
Examples: Funny noises, funny voices, rhymes and songs.
Please provide examples.

Does he/she laugh at things you can see (in person and on television)?
Examples: Funny faces, acting silly (falling over, throwing things).
Please provide examples.

Does he/she laugh at socially inappropriate acts (in person and on television)?
Examples: Walking like a duck, putting pants on the head.
Please provide examples.

Does he/she laugh at jokes and riddles?
Please provide examples.

Part 2: Sharing Laughter

Does he/she try to share with others what he/she is laughing at?

Examples: Showing what he/she is laughing at, looking at others to see if they are laughing along with them.

Please provide examples.

In terms of humour and laughter, does he/she respond in any different or odd ways to particular people?

Examples*:* Responds only to humorous attempts from certain people, only shares humour with particular people.

Please provide examples.

Does your child have different types of laughs, such as a false laugh?
When and how often does this type of laughter tend to occur?
Examples: To get others attention, imitation of another person's laughter, laughter at only certain types of humour.
Please provide examples.

Does your child ever laugh when on his/her own?
How often and under what circumstances does this tend to occur?

Does he/she ever laugh at strange things or at inappropriate times?
Examples: Laughter at something that others do not find funny, laughter when others are hurt or upset.

Part 3: Response to Others' Laughter

How does your child generally respond to other people laughing?
Examples: Pays no attention, looks but does not try to join in, becomes upset.

Does he/she ever try to join in with others laughter, even when he/she does not understand what the laughter is about? If so, how often does this occur?
Please provide examples.

How does your child generally respond to other people laughing directly at him/her?
Examples: Pays no attention, looks but does not try to join in, becomes upset.
Please provide examples.

Part 4: Making Others Laugh

How often does your child attempt to make others laugh?

What types of things does he/she typically do to make others laugh?

Examples: Tickling others, making funny noises, acting silly, singing songs, telling jokes or riddles, pulling funny faces.

Please provide examples.

Has he/she ever attempted to make people laugh by repeating an act that other people had laughed at earlier?

Please provide examples.

Does he/she clown or act silly in order to make others laugh?

Examples: Wearing pants on their head, walking like a chicken.

Please provide examples.

Does he/she ever use any jokes or riddles make others laugh?

Examples: Telling jokes or funny stories, playing with words (rhyming).

Please provide examples.

Part 5: Teasing

Does your child playfully tease or act cheeky with other people?

Examples:

- Teasing by offering someone an object and then taking it away.
- Teasing by obstructing someone (eg. turning off the television when someone is watching, hiding things).
- Teasing by making deliberate mistakes (eg. misnaming familiar objects or tasks).
- Teasing by being disobedient (eg. cheekily throwing things or making noise when told not to, touching forbidden objects to get a reaction).

Please provide examples.

What is your child's attitude during teasing?

Examples: Playful, watchful, keeps going despite the other person being upset.

Please provide examples.

Do you ever playfully tease your child?

Examples: Hiding things from him/her, blocking their play, playing peek-a-boo.

Please provide examples.

How does he/she typically react to your teasing?

Examples: Laughter, pays no attention, gets upset, acts confused.

Please provide examples.

Does he/she respond differently to different types of teasing?

Examples: Laughs when you offer and withdraw objects, but becomes distressed or angry if you attempt to block their play.

Thank you for completing the questionnaire.