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Assessing Expressed Emotion in parents in association with children's social competence, language ability and their understanding of others

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ABSTRACT

The study investigates associations between 1) theory of mind and language 2) theory of mind and social competence and 3) the relationship between these variables and expressed emotion, in 24 typically developing preschoolers and 23 children with autism. Experimental theory-of-mind tasks were administered to the children, along with the parents participating in an open-ended interview and completing a mentalising and executive functioning social competence scale questionnaire measure. For the children with autism findings suggest that theory of mind may only be related to mentalistic social competencies in everyday life and yet is related to a much broader measure of symptom severities. The strength of these associations was significantly reduced when language ability was held constant. These results were not found for the typically developing children. Finally no relationship was found in either group between levels of expressed emotion and theory of mind, social competence and language ability. Reasons for these null findings are discussed.

KEY WORDS:	THEORY OF MIND	AUTISM	EXPRESSED EMOTION	SOCIAL COMPETENCE	LANGUAGE

Introduction

How do children come to understand their social worlds? Establishing the milestones in this journey has fascinated developmental psychologists for decades. A central component, which some view as the foundation of a child's understanding (e.g. Slaughter and Repacholi, 2001), is Theory of Mind. This is defined as the ability to predict and guide behaviour based on the understanding that other people have different mental states processes. The importance of Theory of Mind is indicated by Wellman's argument that it is our "frame work theory of persons", which gives us a "basic grasp of how to go about making sense of ourselves and others" (1990: p.328). Thus individual differences in theory of mind can explain variation in the success of children's everyday social interactions, such that investigation into the factors that may influence theory-of-mind development is of key importance for gaining a complete picture of how children come to understand their social worlds.

Slaughter and Repacholi (2001) identify three lines of enquiry that researchers have followed when investigating individual differences in theory of mind. The first two of these examine associations between individual differences in theory of mind in both social (Lalonde and Chandler, 1995; Capage and Watson, 2001) and cognitive competencies, particularly language (Astington and Jenkins, 1999; Cutting and Dunn, 1999; Happé, 1995). The final line of inquiry looks at possible social influences, with a particular focus on positive family influences (e.g. Symons and Clark, 2000; Meins et al. 2002). These studies have largely focused on typically developing children (TD), but another avenue of research looks at children who appear to have severe problems in understanding their social world; children with autism. This study integrates these three lines of enquiry with a primary focus on examining how these variables interact within a sample of children diagnosed with autism.

Autism

Autism is a complex, heterogeneous developmental disorder that is diagnosed on the basis of the individual having profound impairments in social interactions, verbal and non-verbal communications, as well as limited and repetitive behavioural patterns. The patterns of these impairments vary widely from child to child and nowadays the more commonly used term for this disorder is autistic spectrum disorder (ASD), reflecting this variation (Pellicano, 2007). This triad of impairments can take a multitude of forms and vary in levels of severity, and does not appear to be explained by any single account (e.g. Tager-Flusberg, 2007, Pellicano, 2007). Frith et al (1991) argued that investigation needs to focus on three levels of explanation: genetic/biology, cognition and behaviour, with interplay between each of these levels and with the environment. Psychologists, however, have tended to focus on investigating the level of cognition in an attempt to identify the underlying deficit(s), which could explain the triad of behavioural impairments which characterised this disorder. Note, 'deficits' is a recent line of enquiry as historically researchers searched for a single primary cognitive deficit that alone would be able to explain the development of ASD (Pellicano, 2007). One of these was theory of mind.

The Theory of mind hypothesis and autism

The hypothesis that children with ASD are impaired in their ability to attribute mental states (e.g., Baron-Cohen, Tager-Flusberg and Cohen, 2000) has attracted prolific research within the theory-of-mind literature, perhaps because it offers a parsimonious account of two key impairments in the triad; social and communicative functioning (e.g. Baron-Cohen, Leslie and Frith, 1985). Despite impairments in theory-of-mind among those with a diagnosis of autism being well documented (see Baron-Cohen, 2000 for a review) surprisingly little attention has been given towards investigating the association between theory-of-mind and social functioning in these individuals. Below is a summary of the few studies, which have investigated whether social interaction competence is directly related to underlying impairments in theory-of-mind.

Theory-of-mind and Social competence among those with a diagnosis of ASD

Studies investigating the relationship between theory of mind and social competence have tended to conclude that the individual differences shown by children with autism on theory-of-mind tests are expressed in at least some of the children's everyday behaviours (e.g. Hughes, Soares-Boucaud, Hochmann and Frith, 1997). Frith, Happé and Siddons (1994) were the first group to document findings that autistic children who pass theory-of-mind tasks show more 'everyday social insight'. To assess social functioning they used the Vineland Adaptive Behaviour Scales (VABS) and a set of "Interactive Sociability" items, which all required "mentalising skills" (Frith et al, 1994). As predicted, only the Interactive Sociability scale discriminated between children who passed the theory-of-mind tasks and those who failed. Fombonne, Siddons, Archard, Frith and Happé (1994) replicated these findings declaring the autistic children who passed the theory-of-mind tasks were atypically reported as showing higher levels of both pro-social and maladaptive behaviours involving understanding minds. Note, however, that these correlations were not statistically significant once effects of age and language ability were taken into account. Travis, Sigman and Ruskin (2001) investigated the relationship between multiple measures of social understanding (including false-belief understanding) and two observational measures of social interaction competence. They failed to find a significant relationship between false-belief understanding and the observational measures of social behaviour, leading them to conclude that theory-of-mind performance might only impact on a small range of behaviours, as demonstrated by the two previous studies.

Although Baron-Cohen originally proposed that theory of mind deficits could account for all the social impairments in autism, Frith (2003) and Happé (2003) now favour the view that theory of mind represents one of several co-existing deficits; including weak central coherence and deficits in executive functioning, which complement each other to provide more of a complete picture of the disorder. Pellicano, Maybury, Durkin and Marley, (2006) found that rather than autistic children showing deficits in just one domain, there were several underlying deficits and capabilities which happened to coexist. However, when they attempted to map these underlying deficits with particular behavioural symptoms they were unsuccessful. No relationship was found between indices of behaviour symptomology and performance in any cognitive domain, including theory of mind. Recently Tager-Flusger (2003) reported more promising findings and found that theory-of-mind performance was significantly related to social and communicative symptom severity on the Autism Diagnostic Observation Schedule and also to scores on the Socialization Domain of the VABS.

Theory of mind performance did not however predict the daily living or communication scales; findings that overall support Travis et al's argument. Tager-Flusberg points out that this may be due to these competencies depending heavily on communicative and language ability. Taken together these studies show some indication that theory-of-mind impairments can account for 'some' of the severity of the social-communicative symptoms and levels of social competency. What has become apparent through evaluating these studies is that another cognitive construct, language, is likely to play a mediating role in this relationship.

The role of language in Theory of Mind development

The importance of language for theory of mind development is well established within TD children and language ability has also been closely linked to theory-of-mind performance in those with a diagnosis of autism. Studies have found theory of mind performance to be closely related to both lexical-semantic knowledge (Happé, 1995) and syntactic knowledge (Tager-Flusberg, 2000). However, the level of language ability necessary for an autistic child to pass a false-belief task is significantly higher than the level need by a TD child (Hughes and Leekman, 2004), indicating that language may play a more unique role in assisting autistic children with theory-of-mind performance. In support of this it has been found the relationship between specific aspects of communicative competence and theory of mind is significantly stronger among participants with autism than among controls (Capps et al, 1998). Tager-Flusberg (2007) argues for a 'linguistically mediated theory-of-mind', a position which Happé (1995) has elaborated on more fully. She theorizes that autistic children are able to 'hack out' a solution rather than using foundational social insights. There is evidence from neurological research that high-functioning autistic individuals and non-autistic controls use different neurocognitive mechanisms such that different brain regions are activated whilst solving theory of mind tasks (Frith and Frith, 2003). Despite such evidence, causality cannot be established and the direction of the relationship between language acquisition and theory of mind performance is still debated.

Tager-Flusberg (2000) argues that although some researchers advocate that theory of mind is a pre-requisite for the development of language acquisition (e.g. Tager-Flusber, 1997), yet others argue the causal relationship to run in the opposite direction (e.g. Dunn et al, 1991), but these two positions may be compatible. Joint attention, which is considered to be one of the early appearances of theory of mind (Baron-Cohen, 1995), is thought to explain the significant delays in language acquisition, which define the disorder (Baron-Cohen, Baldwin and Crowson, 1997). Sigman and Ruskin's (1999) longitudinal study supports this conclusion as they found that responses to bids for joint attention in toddlers and pre-schoolers with autism is a good predictor of later language development. According to Baron-Cohen's theory, the cognitive mechanism responsible for theory-of-mind impairments in autistic children is a 'shared attention' module, which he argues is innate and not dependent on social interactions with others. Therefore, one can argue that the degree of impairments within the 'shared attention' module influences language acquisition, which in turn mediates the relationship between later theory-of-mind performance and social competence. However, in opposition to this, the conversational/cultural account would argue that social experience can trigger perceptual-cognitive abilities (such as joint attention) and that variation in children's

linguistic and social experiences can account for the variation in theory-of-mind skills shown by children with autism (Hughes and Leekman, 2004). More recent reports on the impact of early intensive behavioural and developmental interventions can have on a child's behavioural symptoms and cognitive development goes some way towards resolving this issue of causality. Warren et al (2011) evaluated multiple early intervention programs and found that Lovaas-based approaches, early intensive behavioural intervention variants and parent training all resulted in some improvement in either cognitive functioning, language skills or adaptive behaviour skills in some children with ASD. These studies highlight the plasticity and heterogeneity within this disorder and, returning to Frith's argument, support the importance of considering the role the environment plays alongside the main three levels of explanation.

To conclude it would appear that there is interplay between these two cognitive constructs, language and theory of mind, but that there is potential for the social environment to moderate this relationship. Warren et al (2011) also highlight methodological issues that make it difficult to pinpoint particular interventions that are most effective; nevertheless, many interventions include some aspects of parent training suggesting the family environment, specifically, may have a moderating effect on the nature of social experiences that the child participates in.

How the family environment may influence cognitive development and social competence in children with ASD

The intervention studies outlined above suggest that the family environment may influence the core characteristics of autism. Many studies have also looked at the impact that the child may have on the family e.g. Rodrigue et al, (1990) found that mothers of child with autism report more stress in their lives than mothers of children with other disabilities. However, there is little direct research testing the nature and the degree to which the family environment impacts on children with ASD. Greenberg, Seltzler, Hong and Orsmond (2006) argue that this may be due to the theory of autism which was most prevalent in the 50s/60s which placed the blame for this disorder on the parents, in particular the mother. In recent years, there has been renewed interest in this line of research, expressed through two different lines of enquiry. Firstly, there are a few studies which have looked at the impact that the family environment may have on the child's cognitive development and provide support for the conversational/cultural account. Slaughter, Peterson and Mackintosh (2007) investigated whether the degree to which mothers used mental state talk influenced the child's theory of mind development; a finding reported frequently with typically developing pre-schoolers (e.g. Meins et al, 2002, Peterson and Slaughter, 2003). They found that theory of mind performance was uniquely correlated with mother's explanatory, causal, and contrastive talk about emotions. It is possible that this close link may be explained by a third, mediating variable such as language development. The authors highlight how the use of embedded clauses (e.g., "He thinks that [complement clause]") within the cognitive explanations enable children to learn the syntactic rules, which some authors (e.g. Hale and Tager-Flusberg, 2003) argue are necessary for theory of mind development. Siller and Sigman's (2002) findings provide further support for the conversational/cultural account. They examined joint attention and communication development and found that those

parents who were more synchronised with their child in play interactions, had children whose verbal and non-verbal communication development was significantly more advanced. However it should be noted that having a child with autism presents particular challenges that may constrain the kinds of interactions that promote theory of mind; it may be children who showed higher levels of communication that enabled their mothers to interact more effectively with them.

The second line of enquiry researchers have followed is to examine the impact that the family environment may have on the child's behavioural social competence. To investigate this, rather than highlighting certain types of social interactions, researchers have adopted a broader approach and looked to identify certain characteristics of the family environment, which might influence a variety of social interactions for those children with autism. A recent study by Kelly, Garnett, Attwood and Peterson (2009) examined whether aspects of family relationships could exacerbate or ameliorate autistic behavioural symptoms. Their results showed family conflict predicted symptom severity, more strongly than family support. They argue that this may be due to the difficulties that children with ASD face in understanding and expressing emotion; they have less need for closeness and emotional support as measured by the support dimensions but as they are disposed to cognitive/behavioral rigidity, sensory sensitivity, and perspective taking, they are likely to be particularly sensitive to levels of stress within the family. In support of this conclusion intervention, studies have shown that parental stress is associated with fewer improvements in core characteristics of their children (Gabriels et al, 2001). Another dimension linking the family conflict and stress is the phenomenon of expressed emotion (Greenberg et al, 2006).

Expressed emotion

Expressed emotion can be conceptualised as a measure of 'the emotional valence of the household' (Greenberg et al, 2006) and includes the levels of criticism expressed by family members towards an individual with an illness or disability. An environment with high levels of expressed emotion is likely to be stressful to any individual, but in particular individuals with ASD, who often have difficulty regulating their stress responses (Prizant, Wetherby and Rydell, 2000). However, establishing a cause and effect relationship between symptoms and expressed emotion is particularly difficult in families with an autistic child due to the huge amounts of stress that the child may place on the family (Greenberg et al, 2006). However at least one study (Kelly et al, 2009) shows no relationship between symptomology and family conflict suggests that this might not be the case. In contrast, Greenberg et al (2009) notes that there is a danger that parents may become too quick to anticipate their child's needs and so slow language and communication development further. This may explain why in Kelly et al's study family support elements didn't always result in a reduction in levels of ASD symptomology. Despite Kelly's findings, Greenberg and colleagues used the five-minute speech sample and found the relationship between high expressed emotion and levels of maladaptive behavior and autistic symptoms to be bi-directional. They call for intervention measures to establish whether by reducing levels of expressed emotion within a household one can ameliorate symptoms. It would appear there is a relationship between expressed emotion and the child's social competence, but can expressed emotion influence the child's cognitive development as well?

One recent study has followed both lines of inquiry. Benson, Daley, Karlof and Robison (2010) assessed whether expressed emotion (as measured by a new modified coding system, autism-specific five minute speech sample) based on the widely used five-minute speech sample (Magana et al, 1986) was related to several child, parent and family measures. Their findings show that these revised measures had good internal consistency and reliability. The key findings were that expressed emotion was significantly related to language ability and social competence, and expressed emotion was found to be the most significant predictor of the child's social competence. So it would appear that expressed emotion, as a measure of the family environment may influence social competence and cognitive development in children with ASD. Hastings and Lloyd (2007) argued that expressed emotion represents a promising area of research on autism and the family and this paper shall investigate this further.

Aims

The current study had three aims – (a) to replicate previous findings from studies of children with ASD and TD pre-schoolers, of significant associations, between theory of mind performance and other cognitive domains, specifically language; (b) to examine the relation between theory of mind and social competence; and (c) to investigate whether family levels of expressed emotion related to each social competence, language, and theory of mind.

 With regards the first aim, researchers have found children with ASD who pass theory of mind measures to have a significantly higher verbal ability than those who fail such measures (e.g. Happé, 1995). This study also wants to investigate if the relationship between language and theory of mind is significantly stronger in children with ASD than TD children in response to Hughes and Leekman's (2004) claim that language may play a unique role in assisting children with ASD with theory of mind development.

The second of these aims is to examine in both groups the relationship between theory of mind and social competence. Also, the relationship between theory of mind and symptomology will be explored, within the group with autism. Based on what has been concluded from the findings of previous studies, that some of the severity of social and communicative symptoms that characterise ASD can be partially explained by theory-of-mind performance, a relationship is predicted between theory of mind and symptomology and theory of mind and social competence in a sample of children with ASD. However, it is also expected that there may only be a relationship between theory of mind and certain aspects of social competence (particularly mentalistic social competence), in keeping with previous studies (e.g. Frith et al, 1994). Findings in TD groups have been more mixed (Astington, 2003) but a relationship is still predicted, in keeping with the majority of studies. In both groups when language is held constant it is predicted the relationship between these variables will be significantly reduced, as found in previous studies (e.g. Hughes et al, 1994).

The third aim was to investigate whether family levels of expressed emotion are related to each of these constructs: social competence, language, and most

importantly theory of mind. A relationship between expressed emotion and the first two constructs is predicted in children with ASD based on Benson et al.'s (2010) findings, and this study hopes to add to the reliability of such findings. Particularly as their study used a parent self-report measure to establish a relationship between expressed emotion and language it is necessary to establish if these findings still hold when one chooses a more comprehensive and standardised measure of verbal ability. This relationship is not predicted to be found in a sample of TD children, based on Daley et al's (2003) findings that showed this measure to be only useful in atypical populations, as no variability was found in levels of expressed emotion in mothers with TD children. As with the second aim, symptomology will also be addressed in relation to expressed emotion in a sample of ASD children. A relationship is also predicted based on Greenberg et al and Kelly et al's findings and this study hopes to add reliability to these findings using Benson's revised version of the five-minute speech sample. The rationale behind investigating the relationship between expressed emotion and theory of mind is based on the assumption that if expressed emotion is related to language and social competence in children with ASD, and these variables in turn are associated with theory of mind, then it is logical to assume that there may be a relationship between expressed emotion and theory of mind.

Method

Design overview

This study included a variety of assessment methodologies, including experimental tasks with the child, and questionnaires and open-ended interviews with the parents. It was not possible to do a matched participant design so no direct comparisons can be made between the groups during analysis.

Recruitment and participant characteristics

Working with one other dissertation student I recruited the samples for this study by contacting schools and nurseries around Cambridge, Essex, East Yorkshire, and Surrey. Over 200 letters were then sent to parents, which resulted in the recruitment of our final sample: 24 typically developing children and 23 children with ASD. The 23 children with ASD (2 girls and 21 boys) came from two special schools in East Yorkshire, with the exception of 1 who was recruited through a special school in Richmond. Ages ranged from 7yrs 6m to 15yrs with the mean age being 12yrs 1m. In the group of children with ASD 95% were white British and 5% white other. 4 were diagnosed with Asperger's syndrome, 2 with high-functioning ASD, 3 with moderate/low functioning ASD, 5 with pervasive developmental disorder otherwise specified and 7 were diagnosed with some other disorder alongside ASD. For validity purposes an ASD symptom checklist was carried out with all to insure all the participants in this group displayed the 15 symptoms need to be classified as having ASD. With regards to maternal education, 30% of mothers left education after GCSE level, 26% had A levels or equivalent, 26% held a Bachelor's degree and 9% held a higher degree. The main language spoken at home was English.

Children with typical development (TD). In this group, 5 children came from a nursery in East Yorkshire, 5 were recruited via a play school newsletter in Cambridge, and 14 came from Felstead Primary School in Essex. Ages ranged from 2yrs 9m to 5yrs 5m

with the mean age being 4yrs 5m. In this group 87% were white British and with the rest (13%) classified as white other. With regards to maternal education 26% left education after GCSE level, 17% had A levels or equivalent, 30% held a Bachelor's degree and 26% held a graduate degree level. The main language spoken at home was English.

Procedure

October 2010 to December 2011 was spent choosing which measures should be included in the study and gaining Ethical Approval for the research to be carried out. January 2011 to April 2011 was spent doing recruitment, data collection and training for the five-minute speech sample. A great deal amount of time was spent in liaison with head teachers from schools and with nurseries. After getting a school to agree to help us, information about the study was presented in letters to parents. The school then collected slips from those willing to participate and gave their contact details to the researcher.

Child testing took place in individual sessions, in a quiet room either at the school/nursery or within the family home, and was divided into two 30 minute sessions across two days. Within each group the tasks were presented in a counterbalanced fashion, so as to control for order effects. The children were introduced to the 1st experimenter by either a member of staff or the parent and were told that they were here to play some games and that they would get the chance to win some chocolate. In one of the sessions, when a second experimenter was necessary, the 1st experimenter would introduce them to the child just before the task they were required for. If the sessions with the child were being held in the school/nursery then the questionnaires/consent forms for the parents to fill in were administered via the school/nursery who sent them home with the child and who then collected the completed ones and returned them to the researcher. If the sessions were at home then the questionnaires/consent forms were administered to the parents at the beginning of the first session and were collected back either at the end of that session or the end of the second session depending on convenience. The interviews for the five-minute speech sample, along with demographic questions and in the case of parents with a child with ASD, the autistic checklist, were carried out on a separate occasion over the phone. Each subject received an initial telephone call to arrange a convenient time for the interview and to check they were still willing for themselves and their child to participate in the study. This was done before the sessions were carried out with the child and enabled the researcher to enquire about the child. As this study is cross-sectional in design all measures were administered within one month of one another.

Measures

The measures used have all been used in past studies and are known to be considered suitable for this sample. Note as the sample used for this investigation is part of a larger study other child measures were administered within the two 30 minute sessions. These included three executive-functioning tasks but as these are not included in the current analysis they won't be outlined below.

Family Measures

Some demographic questions were administered at the start of the interview. These were the child's date of birth, the child's clinical diagnosis, number of siblings, mother's highest level of education, ethnicity, language spoken and the Family Affluence Scale (FAS 11), which is comprised of four questions to access the family's socio-economic status (Currie et al, 1997).

Autism-specific five-minute speech sample (AFMSS)
(Daley and Benson, 2008)

For the autistic sample the AFMSS was used to measure expressed emotion. The parent was asked to speak about their son or daughter for five minutes without interruptions. This was then recorded and coded for six different measures. Four of these measures are 'global scales' and two of the measures are 'frequency counts' (Benson et al, 2010). The categories positive, neutral, and negative are used to rate initial statement and relationship, while high, moderate, and low are used as ratings for warmth and emotional-over-involvement. The number of critical comments and number of positive comments come under the heading frequency counts. If the speech sample contains at least one positive global scale and a higher number of critical comments than positive comments then the sample is rated as high expressed emotion. For a sample that contains a least one positive global scale OR higher critical comments than positive comments then this sample would be rated as 'borderline' expressed emotion. Low expressed emotion is assigned if the sample fails to meet the specification for high or borderline expressed emotion. Training was carried out in the two months before the coding of the samples used for this study. The authors sent old samples to be used in the training process and feedback was given. Furthermore, the two coders rated the first 10 interviews together to establish reliability.

Preschool five-minute speech sample (PFMSS)
(Daley et al, 2003)

For the typically developing sample the PFMSS was used to measure expressed emotion. This is the measure, which the AFMSS is based on and the same procedure applies. The only difference is when coding there is no rating for 'borderline' expressed emotion.

Child measures

Checklist for Autistic Spectrum Disorder
(Mayes, Calhoun, Murray, Morrow, Yurich, Mahr, Cothren, Purichia, Bouder and Peterson, 2009)

Mayes and colleagues created the checklist to provide a comprehensive list of all the core and associated symptoms of autism. It is designed as a 15-20 minute interview, which was administered across the phone to the parents of children with a diagnosis of autism, and is comprised of 30 symptoms. Under each symptom there are in some cases sub-items and if any of these are found present then the main symptom is also considered present. To be classified in the autistic range 15 or more symptoms are

required to be present. Although Mayes et al argue that for the greatest diagnostic validity one must class past symptoms as being present, this procedure wasn't adhered to as we wanted also to establish symptom severity, for which only the symptoms currently present are of interest.

Mentalising and Executive Functioning Social Competence Scale
(Fombonne et al, 1994; Ronald et al, 2005)

In addition to the telephone interview parents were given a mentalistic and non-mentalistic social competence questionnaire to complete. This measure contained 84 items and used a 3-point scale for occurrence of behaviour and a 3-point scale for levels of perceived importance. The scale was based on "Echelled'AdaptationSociale pour Enfants" (Hughes et al, 1997), Active and Interaction Sociability Scales (Fombonne et al, 1994) and the pro-social and anti-social behavioural questionnaire (Ronald et al, 2005). It is designed to distinguish between those social behaviours, which involve mental state awareness and those social behaviours that do not (Hughes at al, 1997). The scale focuses on the child's habitual behaviour and assesses behaviour in the domains communication, daily living skills, and socialisation. Reliability analysis was carried out to assess the consistency across the mentalistic, non-mentalistic and self-control parts of the questionnaire, as well as the questionnaire as a whole.

British Picture Vocabulary Scale II (BPVS II)
(Dunn, Dunn, Whetton and Burley, 1997)

The BPVS II was used as a measure of children's receptive verbal ability, with norms and age equivalents for children age 3;0 – 15;00 years. The children were shown pages with four black and white pictures on, and then are told a word and they are to point to the picture, which corresponds to that word. The same procedure was used as Dunn et al, and a basal set and ceiling set was established, and the number of errors was calculated. A raw score was then calculated and, this was converted to age based standardised scores. The BPVS II has high internal validity, α =.93 for child age 3;0 – 15; 0 years.

Sally-Anne Puppet Theory of Mind Task
(Baron-Cohen, Leslie and Frith, 1985; Wimmer and Perner, 1983)

The task involves the child following a simple narrative in which a marble was transferred from one location to another, while one of the characters was absent. Children were asked to predict where the 'stooge' character would look for the marble when they returned. Control questions were also asked in order to establish that the child remembers the original and current location of the marble. For the purpose of analysis children were only coded to have passed the task if they answered the test question and the three control questions correctly.

Non-verbal Theory of Mind Task
(Call and Tomasello, 1999)

This task involves two experimenters (a hider and a communicator). The hider places a sticker in one of two opaque containers out of sight of the child and then the

communicator signals which container the sticker is in. In the non-verbal version of the task, the communicator goes out of the room before telling the child which container the sticker was placed in. Whilst the communicator is away, the hider then switchers the containers in front of the child without opening them. When the communicator returns they signal which container they saw the sticker being placed in and the child is then asked, "Where is the sticker?" In the verbal version of this task once again the communicator leaves the room before signally to the child which container the sticker is in. This time, whilst the communicator is away, the hider opens the containers and switchers the sticker from one container to the other in full view of the child. The child is then asked, "Where will (the communicators name) place the green box (the signal)?" The communicator then returns, places the green box and then the child is asked, "Where is the sticker?" Control tasks were also carried out in order to establish that the child is able to follow visible and invisible displacements, had adequate memory capabilities and were able to overcome the communicators advise when they new it to be incorrect (Call and Tomasello, 1999).

Missing data

Analysis was based on data from 23 children with ASD and 24 typically developing children with some missing data for the following tasks. As a result of timing and location constraints, 3 children failed to complete the Sally-Anne tasks, the Non-verbal theory of mind task and the BPVS, while for two children with ASD and 1 typically developing child. Mothers did not give a five-minute speech sample or respond to demographic questions. In addition, questionnaire data is missing for 8 typically developing children and 4 children with ASD. The primary reason being in this case that questionnaire response rates weren't as high as was hoped. This is well documented within the field and is usually compensated for by the recruitment of a large sample, however due to the comprehensive nature of this study and the use of multiple measures this wasn't possible. Although both the schools and the researchers contacted participants on numerous occasions, some data were still missing when the data analysis was conducted.

The missing data patterns for the primary variables of interest were assessed using SPSS version 18.0 missing value analysis module. The MCAR test failed to reach significance, $\chi^2(1,N = 47) = 6.737$, which suggests that variables within the data set as a whole exhibit a pattern of values that are missing at random. As data was missing from a selection of different variables it was not appropriate to use the EM estimation method to impute values as in an attempt to maximise statistical power.

Limitations

The present study had a number of methodological limitations which should be outlined first so that results can be presented with caution. The first refers to sample size. The recruitment process was very time consuming and therefore due to timing constraints a larger sample could not be recruited. Given the enormous variability within the ASD population it is evident from the results that a much larger sample is needed for this kind of study. The failure to find significant links may reflect a type II statistical error. Another limitation is the use of only two theory-of-mind tasks. A larger battery of tasks would be preferable but would obviously be quite taxing on these young children. The importance section of the questionnaire measure was rather difficult to interpret as parents appeared to understand the questions in

different ways. If time had allowed a pilot study would have been carried out to reveal this in the earlier stages of the study. Both samples lacked heterogeneity with regards to ethnicity, as the sample was predominantly white British, and therefore limits the extent the findings can be generalised to other populations. The study design was another limitation as cross-sectional designs are unable to establish causal relationships.

Results

Descriptive statistics and correlations

Table 1
Descriptive statistics for social competence variables, language, family variables and ASD symptomology

		Mean (SD)	*Range*
TD	Self Competence Total	66.5 (6.4)	52.4 - 76.9
	Mentalistic social competence	64.7 (9.1)	51.8 – 81.3
	Non-mentalistic social competence	77.5 (9.6)	50 – 89.9
	Self-control	59 (11.9)	36.4 – 85.6
	Importance of mentalistic social competence	66.6 (12.5)	50 – 94.6
	Importance of non-mentalistic social competence	77.5 (7.1)	66.7 – 87.5
	Importance of self-control	60.6 (14.9)	42.4 – 92.4
	Child's age	4yrs 5m (7m)	2yrs 11 – 5yrs
	Total number of siblings	1.6 (0.7)	6
	Socio-economic status score	7 (1.8)	1 – 3
	Verbal age	4yrs8m (1yr 5m)	2 – 9
			3yrs1 – 9yrs
ASD	Self Competence Total	46 (8.4)	31.3 – 65.8
	Mentalistic social competence	31.3 (11.5)	9.8 – 58.9
	Non-mentalistic social competence	50.5 (12.9)	37.5 – 86.5
	Self-control	39.8 (14.4)	13.4 – 67.9
	Importance of mentalistic social competence	61.5 (22.2)	23.2 – 96.4
	Importance of non-mentalistic social competence	69.1 (14.4)	39.6 – 93.8
	Importance of self-control	53.7 (15.2)	12.5 – 89.3
	Child's age	12yrs 1m (2yrs	7yrs 6 – 15yrs
	Total number of siblings	5m)	0
	Socio-economic status score	1.3 (0.7)	0 – 3
	Verbal age	7 (1.6)	4 – 9
	Symptom severity	7yrs 4m (3yrs 1m)	3yrs – 14yrs
		25.3 (3.7)	17 - 30

Table 1 shows the descriptive statistics for measures of social competence, language, family measures, (other than the five-minute speech samples) and ASD symptomology. Kolmogrorov-Smirnov tests for normality were carried out on all of these measures looking at each group separately. Within the ASD group only verbal age score was significantly not normal, $D(20) = .269$, $p < .01$. This pattern wasn't found within the TD group as all variables were normally distributed. To look at the relationship between the verbal age score and other measures, Spearman's Rho was used, however when investigating the relationship between other continuous variables, Pearson's correlation coefficients were used.
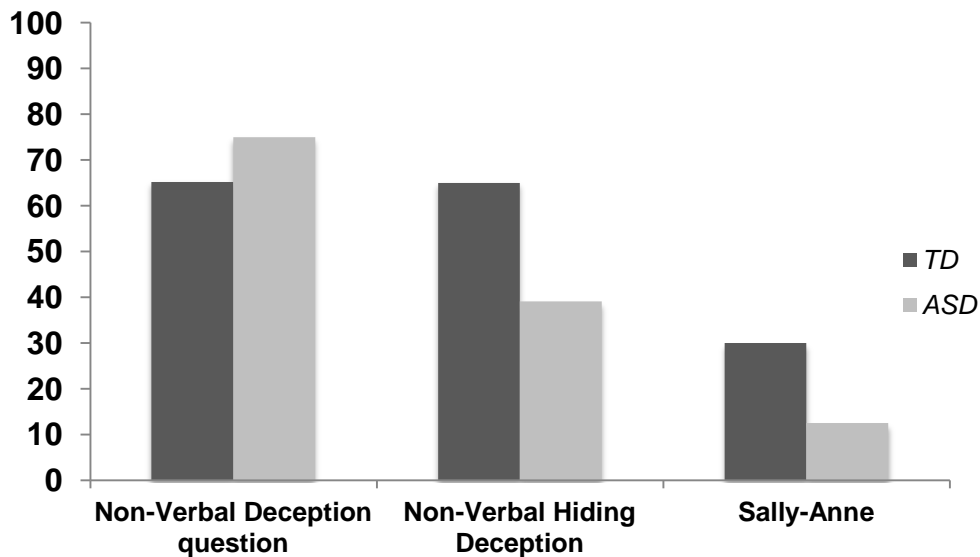
Figure 1: Percentage of children who passed the theory of mind tasks (n=44)

Figure 1 presents the children's success rates across the measures of social understanding; the Sally-Anne task and the Non-verbal task. Unexpectedly, a greater percentage of children passed the deception question and hiding deception parts of the Non-Verbal task than the Sally-Anne task. Coherence in success/failure on the social understanding tasks was assessed by using the phi-contingency statistic. Overall findings indicate coherence between deception question and the hiding deception parts of the non-verbal task for both the group with ASD and the TD groups, ϕ= .586, $p < .01$ and ϕ= .545, $p < .05$, respectively. However, there was much less coherence between these measures and the Sally-Anne task, ϕ= -.206, ns and ϕ= .378, ns. Given the low success rate on the Sally-Anne and the lack of consistency between this measure and the Non-verbal measures, the Sally-Anne task was excluded from the aggregate. Thus, the theory of mind aggregate only represents performance across the deception question and finding deception parts of the non-verbal task and only ranged from 0 to 2. The Sally-Anne task was not, however, excluded from analysis, but separate analysis was run for this measure and the social understanding aggregate.

Table 2
Descriptive statistics for the five-minute speech sample components

		Number classified in each category for each component (%)
TD Five-minute speech sample	Initial Statement (%)	
	Positive	13 (56.5)
	Neutral	10 (43.5)
	Negative	0 (0)
	Warmth (%)	
	High	21 (91.3)
	Moderate	1 (4.3)
	Low	1 (4.3)
	Relationship (%)	
	Positive	22 (95.7)
	Neutral	1 (4.3)
	Negative	0 (0)
	Emotional over-involvement (%)	
	High	0 (0)
	Moderate	0 (0)
	Low	23 (100)
	Number of critical comments	
	Mean (SD)	1.39 (1.48)
	Range	5
	Number of positive comments	
	Mean (SD)	7.43 (3.53)
	Range	16
	Expressed emotion	
	High	0 (0)
	Low	23 (100)
ASD Five-minute speech sample	Initial Statement (%)	
	Positive	10 (47.6)
	Neutral	11 (52.4)
	Negative	0 (0)
	Warmth (%)	
	High	19 (90.5)
	Moderate	2 (9.5)
	Low	0 (0)
	Relationship (%)	
	Positive	13 (61.9)
	Neutral	8 (38.1)
	Negative	0 (0)
	Emotional over-involvement (%)	
	High	0 (0)
	Moderate	0 (0)
	Low	21 (100)
	Number of critical comments	
	Mean (SD)	0.26 (1.18)
	Range	4
	Number of positive comments	
	Mean (SD)	3.95 (2.78)
	Range	10
	Expressed emotion	
	High	0 (0)
	Moderate (Borderline)	2 (9.5)
	Low	19 (90.5)

Table 2 presents the descriptive statistics for each five-minute speech sample component for the TD group and the group with ASD. There was no variability within the TD group with regards to expressed emotion, emotional over-involvement and very little variability was observed for warmth. Greater variability was observed for the relationship, positive comments, and critical comments components. A similar pattern was found in the ASD group, although an extra category exists for expressed emotion (moderate/borderline) so the results differ slightly to those found in the TD group. No parents were classified as high in expressed emotion but two parents were classified as moderate and the rest, the greater majority, once again classified as low. Also no variability was found for emotional over-involvement and little variability was found for warmth. Unlike the TD group there was more variability found in the relationship component, with eight parents (38.1%) classified as neutral, and the rest as positive. Finally both the means for critical comments and positive comments were much lower for the ASD. Unexpectedly, the components, expressed emotion, warmth, and emotional over-involvement show too little variability to use for further analysis.

Table 3 shows the correlations for all the variables used in the analysis. Within both groups there is a high degree of coherence for the questionnaire measures of social competence. In the TD group total social competence is positively related to mentalistic social competence, non-mentalistic social competence and self-control. Within the group with ASD total social competence is significantly related to the latter two measures but not mentalistic social competence, however if we look at the difference between the two groups, using Fisher's statistic, with reference to this relationship the difference between the two correlations is not statistically significant suggesting that overall coherence applies to both groups, $z = 1.5$, ns. There is also no significant difference between the correlations for mentalistic social competence and non-mentalistic social competence, despite only the correlation for the TD group reaching significance, $z = 1.15$, ns. No overall coherence was found between the five-minute speech sample components in either group, with correlations not reaching above .28. There was also some coherence across the theory of mind measures. In the TD group the Sally-Anne score was significantly related to the aggregate score. Although no relationship was found between these measures in the group with ASD, the difference between the two correlations was not statistically significant, $z = 1.32$, ns.

In the TD group verbal age was significantly related to total social competence. This relationship was not found to be significant in the group with ASD, and the difference between the two correlations was significant, $z = 2.1$, $p < .05$. The same pattern occurred for the relationship between verbal age and self-control, with a significant relationship only occurring in the TD group. The difference between the correlations was highly significant once, $z = 3.26$, $p < .001$. Interestingly, in the ASD group mentalistic social competence was significantly related to verbal age, yet this wasn't the case in the TD group; however this group difference in the strength of correlations was not significant, $z = 0.9$, ns. Finally a relationship between the child's verbal age and their real age was found only in the TD group and the difference between the correlations was significant, $z = 1.96$, $p < .05$.

In the ASD group the Sally-Anne task was significantly related to mentalistic social competence and verbal age. This was not found in the TD group and the difference

between the correlations was insignificant in the former and significant in the later, z = 0.8, ns, z = 2.85, p < .001, respectively. In the group with ASD the Sally-Anne task score was also related to symptom severity, which was in turn related to verbal age. However, the Sally-Anne task score was not significantly related to the social interaction items on the symptom severity checklist, r = -.153, ns. Finally, in the TD group the importance of mentalistic social competence was significantly related to mentalistic social competence and the Sally-Anne task. This was not found in the group with ASD and the difference between the correlations was significant in former and insignificant in the latter, z = 1.81, p < .05, z = 0.33, ns, respectively.

Theory of mind and language

T-tests were carried out to assess if the children who passed the Sally-Anne task differed significantly on the related measures to those who failed. Children with ASD who passed the Sally-Anne task tended to have significantly higher verbal age scores, t(20) = 5.128, p < 0.01 than those who failed. In the TD group those who failed did not differ significantly on measures of verbal age, t = -.57, ns than those who passed.

Associations among theory of mind, language, and social competence

In the TD group children mean parental ratings of the importance of social competence differed significantly for children who passed the Sally-Anne task (X=86.6) and those who failed (X=63.8): t(16) = -9.393, p < 0.01. This group difference was not found in the group with ASD: t(19) = -.827, ns; perhaps because parents attributed levels of social competence to the severity of their child's autism.

Within the ASD group, children who passed the Sally-Anne task received on average lower symptom severity scores, t(20) = -2.476, p < .05 and higher mentalistic social competence scores, t(19) = 3.208, p < .05 than those who failed. In the TD group this group difference in mentalistic social competence was not significant, t = 1.3, ns.

In the ASD group in order to explore the associations between theory of mind, verbal age, social competence and symptom severity further, partial correlations were conducted. Previous research suggests that the correlations between theory of mind and mentalistic social competence and theory of mind and symptom severity may not be significant if we control for verbal age scores. Partial correlations were carried out to quantify both these relationships while controlling for the effects of verbal age. Both the relationships between theory of mind and mentalistic social competence, and theory of mind and symptom severity were no longer significant when language was held constant, r = .31, ns and r = -.41, ns.

The associations between expressed emotion, theory of mind, language, and social competence

In the TD group a negative association was found between the theory of mind aggregate and the initial statement, r = -.43, p < 0.01 and a negative association was also found between self control and positive comments, r = -.59, p < .01. Children who passed the Sally-Anne task showed no difference in any component of the five-minute speech sample to those who failed. However if we look at examples of each

component from each group certain patterns can be identified. For example the initial statement for children with ASD is more likely to give reference to their disorder. Furthermore they are more likely to include references to these other variables, language, social competence and symptom severity. Examples are given below (names have been changed):

Initial Statement

ASD

"Charlie is a 7 year old boy who was diagnosed with Autistic Spectrum Disorder 2 years ago"

TD

"Erm, well, Jason is just a typical fun loving four-year old"

Positive comment

ASD

"We have seen a remarkable improvement in Harry over the past year, and I am so proud of have far he has come in terms of his eating preferences and interactions with other children."

TD

"Lily is good at music. She loves to play the piano and has a very good singing voice"

	Table 3 Correlations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
TD	1 Self Competence Total	-																	
	2 Mentalistic social competence	.78**	-																
	3 Non-mentalistic social competence	.76**	.71**	-															
	4 Self-control	.61*	.28	.52*	-														
	5 mentalistic social competence 2	.41	.52*	.15	-.15	-													
	6 non-mentalistic social competence 2	.29	.05	-.08	-.24	.32	-												
	7 Importance of self-control	.27	-.13	.24	.14	-.34	.39	-											
	8 Child's age	.22	.06	.12	.53*	-.24	.03	-.19	-										
	9 Total number of siblings	-.04	.16	-.18	-.25	.41	-.03	-.44	-.06	-									
	10 Socio-economic status score	.06	.35	.2	.21	-.09	-.51*	-.23	.19	-.05	-								
	11 Verbal age	.66**	.29	.48	.68*	.13	.27	.04	.67**	-.22	.13	-							
	12 Initial Statement	-.24	-.27	-.26	-.01	-.01	-.45	-.37	-.04	-.19	.18	.07	-						
	13 Relationship	-.03	-.11	-.25	-.03	-.19	.08	.14	-.09	-.19	-.05	.03	.24	-					
	14 Positive comments	-.16	-.18	-.19	-.59*	-.08	.41	.41	-.34	-.07	-.16	-.37	-.23	-.02	-				
	15 Critical comments	.03	.28	.19	.18	.23	-.31	-.48	.23	.02	.37	.18	-.23	-.19	-.10	-			
	16 Non-verbal	.38	.06	.09	.09	.04	.66*	.36	.18	.1	-.14	.35	-.43*	-.03	.26	-.17	-		
	17 Sally Anne [1]	.21	.27	.14	-.35	.45*	.43	-.02	-.24	.21	-.24	-.11	-.34	-.08	.23	-.27	.41*	-	
ASD	1 Self Competence Total	-																	
	2 Mentalistic social competence	.45	-																
	3 Non-mentalistic social competence	.76*	.43	-															
	4 Self-control	.65*	.07	.75*	-														
	5 mentalistic social competence 2	.26	-.02	-.09	-.24	-													
	6 non-mentalistic social competence 2	.48*	.1	.06	-.09	.78**	-												
	7 Importance of self-control	.29	-.18	-.03	.11	.09	.2	-											
	8 Child's age	.26	.11	.21	.19	.27	.28	.49	-										
	9 Total number of siblings	-.13	-.19	-.04	-.24	.24	,04	-.27	.08	-									
	10 Socio-economic status score	.15	.03	-.02	-.12	.50*	.41	.05	-.27	.04	-								
	11 Verbal age	.01	.56*	-.05	-.37	.41	.34	-.20	.16	-.28	.01	-							
	12 Initial Statement	.2	-.04	.04	.31	-.05	.14	.58*	.16	-.19	.12	-.29	-						
	13 Relationship	.09	-.04	-.26	-.08	.35	.28	.12	.25	.29	.35	-.02	.16	-					
	14 Critical comments	-.05	.04	.19	.11	-.27	-.30	-.05	.33	.37	-.22	-.05	-.13	.22	-				
	15 Positive comments	.23	-.15	.01	.14	.08	.37	.14	.01	-.05	.09	-.19	-.21	-.28	-.15	-			
	16 Non-verbal	-.01	.21	-.02	-.04	-.12	-.09	-.5*	-.63*	.03	.22	.08	-.14	-.04	-.14	.22	-		
	17 Sally Anne [1]	.0	.52*	-.01	-.26	.36	.24	-.07	.31	-.13	.00	.68**	.00	.16	.12	-.3	.00	-	
	18 Symptom severity	-.35	-.70**	-.41	-.05	-.20	-.19	.03	-.38	.11	-.28	-.43	-.18	-.17	-.22	.36	.24	-.51*	-

[1]Kendall's * < 0.05 ** < 0.01

2 = importance of

Discussion

Theory of mind and language

The results of the study provide support for the first hypothesis. In the ASD group, children who passed the Sally-Anne theory-of-mind task were found to have significantly higher verbal ability than those who failed the task. This is in line with several past studies (Happé, 1995, Frith et al, 1994). However, in the TD group, children who passed the Sally-Anne task did not differ significantly in verbal ability than those who failed. The findings for the TD group were not in line with previous studies, which have replicated significant findings on numerous occasions (e.g Astington and Jenksins, 1999). One reason may be that only 3 children out of the 24 passed the task and therefore the sample size for the two groups wasn't big enough to yield any positive results. However, despite this unusual finding it shouldn't be ignored that relationship between language and theory of mind understanding was significantly stronger in the group with ASD than in the TD group. This finding supports Hughes and Leekman's (2004) suggestion that language may play a more unique role in the assisting children with ASD in the development of theory of mind ability, in comparison to typically developing children. One could argue that this provides support for the 'hacking' hypothesis (Happé, 1994), which states that children with ASD use other non-mentalising strategies to compensate for their lack of social insight. However, if such strategies existed which enabled them to solve experimental tasks, one wouldn't expect them to generalize to the large variety of mentalising situations encountered in real life (Frith et al, 1994), but this was found to be the case. This study also found a relationship between verbal ability and mentalistic social competence within the group with ASD, which does not support the 'hacking' hypothesis and suggests that as children with higher verbal ability also show high mentalistic social competence and they are likely to have developed some genuine mentalising ability. This relationship was not significantly stronger in the group with ASD compared with the TD group suggesting to some extent this relationship may apply to both groups, but isn't as robust in the latter. Furthermore, results suggest that verbal ability is more strongly associated with general social competence and self-control in the TD group than mentalising ability. This finding indicates that although it can be useful to compare typically developing groups with atypical groups in the hope that a pattern in one group might help explain the development in another, one must recognise that what is important for development in one group may actually be completely different to the other group. For example, language may influence social development more broadly in the TD group compared with the group with ASD were it may have a larger effect on just one aspect of social development. Obviously this is just theorizing, as we cannot establish causality based on these results.

Associations among theory of mind, language, and social competence

The group of children with ASD who passed the Sally-Anne task scored significantly higher on mentalistic social competence and significantly lower on symptom severity than those who failed. No relationship was found between performance on the Sally-Anne task and overall social competence. This is in line with previous findings (Frith et al, 1994) and supports Travis et al's (2001) argument that theory of mind ability might only impact on a small range of behaviours. However, the relationship between

performance on the Sally-Anne task and symptom severity doesn't adhere to this argument. The symptom severity measure highlights a range of deficits, and yet performance on the Sally-Anne task was not associated with deficits in the items on the symptom severity checklist measuring problems with social interaction. Pellicano et al, also failed to map specific symptoms to specific cognitive deficits in an attempt to support Frith (2003) and Happé's (2004) view that theory of mind is just one of the cognitive deficits that can explain only a set number of behavioural symptoms. However, examining the checklist in more detail shows that although these symptoms measure problems of social interaction they are more representative of general social competence with only a couple of items reflecting problems with social understanding and mentalistic aspects of social competence. Therefore it makes sense that if overall social competence isn't related to theory of mind then an overall measure of problems with social interaction will also be unrelated. In studies that have found this relationship to be significant (Tager-Flusberg, 2003), it may be that the items used to assess social functioning refer more to mentalistic understanding than the measure used within this study.

It is however interesting that an overall measure of symptom severity is related to theory-of-mind performance but perhaps this indicates the presence of subgroups within the ASD population. Frith et al (1994) suggested that three populations might exist within the ASD population, those who fail theory-of-mind tasks and have poor social adaptation, those who pass via non-mentalistic routes but still have poor social adaptation and those who pass and show some degree of mentalistic capabilities in everyday life. It may be that the latter group also show fewer traits across a range of symptoms reflecting a broader higher level of functioning. It is logical to assume, like Pellicano et al, that certain cognitive deficits should be related to theoretically similar behaviours and the finding theory of mind is unrelated to repetitive behaviours and interests (Tager-Flusberg, 2003) supports this conclusion. However, it may be that higher functioning children show fewer traits across a whole range of symptoms, and although some level of social insight is usually a characteristic of these children, the traits shown across other symptom categories may vary, meaning it is unlikely that theory-of-mind ability is related to any one cluster of symptoms. Overall these findings refute the theory-of-mind hypothesis (Baron-Cohen et al, 1985) and suggest that as theory of mind cannot explain impairments such as repetitive behaviours, some other intervening variable may be better able to explain this higher level of social insight and fewer traits across a range of symptoms.

This study also replicated previous studies (Fambonne et al, 1994) in finding that if verbal ability is held constant then the correlations between theory of mind and mentalistic social competence and theory of mind and symptom severity fall below significance. This suggests that verbal ability has a moderating effect on these relationships and some authors (Dunn et al, 1991) argue that language is actually a pre-requisite for theory of mind development. It therefore may be the intervening variable that explains why some children are higher functioning across a range of behaviours. Also it has been theorized that verbal ability may influence these experimental tasks (Astington and Jenkins, 1999), contesting the validity of their ability to measure social insight. This was one of the reasons why a non-verbal theory of mind measure was included, but there was no relationship between this measure and either verbal ability or social competence. Finally, there was no significant difference in the TD group between those who passed the Sally-Anne task

on levels of mentalistic social competence, and those who failed. Previous studies which have investigated this relationship have had mixed results and many also found this relationship to be insignificant (e.g. Frith et al, 1994). It may be that some of the children who fail show real life mentalising capabilities but are not yet able to apply them to experimental conditions. One could argue that this relates to Astington and Jenkin's argument that these experimental tasks require a certain level of verbal ability and this is why these children may exhibit real life mentalising capabilities but not perform well in experimental conditions.

The associations between expressed emotion, theory of mind, language, and social competence

With regards to the third aim of this study, to investigate whether family levels of expressed emotion are related to each of these constructs: social competence, language, and most importantly theory of mind, the results remain inconclusive. In the TD group a negative relationship was found between the initial statement and the theory-of-mind aggregate and a negative relationship was found between positive comments and self-control. These findings may reflect the parent's over-protectiveness of a less able child. Self-control was, however, linked to verbal age so one would expect a relationship between verbal age and these two measures, but this wasn't the case. These findings were interesting as no relationship was predicted between any component from the five-minute speech sample and the other variables used in the analysis based on past research (e.g. Daley et al, 2005). Despite this, the lack of variability across most of the components of the five-minute speech sample is in keeping with Daley et al's findings as both studies rated all mothers as low in expressed emotion. With reference to the ASD group however, the lack of variability within each of the components of the five-minute speech sample prevented more in-depth analysis in this group and also meant that we were not able to replicate Daley's findings showing that expressed emotion was a useful tool to use to discriminate between clinical and non-clinical groups. This result is in keeping with previous studies (Greenberg et al, 2006; Benson et al, 2010) and although this study had even less variability, the sample size was much smaller. Greenberg has accounted for the lack of variability by arguing that it may reflect a pattern of family strength and the ability to cope with the stresses that having a child with autism may produce suggesting the positive influence that a family environment may have on a child with ASD. He also noted that parents typically perceive the behavioural symptom to be out of the child's control and therefore critical comments are less common. In support of this assumption qualitative analysis from this study revealed a common pattern of parents often justifying negative comments by referring to the child's disorder. Furthermore the type of ASD sample recruited for this study may account for the lack of variability. The children all attended special needs schools and parents during the telephone interview frequently praised the schools for the amount of support that they provided. The mean age was 12yrs 1m in comparison to Benson et al's sample where the children were on average much younger (8yrs 6m). Also 19% of Benson et al's sample used non-verbal means to communicate and 77% were in mainstream schools. One could argue the amount of stress the child puts on the family in the current sample is likely to be significantly reduced because of the difference in age and ability and references made by the parents to recent improvement support this conclusion.

Conclusion

This study adds further reliability to the research literature on children with ASD, which has found associations between 1) theory of mind and language 2) theory of mind and social competence and 3) theory of mind and symptom severity. The findings suggest that theory of mind may only be related to mentalistic social competencies in everyday life and yet is related to a much broader measure of symptom severities than one might theoretically expect. However when language ability was held constant the associations between theory of mind and both mentalistic social competence and symptom severity were significantly reduced. The suggestion has been made that language ability may be a prominent factor on the delayed journey that the child takes to understanding their social world. The same conclusions cannot be made for typically developing children, and this study highlights that it isn't always helpful to look at typical and atypical populations in tandem. Lack of variability in the expressed emotion measures for the group of children with ASD meant that few conclusions can be drawn with regards to relationship between the family environment and the cognitive and behavioural development of the child.

Future directions

This study revealed some interesting patterns in the five-minute speech samples when analysed qualitatively. Future researchers may want to take the five-minute speech samples used in this study and analyses them via other methods. Maternal mind-mindedless measures, which Mein's et al (2002) have used to examine the predictors of theory of mind in TD children may also provide some insight into the relationship between the family environment and theory of mind in sample of children with ASD. Also, how this measure may relate to language, everyday social competence and symptom severity. Future research could also add to the sample collected for this study, making it less heterogenic, and carry out a similar study to see if Benson et al's (2010) findings can be replicated. Replication is needed before a longitudinal study can be carried out to assess the causal direction of any variables which are found to be associated. For example, it may be that initial research was right to concentrate solely on the impact the child may have on the family, rather than the impact that the family environment may have on the child. Intervention studies would then be needed to address whether or not levels of 'emotional valance' within the family can actually be reduced. Finally, longitudinal studies should also be conducted to assess the relationship between language and theory of mind in an attempt to resolve the issue of causality.

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