

RUNNING HEAD: Impaired pretense in children with autism

Impaired competence for pretense in children with autism: Exploring potential cognitive predictors.

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Abstract

Lack of pretense in children with autism has been explained by a number of theoretical explanations, including impaired mentalising, impaired response inhibition, and weak central coherence. This study aimed to empirically test each of these theories. Children with autism (n=60) were significantly impaired relative to controls (n=65) when interpreting pretense, thereby supporting a competence deficit hypothesis. They also showed impaired mentalising and response inhibition, but superior local processing indicating weak central coherence. Regression analyses revealed that mentalising significantly and independently predicted pretense. The results are interpreted as supporting the impaired mentalising theory and evidence against competing theories invoking impaired response inhibition or a local processing bias. The results of this study have important implications for treatment and intervention.

Keywords: Autism; functional play; pretend play; mentalising; response inhibition; weak central coherence

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Impaired Competence for Pretense in Children With Autism: Exploring Potential Cognitive Predictors.

Lack of pretend play is a manifest behavior that is particularly significant in autism symptomatology and in early diagnosis (APA, 2000; Baron-Cohen et al., 1996).

While the presence of such a deficit is undisputed (see Jarrold, 2003), the cause or causes remain controversial (Boucher, 2009). A number of theoretical explanations of the deficit have been advanced but empirical validation of competing theories is lacking (Rutherford, Young, Hepburn, Rogers, 2007). The main aim of the research reported here was to address this issue in an empirical investigation of relationships between pretend play and, respectively, mentalising ability, response inhibition and drive for central coherence. If deficits in pretense were found to be linked to problems with any or all of these cognitive abilities, this would provide an insight into what might underlie the problems that children with autism encounter with pretense. This would have important implications for intervention aimed at facilitating pretense. Given the importance attributed to pretend play in the development of language and social cognition (Lillard, 2002) there is a clear need to gain a better understanding of the pretend play impairment.

Impaired Mentalising?

In a seminal paper, Leslie (1987) proposed that the ability to engage in and recognize pretend play requires the capacity to simultaneously hold two representations in mind, the primary representation (reflecting the real world) and the new pretend identity, which is a representation of the primary representation (what Leslie called the “metarepresentation¹” and later the M-Representation; Leslie & Roth, 1993).

According to Leslie, this capacity to represent representations emerging during the

second year of life also underlies the later more advanced ability to understand other people's minds, known as a theory of mind, which develops around the age of four years. Theory of mind (ToM) is the ability to ascribe mental states to self and others and to predict behavior on the basis of these states (Wimmer & Perner, 1983). Using measures assessing the ability to attribute false beliefs to others, ToM has been robustly demonstrated to be impaired in children with autism (Perner, Frith, Leslie, & Leekam, 1989). This ToM deficit reflects a difficulty in mentalising: in the case of tests of false beliefs, the child is unable to represent in their own mind someone else's false belief as separate from their own true belief.

According to the original version of the ToM theory, children with autism demonstrate impairments in both pretense and ToM as a result of an underlying basic difficulty in forming and manipulating secondary representations. Thus, children with autism therefore lack the *competence* to understand and produce pretense. In contrast to pretend play, functional play does not pose a problem because it is not underpinned by the need to form secondary representations. Instead, primary representations are sufficient for functional play because the world is simply represented as it is (Baron-Cohen, 1987).

There is empirical evidence in support of a link between pretend play and ToM in typically developing children. For example, Taylor and Carlson (1997) and Suddendorf, Fletcher-Flinn, and Johnston (1999) found that children who passed ToM tasks produced significantly more imaginary object pretense than children who failed these tasks. Moreover, in a study of children with autism and matched controls, Rutherford et al. (2007) found that development in the production of pretend play could be predicted by earlier measures of joint attention. Joint attention is believed to directly reflect a capacity for mental representation (Baron-Cohen, 1989) and is

precursor to ToM development (Rochat & Striano, 1999). To date, however, there has been no direct investigation of the link between the ability to understand – as opposed to produce - pretense and mentalising ability in children with autism. This is an important omission because measures of production do not permit investigation of any underlying competence that might be masked by a *performance deficit* (Jarrold, Smith, Boucher, & Harris, 1994b). One of the main aims of the current research is to make such direct investigation.

A Problem of Inhibition?

The observation that children with autism show an improved capacity for pretence under instructed or elicited conditions (Lewis & Boucher, 1988) challenged the characterization of impaired pretence in autism as a competence deficit. Additionally, children with autism were found to have no difficulty comprehending the pretend play of another person (Jarrold et al., 1994b; Kavanaugh & Harris, 1994). These findings seriously challenged the impaired mentalising explanation of lack of pretense, which entails a competence deficit. It was therefore suggested by Harris (1993) that a selective impairment of the spontaneous production of pretend play might result from a performance deficit and in particular from impaired response inhibition.

Specifically, Harris argued that when engaging in pretense the pretender must inhibit their real-world knowledge and act ‘as-if’ something is the case, and that impaired response inhibition would interfere with this ability.

More recent evidence, however, suggests that there is in fact lack of competence – not just a performance deficit – for pretend play in children with autism. Rutherford et al. (2007) showed that both spontaneous (performance measure) and scaffolded pretense (competence measure) was significantly impaired in children

with autism relative to matched controls. In addition, Bigham (2008) reported that children with autism were more likely than ability-matched controls to make literal errors when interpreting another person's pretend gestures. Bigham's finding does not, however, preclude a role for impaired response inhibition: it is consistent with response inhibition impairment and with combined competence-performance impairment. A further aim of the current research was to investigate a possible association between impaired response inhibition and children with autism's problems interpreting - as opposed to producing - pretend play.

A Local Processing Bias?

The 'weak central coherence' theory (Frith, 1989; 2003) proposes that individuals with autism have anomalously good ability to perceive parts or focus on detail (local processing) but impoverished ability to perceive wholes (global processing) relative to neurotypical individuals. Support for the notion of a local processing bias in individuals with autism comes from a plethora of studies demonstrating superior performance relative to matched controls on tasks such as the Embedded Figures Task (EFT: Witkin, Oltman, Raskin, Karp, 1971) in which a simple shape must be identified from within a complex whole. Despite robust evidence of strong local processing, evidence of impaired global processing is mixed (e.g. Mottron, Burack, Stauder, & Robaey, 1999). Consequently, Happé and Frith (2006) revised Frith's hypothesis to emphasize an unusually strong preference for utilizing local rather than global processing strategies.

It has been suggested that weak central coherence can explain the poor performance of children with autism on ToM tasks (Jarrod, Butler, Cottington, & Jiminez, 2000). Weak central coherence has also been advanced as an explanation for

impairments in the pretense of children with autism (Morgan, Mayberry, & Durkin, 2003). If children with autism do find it difficult to integrate several pieces of information then it is plausible that they may fail to encode and relate all of the available cues when observing the pretense of another person. In other words, they may fail to take into account the context in which the non-literal acts are performed. Functional play would not pose a problem because successful comprehension can be achieved simply by knowing the behaviors conventionally associated with objects and situations. To date there are no empirical studies investigating the relation between global processing and the ability to pretend, and there is only one known investigation of the relationship between local processing and pretence (Morgan et al., 2003). While Morgan et al. failed to find an association between pretense and local processing, they also failed to find evidence of impaired pretend play in children with autism, making their results somewhat difficult to interpret. The possibility that a local processing bias can help to explain lack of pretense in children with autism therefore requires further empirical investigation.

The Current Study

The first two preliminary aims of this study were:

1. To replicate the results of the earlier study (Bigham, 2008) in which children with autism showed a pattern of intact comprehension of functional play but impaired comprehension of pretend play relative to controls, thereby distinguishing between a competence deficit hypothesis and a performance deficit hypothesis.
2. To replicate previous research showing that the performance of children with autism relative to controls is impoverished on measures assessing (a) mentalising and (b) response inhibition, but superior on a measure of (c) local processing.

The third major aim was to:

3. To assess relationships between comprehension of pretense and, respectively, performances on measures of (a), (b) and (c). If meaningfully associated, measures of each underlying cognitive ability should correlate with the measure of pretend play: measures of (a) and (b) should show significant positive correlation and (c) should show significant negative correlation with the measure of pretense.

A subsidiary aim was to investigate whether or not children with autism make more literal errors relative to controls when interpreting pretense; and if more such errors are made, then to assess whether or not literal errors are specifically associated with impaired response inhibition. This will provide a further test of the proposed association between impaired response inhibition and impaired pretense in children with autism.

Method

Participants

The participants were 60 children with autistic disorder (AD), 28 children with intellectual disability (ID) without autism, and 37 typically developing children (TD) matched for verbal age (VA) using the British Picture Vocabulary Scales (BPVS; Dunn, Dunn, Whetton, & Pintilie, 1982). The children were recruited from schools within the Greater London (UK) area and none of the children had previously participated in any of the earlier studies conducted by the author. The children with autism attended specialist schools catering for autism and all had been diagnosed with autism by experienced psychiatrists and clinical psychologists using DSM-IV (APA, 2000) criteria. The TD children attended local mainstream schools and were described by their teachers as having no prior or current social, emotional or cognitive

problems. The children in the ID group were selected from special needs schools and inspection of their statements of Special Educational Needs as well as discussions with their teachers indicated that none had any prior or current autistic behavior. All of the children had a receptive VA between 4 and 7 years. The three groups were compared on chronological age (CA) and VA. Table 1 shows the means for each group. The VA for the groups was not significantly different, $F(2, 124) = .17$, n.s. The difference between the three groups on CA was significant, $F(2, 124) = 72.86$, $p < .001$, with the TD children younger than the other two groups.

[Place Table 1 about here]

Measures

Comprehension of functional play and pretend play. The materials and procedure are identical to those reported elsewhere and are therefore only presented briefly below (Bigham, 2008; Bigham & Bouchier-Sutton, 2007). The task requires children to watch a series of six pretend actions such as writing enacted using either: (a) real or replica objects (functional play); or using (b) substitute objects or (c) no objects all (pretend play). There were four different types of substitute object representing gradually more difficult substitutions. These ranged from simple substitutions where the substitute was similar in size and shape to the referent and with no clear intended function (e.g. appropriately shaped wooded objects) to completely arbitrary substitutions where the substitute shared no similarity with the referent and had its own clearly defined, different function (e.g. a spoon used as if it were a saw). The actions and the props used to assess functional play and object substitution pretense are shown in Table 2. Two different types of gestures were used to assess children's understanding of pretense performed without any substitute objects. These were body-part-as-object gestures (e.g. using one's finger as if it were

a pen) and imaginary object gestures (e.g. pretending to hold an imaginary pen). In total seven levels of play were assessed.

[Place Table 2 about here]²

Procedure. The children were seen individually at their school. To avoid fatigue and practice effects each child was presented with only three of the possible six pretend actions for each of the seven levels of play. The subsets of actions for each type of play were systematically selected and predetermined on each child's response sheet. This ensured that the children within each participant group received similar numbers of the different actions. The children were always presented with an action performed using a real or replica object first thereby increasing the likelihood that the child's first response would be correct. This was to minimize the possibility of failure effects. All the remaining items were presented in a random order, the exception that consecutive actions or levels of play differed.

The experimenter sat at a table next to the participant and performed the actions one at a time. While viewing each action the children were asked a series of questions. First, each participant was asked, "*What am I doing?*" If this did not elicit a response the question was re-phrased, "*What am I pretending to do?*" Again, if the participant did not respond then the child was asked, "*What am I pretending the (object) is?*" If the participant was unable to answer any of the questions then the next action was presented. Testing lasted around 25 to 30 minutes.

Scoring. Correct responses were awarded one point. Incorrect responses and non-responses were awarded a score of 0. Scores ranged on a scale from 0 to 3 for each level of play. In order to analyze the types of mistakes the children made, incorrect responses were coded as literal or non-literal. Literal errors were either function or action based. Functional errors involved the children responding on the

basis of the actual function of the substitute. To illustrate, “*stirring*” was used to describe the sawing action when a spoon was used and “*screwing*” was used to describe the writing action when a screwdriver was used. Action based errors involved the children merely describing the physical behavior carried out by the experimenter (e.g. “*pushing the saw*” and “*waving your hand*”).

Mentalising (false belief). Following the procedure of Perner et al. (1989), the children were shown a Smarties tube and were asked, “*What do you think is in here?*” The experimenter then said, “*Let’s open it and have a look*” The experimenter opened the tube to reveal a pencil and said, “*Oh, what’s really inside?*” All of the children responded correctly to these two control questions. The children’s understanding of their own and another’s false belief was then assessed as follows. The pencil was put back inside the tube and the children were asked, “*When you first saw this, before we opened it, what did you think was inside?*” If any of the children did not respond they were given a forced-choice question, “*Before we opened the tube, what did you think was inside, Smarties or a pencil?*” Finally, the children were asked, “*What will (familiar person) think is in it?*” If any of the children did not answer or said they did not know they were given a forced-choice question, “*What will s/he think is inside? A pencil or Smarties?*” The structure of the forced choice questions was counterbalanced as it was felt that some of the children might simply echo the last of the two options. Correct responses were awarded one point and incorrect or non-responses were not awarded any points. Scores ranged on a scale from 0 to 2.

Response inhibition (Luria hand game). The procedure used in this study is identical to that reported by Hughes (1996). In brief, the children were first presented

with an imitative task in which they copied hand gestures (pointing a finger and making a fist) made by the experimenter. None of the children failed this control task. They were then presented with a conflict task in which the children were instructed to make a different gesture to that made by the experimenter (e.g. pointing a finger when the experimenter made a fist). The instructions were repeated with corrective feedback when necessary until the child made 4 consecutive correct responses. Five of the children with autism and one child with ID were excluded at this point. At test the children were presented with a predetermined set of fist and finger trials. Children were not given feedback on their responses. Testing was terminated if a child made six consecutive correct responses. Each child was presented with a maximum of 15 trials. Responses to the imitative task were scored according to the proportion of correct responses out of the total number of trials presented.

Local processing (Children's Embedded Figures Task). The children were given the Children's Embedded Figures Test (CEFT; Witkin et al., 1971). The test requires the participants to locate a target figure within a series of line drawings. The procedure was identical to that described in the test manual. In brief, the children were instructed to search for the target in each picture and then trace the outline with their finger. One of the children with autism failed the pre-test and was excluded from the analyses. The children were given a score, ranging from 0 to 25, depending on how many test items they successfully located. Due to problems with absences 7 TD, 2 ID, and 11 children with autism did not complete the CEFT. When these children were excluded, the groups remained matched for VA.

Results

Results are reported under three headings corresponding to the aims of the study: (a) Do children with autism show a pattern of intact comprehension of functional play but impaired comprehension of pretend play relative to controls? (b) Do children with autism show impaired mentalising and response inhibition but superior local processing relative to controls? and (c) Can performances on measures of mentalising, response inhibition and local processing predict comprehension of pretense?

The participant groups were equated for VA therefore, following Miller and Chapman (2001), in the statistical analyses that follow VA was entered as a covariate only when VA correlated with the dependent variables.

Do Children With Autism Show a Pattern of Intact Comprehension of Functional Play but Impaired Comprehension of Pretend Play Relative to Controls?

The first question of interest was whether there were between-group differences in understanding of functional play and each level of pretend play. A series of one-way analyses of variance (ANOVA) using an alpha level of .007 (Bonferroni adjusted for multiple comparisons) were performed. There were no significant group differences at the Bonferroni corrected level in functional play scores. There were, however, significant group differences in the scores for all levels of pretend play. Post hoc Bonferroni multiple comparisons revealed that in each case the autism group understood significantly fewer of the pretend actions than the two control groups. Group means and significant differences where they occurred are shown in Table 3. Entering VA as a covariate did not affect the results.

[Place Table 3 about here]

Do Children With Autism Show Impaired Mentalising and Response Inhibition but Superior Local Processing Relative to Controls?

A series of one-way ANOVAs using a Bonferroni adjusted alpha level of .017 were performed to investigate whether there were any significant group differences on the measures of mentalising³, response inhibition, and local processing. There were significant group differences on all three measures and post hoc Bonferroni multiple comparisons revealed that the autism group scored significantly lower than the control groups on the measure on mentalising and response inhibition, and significantly higher than the controls of the measure of local processing. Group means and significant differences are shown in Table 4. The results remained unaltered when VA was entered as a covariate.

[Place Table 4 about here]

Can Performances on Measures of Mentalising, Response Inhibition, and Local Processing Predict Comprehension of Pretense?

Correlations between pretend play (aggregate score) and the predictor variables: VA, mentalising, response inhibition and local processing are shown in Table 5. With the exception of the local processing measure all variables showed a significant positive relationship with each other. Given that none of the relationships between the predictor variables exceeded .7 and that collinearity diagnostics indicated no cause for concern all of the predictor variables were retained in the subsequent regression analysis (Tabachnick & Fidell, 2001).

[Place Table 5 about here]

A hierarchical multiple regression was performed to investigate the relationship between pretense and the predictor variables: VA, mentalising, response inhibition and local processing, after accounting for participant group. Participant

group was entered first using dummy codes (ID vs. autism and ID vs. TD), VA was entered into the second block and in the third block the measures of mentalising, response inhibition and local processing were entered simultaneously. As shown in Table 6, group accounted for 28% of the variance, $F(2, 98) = 20.88, p < .001$, in pretend play scores. Once the variance associated with group was removed there was a significant increase in R^2 ($\Delta R^2 = .20$), $F_{ch}(1, 97) = 38.04, p < .001$. VA therefore explained a further 20% of the variance in pretend play scores. Once the variance associated with group and VA were removed there was another significant increase in R^2 ($\Delta R^2 = .05$), $F_{ch}(3, 94) = 3.24, p < .05$. Performance on these three measures therefore explained an additional 5% of the variance in pretend play scores. However, of the three variables included in Step 3 only the mentalising measure ($\beta = .24, p < .01$) made a statistically significant contribution to the variance. The response inhibition measure ($\beta = -.03, p = .72$) and the local processing measure ($\beta = -.06, p = .46$) did not make unique contributions.

[Place Table 6 about here]

A final subsidiary aim was to investigate whether there were any group differences in the number of literal errors on the pretense task an ANOVA was performed. The results revealed that there were significant group differences, $F(2, 124) = 18.24, p < .001$ partial $\eta^2 = .25$. Post hoc Bonferroni multiple comparisons indicated that the autism group ($M = 4.55, SD = 3.35$) made significantly more literal errors than both control groups ($p < .001$) ($M = 1.62, 1.57, SD = 2.00, 1.95$, respectively) which did not differ from each other. Entering VA as a covariate did not alter the results.

A partial correlation controlling for VA was performed in order to investigate the relationship between number of literal errors and performance on the response inhibition task. The results revealed a significant negative correlation ($r = -.34, n = 119, p < .01$). Better performance on the response inhibition task was associated with fewer literal errors. A similar set of results emerged when looking at the relationship between literal errors and mentalising ($r = -.31, n = 125, p < .01$) and local processing ($r = .27, n = 107, p < .01$). In the case of local processing, better performance was associated with more literal errors.

Discussion

Two preliminary aims of this study were: (1) to replicate an earlier study (Bigham, 2008) showing that relative to matched controls children with autism have difficulty interpreting the pretend play, but not the functional play, of another person thereby supporting a competence deficit hypothesis rather than a performance deficit hypothesis; and (2) to replicate previous research showing that the performance of children with autism relative to controls is impoverished on measures assessing (a) mentalising and (b) response inhibition, but superior on a measure of (c) local processing. The third and major aim of the study was (3) to explore whether performances on (a), (b) and (c) predict comprehension of pretense in order to empirically test the associated theoretical accounts.

In relation to the first aim, the results of this study replicate the earlier findings (Bigham, 2008) and provide strong evidence to suggest that children with autism lack competence for some types of pretense. This is consistent with findings reported by Rutherford et al. (2007) but inconsistent with earlier reports of intact comprehension (Jarrold et al., 1994b; Kavanaugh & Harris, 1994). However, in both of these earlier

studies the children watched the experimenter pour an imaginary substance (e.g. tea) from an associated container (e.g. a teapot) onto a toy animal. It is possible that the use of appropriate props facilitated comprehension. Where this facilitation is absent, as was the case in both this study and Rutherford et al.'s study, children with autism show impaired comprehension.

The second aim of the current study was to replicate previous research showing impaired mentalising and response inhibition, but superior local processing in children with autism relative to ability-matched controls. The results confirmed this pattern. This paved the way for investigating the major aim of this study, which was to explore if performances on measures of mentalising, response inhibition and local processing were associated with and predictive of pretense comprehension.

In the regression analysis four variables, namely measures of VA, mentalising ability, response inhibition and local processing were entered as possible predictors after accounting for any variance associated with participant group. All of the predictor variables have been theoretically implicated in the development of pretense, as noted in the Introduction. The VA measure was strongly associated with pretense, confirming results of previous research showing a relationship between pretend play and language development (Haight & Miller, 1992) and more specifically that receptive language is related to pretend play (Lewis & Boucher, 1988). Assuming that both language and pretense require secondary representation (i.e. symbolization) then these results lend support to the symbolic deficit hypothesis (Baron-Cohen, 1987; Ricks & Wing, 1975). That is, impaired symbolization contributes to deficits in language, pretense, and mentalising.

Of the remaining predictor variables (mentalising, response inhibition and local processing) only mentalising was a significant predictor of pretense after

removing all of the variance associated with group and VA. The correlations show that the mentalising and response inhibition measures were related and this is consistent with the suggestion that ToM tasks, such as those assessing mentalising, also require a degree of response inhibition (Leslie & Polizzi, 1998). However, the observation that only mentalising significantly and independently predicted pretend play provides evidence of at least some independence of these variables. Conversely, lack of a significant relationship between mentalising and local processing tends to disconfirm the claim that performance on ToM tasks reflects a bias towards local processing as implied by Jarrold et al. (2000). However, this does not preclude an association between global processing and mentalising (Happé & Booth, 2008) as discussed below.

The lack of an association between pretense and response inhibition suggests that difficulties with response inhibition are not linked to the impairments observed in the pretense of children with autism and supports previous findings (Jarrold, Boucher, & Smith, 1994a). Further support for this comes from the results connected with the subsidiary aim of the current study, namely an investigation of the relationship between number of literal errors and problems with response inhibition. Although there was a strong association between the number of literal errors and performance on the response inhibition measure, there were comparable relationships between literal errors and the mentalising and local processing measures. Increased literal errors in the autism group are therefore not uniquely associated with impaired response inhibition.

The observation that pretend play was not associated with local processing is consistent with the findings of Morgan et al. (2003) who also reported no association. Taken together, these findings provide strong evidence to suggest that a local

processing bias is not associated with the deficits observed in the pretense of children with autism. However, recent research has led to the suggestion that local and global processing are two independent dimensions of weak coherence (Happé & Booth, 2008). It remains possible therefore that problems with global, or integrative, processing might be associated with deficits in the pretense of children with autism, and this warrants further investigation.

The results of the current research show that performance on the mentalising measure makes a significant and independent contribution to performance on the pretend play task over and above their possible shared reliance on symbolizing ability, with better performance on one being associated with better performance on the other. These findings suggest that some other ability contributing to success on mentalising tests is related to ability to interpret the pretense of another person. On the assumption that this ability is a capacity to represent mental states, then the results provide support for the mentalising deficit theory. This is consistent with the observation that children with autism lack early mind sharing behaviors, such as joint attention behaviors and, moreover, that early joint attention behaviors predict later ability to produce pretense (Rutherford et al., 2007). Interventions might therefore aim to facilitate both symbolizing and early mentalising ability in young children with autism.

An obvious limitation of the current research is that only one measure of each cognitive construct was assessed. Future research should use a variety of different measures, which could yield different results. A further limitation is that only object substitution pretense and imaginary object pretense were assessed. Future research could investigate understanding of pretend properties and independent agency.

In conclusion, the results of the research reported here provide evidence to support a competence deficit hypothesis. That is, children with autism lack the competence for some types of pretense. Unique to this study was an empirical investigation of the relationship among comprehension of pretense and mentalising, response inhibition and local processing. Only the mentalising measure significantly and independently predicted performance on the pretend play task. These results are interpreted as providing empirical evidence to support the mentalising account and evidence against the competing theoretical alternatives invoking response inhibition or a local processing bias.

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Footnotes

¹ The term “metarepresentation” has been used to refer to different representational abilities. In referring to the ability to represent a representation, the term “secondary” representation (as used by Perner, 1991) is used throughout this paper.

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³ Preliminary analyses indicated that performances within groups did not differ significantly between the self- and other-false belief tests therefore all between groups analyses were performed on a self- + other-false belief composite score.