Longitudinal Effects Of Theory Of Mind On Later Peer Relations: The Role Of Prosocial

Behaviour

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Abstract

Children's peer relations represent a key aspect of school adjustment. However, little is known about their social-cognitive precursors. To address this gap, we followed 70 children across the transition to primary school. At Time 1 (age 5), Time 2 (age 6) and Time 3 (age 7) children were assessed on their theory of mind, prosocial behaviour, and verbal ability. In addition, at Time 2 and at Time 3 we gathered peer nominations. Results supported our mediational hypothesis of indirect paths from early theory of mind to subsequently lower peer rejection and higher peer acceptance, via improvements in prosocial behaviour. We discuss implications of these longitudinal effects for our understanding of the impact of social-cognitive achievements for children's developing social relations.

Keywords: theory of mind, peer relationships, prosocial behaviour

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Theory of mind refers to the ability to recognize the existence of mental states and to predict and explain social behaviour on the basis of these mental states (Astington, 1993; Wellman, 1990). Almost thirty years of research in this area have shown not only the existence of a dramatic improvement in theory of mind during preschool years (Wellman, Cross, & Watson, 2001), but also substantial individual differences between children of the same age (Cutting & Dunn, 1999; Repacholi & Slaughter, 2003). In the present paper we investigated if and how individual differences in children's theory of mind predict later children's relationships with peers. More precisely, we examined the role of prosocial behaviour in mediating the association between early theory of mind and later peer relationships.

The study of the relation between children's theory of mind and their social interactions represents a hot topic in developmental psychology. There are several basic reasons for expecting a link between mindreading skills and social variables. As Hughes and Leekam highlighted in a highly cited paper, "theory-of-mind skills transform and/or are transformed by children's close relationships" (Hughes & Leekam, 2004, p. 590). Theoretically, the existence of a close link between children's theory of mind and social relationships fits with the social constructivist approach (Astington & Olson, 1995; Carpendale & Lewis, 2004; Dunn, 1996; Nelson, 1996). Notwithstanding some specific differences in their theoretical formulations, these authors all propose a model of children's development that explicitly emphasizes the construction of social understanding within the context of social interactions. According to this approach, children's development of theory of mind should not be understood simply in terms of the growth of their own cognitive abilities, but rather should be regarded as inextricably tied to children's participation in social exchanges with other people. Support for this view comes from

studies showing that children with positive relationships with parents (Meins et al., 2002; Ruffman, Perner, & Parkin, 1999) and siblings (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Hughes, Fujisawa, Ensor, Lecce, & Marfleet, 2006) perform better on theory-of-mind tasks. A similar effect is likely to be found for peer relationships, which constitute a relevant context in children's social life before (Brown, Donelan-McCall, & Dunn, 1996; Hughes & Dunn, 1997) and during the school years (Ladd, 1999). Indeed, the peer context offers unique opportunities to understand that people can have a different point of view on the same situation (Banerjee, 2004; Zerwas et al., 2004). The complex interplay between theory of mind and peer relationships has recently been underlined by the results of a recent study by Banerjee, Watling, and Caputi (in press), which show evidence of a cyclical relationship between mindreading (*faux pas* understanding) and peer relations during the primary school years.

Despite the progress in theoretical and empirical work described above, the existing literature on theory of mind and social relationships is at present rather limited and far from conclusive. In addition, much of the evidence for the importance of theory of mind for social competence comes from studies in children with autism, for whom the mentalizing deficit provides a potential explanation for problems in social interaction and communication (Peterson, Garnett, Kelly, & Attwood, 2009; Tager-Flusberg, 2003).

Studies on typically developing children are relatively few in number, and we are only just beginning to piece together the connections between social cognition and social relations. In one of the first studies on this topic, Dockett (1997) tested 3- to 5- year-old children on their theory of mind and measured their degree of popularity using peer nominations. As expected, the author reported a significant association between the two variables. Compatible results were found in another sample of 3- to 5-year-olds by Peterson and Siegal (2002). They showed that

rejected children (receiving high numbers of least-like and low numbers of most-like peer nominations) scored lower than popular children (high on most-like and low on least-like) on a battery of theory-of-mind tasks.

However, the links between peer relations and theory-of-mind skills have been rather tenuous in other studies. For example, Slaughter, Dennis and Pritchard (2002) examined the relations between children's theory of mind and their level of social preference (calculated as the difference between positive and negative nominations) and social impact (calculated as the sum of positive and negative nominations). The researchers reported that theory of mind predicted social preference only for children older than 5 years of age; in addition, they did not find any significant effect of theory of mind on children's peer status over and above the effect of verbal intelligence. Similarly, Badenes, Estevan, and Bacete (2000) reported a heterogeneous pattern of associations between theory of mind and peer relations. More precisely, they found few differences in theory of mind among popular, average and rejected boys and girls, with popular girls scoring higher than average or neglected girls on a deception task, and rejected boys older than 6 years having a poorer understanding of white lies. Even more strikingly, Garner and colleagues (2005) reported no significant association between theory of mind and teachers' rating of children's social competence. They measured false-belief understanding and positive and negative behaviours with classmates in a socially diverse sample of preschoolers; the authors found a lack of correlation between these variables when age, socio-economic status and language were taken into account.

Considered altogether, the empirical studies discussed above show that there is no clear consensus on whether and how theory of mind is related to children's relationships with peers. The inconsistency of findings is likely to relate to both methodological and theoretical issues. One interesting possibility concerns the age of participants. Results from the studies presented

above and from other studies with older children (Banerjee et al., in press) seem to indicate that theory of mind could become more important for peer relationships as children increase in age. According to the social constructivist approach, this result can be interpreted considering the increasing importance of peer relationships as children grow up and enter the school arena. However, it is also possible that a certain degree of theory-of-mind ability is necessary before children can capitalise on these skills in order to improve their social relationships with peers. Thus, it seems plausible that theory of mind might confer benefits to social relations after rather than before 5 years of age, in coincidence with the myriad social and cognitive challenges posed by children's transition into primary school (McIntyre, Blacher, & Baker, 2006).

Another intriguing plausible explanation is proposed by Banerjee and Watling (2005) and by Astington (2003), who argued that standard theory-of-mind tasks (first- and second-order false-belief tasks) represent situations that are quite different from real life circumstances in which children are required to use mentalizing abilities. Thus, first- and second-order false-belief tasks do not necessarily involve exactly the same kind of social understanding that is necessary to build positive social relationships. According to this view, other more "ecologically-valid" theory-of-mind measures such as the *faux pas* task (Banerjee et al., in press) and the *strange stories* task (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Happé, 1994) are expected to show closer connections with children's interpersonal relationships. The strange stories task evaluates children's ability to understand non-literal utterances, such as sarcasm and irony; the *faux pas* task measures children's understanding of mental states involved in unintentional insults. This task requires children to detect and identify *faux pas* in a number of hypothetical vignettes, to answer a comprehension question about the *faux pas*, and to identify the false belief that led to the *faux pas*. Understanding a *faux pas* is particularly important in children's everyday life as recently shown by Banerjee and colleagues (in press) who reported

significant associations between peer rejection and poorer understanding of *faux pas* in children aged between 7 and 11 years.

Another interesting explanation has been recently advanced by Hughes (2011). She affirms that the lack of a strong and clear association between children's theory of mind and their peer relationships could reflect a theoretical rather than methodological issue. Considering the profound discrepancy that may exist between *having* an ability and *using* it in real life situations, Hughes argues that we cannot expect children with good theory of mind (as indexed by classic and advanced tasks) to always use their knowledge in a similar way when interacting with peers. We argue that such a perspective is very significant in consolidating the socio-constructivist approach, because it helps us understand how theory of mind is not only constituted, but also applied, within social relationships. Thus, the theory-of-mind-*built*-in-context perspective needs to be combined with the theory-of-mind-*used*-in-context perspective in order to better understand the link between mindreading and peer relationships.

Such a model is particularly intriguing because it implies that the link between theory of mind and peer relationships is not simply direct but is likely to be mediated by other variables. In the present study we adopt this view by considering, among all the possible factors, the mediating role of prosocial behaviour. It is defined as a series of actions that benefit others and indicate a concern for the wellbeing of another person, such as helping, sharing, comforting and cooperating (Weir & Duveen, 1981). Our rationale for concentrating on prosocial behaviour as a key mediating variable comes from previous evidence for a strong link between the frequency of prosocial acts and both peer relationships and theory-of-mind understanding at this age (Slaughter et al., 2002). On the one hand, children who frequently engage in prosocial acts are more likely to show high level of cooperative play with friends in preschool (Dunn & Cutting, 1999), to build sincere friendships after the transition to primary school (Dunn, Cutting, &

Fisher, 2002), and to be popular among their peers (Denham, McKinley, Couchoud, & Holt, 1990). On the other hand, children who tend to display low levels of prosocial behaviour are often rejected by their peers (Parkhurst & Asher, 1992). Interestingly, this association was found not only in preschoolers but also in young adolescents (Pakaslahti, Karjalainen, & Keltikangas-Jarvine, 2002).

Furthermore, children's level of prosocial behaviour, in turn, appears to be predicted by their social understanding. Being able to put oneself in another child's shoes seems to be a fundamental prerequisite for prosocial behaviour (Eisenberg & Mussen, 1989). Consistent with this view, children who score higher on theory-of-mind measures, such as emotion-understanding, perspective-taking and false-belief tasks, are more likely to frequently engage in prosocial behaviours (Dekovic & Gerris, 1994; Denham, 1986; Denham et al., 1990; Lalonde & Chandler, 1995; Nelson & Crick, 1999; Slaughter at al., 2002; Strayer, 1980). Thus, children whose advanced mindreading skills make them particularly sensitive to what the other children think and feel are also particularly good at helping and comforting others.

The present study

In the empirical work reported here, we focused on the transition to school as it is "one of the first rights of passage children experience in their formative years" (McIntyre et al., 2006, p. 349). At school entry, children are faced with heightened demands for well-regulated and goal-directed activities, including sustained behavioural inhibition, compliance with rules, and the capacity to initiate and sustain positive interpersonal relationships with teachers and peers (Campbell & von Stauffenberg, 2008; Kellam, Rebok, Ialongo, & Mayer, 1994). Together, these factors have been recently considered equally important for children's school readiness. Indeed, Denham (2006) and Mashburn and Pianta (2006) have re-defined this construct highlighting the

importance of children's social-emotional competence and social relationships in shaping developmental trajectories within the school context.

We addressed the key methodological and theoretical issues identified above by: a) considering the social-cognitive achievements of children as they navigate the transition to primary school (from ages 5 to 7 years); b) utilising a wide range of age-appropriate theory-of-mind tasks; c) investigating – among the many possible mechanisms that might contribute to the relationship between theory of mind and relationship with peers – children's prosocial behaviour as a mediator; and d) considering the possibility of distinctive links with peer acceptance versus rejection.

Crucially, we investigated these associations between children's theory of mind, prosocial behaviour, and peer relationships using a longitudinal design. It seems possible that some of the ambiguities in previous research stem from a failure to consider effects of theory of mind on peer relations *over time*. Although a cross-sectional approach is obviously less time consuming, it can reveal only a small portion of the mosaic. Thus, in the present study, we followed a group of children from the last year of preschool through the second year of primary school. Longitudinal measurement of the key variables across multiple time points allowed us to conduct cross-lagged analyses that reveal if and to what extent a given variable (e.g., theory of mind) can predict changes over time in other variables (e.g., peer relations). In addressing such an issue, we also wanted to control for verbal ability, since prior research has suggested links with theory of mind (Milligan, Astington, & Dack, 2007), social competence (Putallaz, 1983) and prosocial behaviour (Slaughter et al., 2002).

Overall, the present study had two main hypotheses, based on our theoretical formulation. First, we expected to find a longitudinal association between early theory of mind and later peer relationships, independently of the role of verbal ability. Second, we hypothesised indirect paths

from early theory of mind to subsequent peer relationships, via differences in prosocial behaviour. In evaluating these two hypotheses, we suggest that a full understanding of the mediating role of prosocial behaviour in the connection between theory of mind and peer relations entails a separate consideration of peer acceptance and rejection (Newcomb & Bukowski, 1983). Whereas peer acceptance is reflected in the number of most-like peer nominations received by a child, peer rejection is reflected in the number of least-like nominations received.

Unfortunately, very few studies have adopted a perspective that differentiates acceptance and rejection, and this limits our understanding of how theory of mind might be precisely connected with interpersonal relations. However, the rationale for looking separately at these two dimensions is strengthened by the results of work showing that acceptance and rejection, despite being moderately related one another, are not polar opposites (Bukowski, Sippola, Hoza, & Newcomb, 2000). In particular, Bukowski and colleagues found a high level of heterogeneity in rejection at the low end of acceptance and vice versa. Furthermore, Banerjee et al. (in press) found more consistent links between *faux pas* understanding and peer rejection rather than peer acceptance. However, they also cautioned that the connections with peer acceptance need to be examined in further research, since both low levels of acceptance and high levels of rejection are conceptually plausible correlates of children's interpersonal and social-cognitive difficulties. The present study offers an opportunity to investigate subtle distinctions related to this issue at a crucial age, when children are negotiating peer interactions during the transition to school.

It should be noted that this study, by tracing developmental trajectories connecting theory of mind and peer relations in Italian children, is one of relatively few that involve children from non-English speaking Western countries. This is a relevant issue from both a theoretical and an empirical point of view as it speaks to the nature/nurture debate in theory-of-mind development.

Previous research has shown that Italian children lag behind their British counterparts between 5 and 6 years of age (Hughes et al., 2011; Lecce & Hughes, 2010) and during preadolescence (Lecce & Hughes, 2009). The present study will build on previous studies by evaluating theoretically-driven hypotheses about how individual differences in Italian children's theory of mind are connected with their social profiles.

Method

Participants

A sample of 84 Italian children was recruited via kindergartens and also invited to participate 12 and 24 months later; our analyses are based on the 70 children (39 boys) for whom complete data were available for the key variables of this study. It should be noted that data on theory of mind at Time 1 in a subsample (67%) of these children were also examined in a cross-cultural study by Lecce and Hughes (2010). Children were 5 years old ($M = 67.25$ months, $SD = 4.32$ months, range = 54-75 months) at Time 1, 6 years old ($M = 78.31$ months, $SD = 3.07$ months, range = 72-84 months) at Time 2, and 7 years old ($M = 90.14$ months, $SD = 3.19$ months, range = 83-96 months) at Time 3. The schools were located in the city of Pavia (North of Italy) and surrounding towns, in areas with mixed socio-economic backgrounds. At Time 1 children were attending 12 different kindergartens (15 classes): 10 public schools (12 classes) and 2 private schools (3 classes). At Time 2 children moved to 17 different primary schools (20 classes): 16 public schools (19 classes) and 1 private school (1 class). At Time 3 children did not change schools. All the children were of Caucasian origin and native Italian speakers. No participant was clinically referred for cognitive or learning difficulties.

With regard to parental occupation, 19.05% of the fathers were in professional/managerial occupations, 34.92% were in skilled non-manual occupations, and 46.03% were in manual occupations or unemployed; 12.31% of the mothers were in professional/managerial occupations, 56.92% were in skilled non-manual occupations, and

30.77% were in manual occupations or unemployed. With regard to parental education, 29.69% of fathers and 27.69% of mothers had a University degree, 31.25% of fathers and 47.69% of mothers had the equivalent of A-levels (i.e., high school diploma), and 39.06% of fathers and 24.62% of mothers had the equivalent of General Certificates of Secondary Education (GCSEs). On the basis of parental education and occupation, socioeconomic status was estimated for each child through the procedure described by Hollingshead (1975). Children's socioeconomic status was distributed as follows: 17.46% medium-low category, 19.05% medium category, 49.21% medium-high category, and 14.29% high category. In terms of family structure, 37.05% of the children were singletons, 50.00% had one sibling, 10.94% had two siblings, and 1.56% had three siblings.

Procedure

Data collection took place every year between March and April, at the end of the Spring Term. Parental written consent was obtained at each time point. To obtain consent, a letter explaining the study was delivered to the parents by the teachers. About 95% of the contacted families gave consent to participate in the study. At every time point, each child was individually administered a battery of theory-of-mind tasks and a verbal ability task. The tasks were counterbalanced for order over the testing occasions across children. In addition, two teachers rated children's prosocial behaviour at all time points. Finally, peer sociometric nominations were collected after the transition to primary school, i.e., at Time 2 and Time 3, when children had known each other respectively for at least seven and nineteen months. The entire class for each participating child provided peer nominations (total $n = 501$).

Design

At Time 1 and Time 2 children completed a battery of theory-of-mind tasks (first order and second-order false belief, and mixed emotion understanding) previously used by Hughes and

colleagues (Hughes et al., 2000) and a verbal ability test (Peabody Picture Vocabulary Test Revised - Dunn & Dunn, 1981). At Time 3 children were administered the Theory of Mind Test (Pons & Harris, 2002) and the Test of Emotion Comprehension (Pons & Harris, 2000) as measures of theory of mind, and the Test for Reception of Grammar (Bishop, 1982) as a measure of verbal ability.

As for prosocial behaviour, at each time point we asked two teachers to complete together for each child the Cooperation subscale from the Social Skills Rating System (SSRS - Gresham & Elliott, 1990) and the Prosocial subscale from the Strengths and Difficulties Questionnaire (SDQ - Goodman, 1997). At Time 2 and Time 3, teachers also completed the Prosocial scale from the Child Behavior Scale (CBS - Ladd & Profilet, 1996).

Finally, at Time 2 and Time 3 we measured children's peer rejection and popularity using the sociometric nominations in the context of the classroom.

Measures

Theory of Mind - False belief understanding (Time 1 and Time 2). Following the procedure suggested by Hughes and colleagues (2000), we administered two standard first-order false-belief tasks: an unexpected content (Wimmer & Hartl, 1991) and an unexpected transfer task (Wimmer & Perner, 1983). In each task children were credited with one point if they correctly answered both the experimental and the control question. We also administered two second-order false-belief stories based on the simpler second-order task developed by Sullivan, Zaitchik and Tager-Flusberg (1994). Each story involved a first- and a second-order false-belief question as well as control reality questions. In each story and for each type of false-belief question (first-and second-order) children were credited with success (one point) only if they passed both the test and the control question. Finally, we administered two belief-desire reasoning tasks presenting either a nice surprise or a nasty surprise (Harris, Johnson, Hutton,

Andrews, & Cooke, 1989). Each story involved a first-order false belief and then an emotion-based-on-false-belief question as well as control reality questions. Again, children were credited with success (one point) only if they passed both the test and the control question. Therefore possible total scores range from 0 to 10.

Theory of mind - Mixed emotion understanding (Gordis, Rosen, & Grand, 1989) (Time 1 and Time 2). Children's understanding of emotions was assessed using six stories of a storytelling interview. In the first "explain" set, children were told three stories, in which it was made explicit that the protagonist felt two conflicting emotions and children were asked to explain why the character felt each emotion. In the second "infer + justify" set, children were told three stories, and asked both to infer and explain how the character felt. Children's answers were scored: 0 for no emotion explained/stated, 1 for one emotion, or 2 for two opposite-valence emotions. Possible scores therefore ranged from 0 to 12 points.

Theory of Mind Test (TMT - Pons & Harris, 2002) (Time 3). The TMT consists of a book with a scenario on every page. The test is divided into ten blocks, each made up of three items, to give a total of thirty items presented in a fixed order. Each block evaluates a specific component of theory of mind (Flavell, 2004): (a) Level 1 perspective taking; (b) Level 2 perspective taking; (c) Understanding of intentionality; (d) Understanding of ignorance; (e) Understanding of first-order false belief; (f) Understanding of the distinction between appearance and reality; (g) Understanding of lies; (h) Understanding of jokes; (i) Understanding of second-order false belief; (j) Understanding of double-bluff. We administered 22 items out of 30: 2 items for components (a) to (h) and 3 items for components (i) and (j), that are particularly informative given the age of the participants. The administration procedure is divided into two steps. The experimenter, while showing a drawing, reads the corresponding story regarding the

depicted characters and the child is asked to give an answer choosing between two options. Scores could range from 0 to 22 points.

Theory of Mind - Test of Emotion Comprehension (TEC - Pons & Harris, 2000) (Time 3). The TEC has a structure very similar to the TMT. It comprises a book (A4 format) with a scenario in the upper part of each page, in which the faces of the depicted characters are left blank. The experimenter, while showing the picture, reads the corresponding story and asks the child to infer the emotional state of the character choosing from four facial expressions. These represent four possible emotions (two positive and two negative) of the character. The test is divided in nine blocks, presented in a fixed order, which evaluate nine components of emotion understanding: (I) Emotion understanding based on facial expression; (II) Understanding of external causes of emotion; (III) Emotion understanding based on desires; (IV) Emotion understanding based on beliefs; (V) Understanding of the influence of a reminder on the present emotional state; (VI) Understanding of the capacity to control a felt emotion; (VII) Understanding of the capacity to hide an emotion; (VIII) Understanding of mixed emotions; (IX) Understanding of moral emotions. Following the authors' scoring system, one point is credited to the investigated component by answering correctly all the questions in a block. Score range: 0-9.

Prosocial behaviour. As anticipated, at each time point two teachers were asked to complete jointly, for each child, the Cooperation subscale of the Elementary version of the SSRS (Gresham & Elliott, 1990). This subscale is made up of 10 items based on a 3-point scale (scores range: 0-20). In addition, they filled in the 5-item Prosocial subscale of the SDQ (Goodman, 1997) on a 3-point scale (scores range: 5-15). Finally, at Time 2 and Time 3 teachers also completed the 7-item Prosocial scale of the CBS (Ladd & Profilet, 1996) on a 3-point scale (scores range: 7-21).

Peer nominations (Coie, Dodge, & Coppotelli, 1982) (Time 2 and Time 3). Each child was given a list of the classmates (with names in random order) and asked to identify the names of three peers whom he/she most liked (ML) and three peers whom he/she least liked (LL). ML and LL nominations received by every child were standardized within each classroom. Peer nominations were provided by the entire class of each participating child. Care was taken to instruct children in the confidentiality of responses.

Verbal ability - Peabody Picture Vocabulary Test - Revised (PPVT-R - Dunn & Dunn, 1981) (Time 1 and Time 2). This test measures children's receptive language. The experimenter reads a word and presents four pictures to the child, who is then asked to point to the picture that best represents the word (e.g., "Can you show me the dog?").

Verbal ability - Test for Reception of Grammar (TROG - Bishop, 1982) (Time 3). This test focuses on grammar structures, giving us a more inclusive measure of language ability and therefore serving as a more stringent control for verbal ability in our analyses. The child is asked to choose a picture from four alternatives which best corresponds to the meaning of the word or sentence read aloud by the experimenter. The test comprises eighty items, divided into twenty blocks, presented in a fixed order. Each block contains four items which measure the same syntactic ability. In the present research we took into consideration the total number of blocks passed (range 0-20).

<div align="center">Results</div>

We begin by presenting preliminary results on data reduction strategies for the construction of an overall index of theory of mind and prosocial behaviour at each time point. For each of these aggregates we provide Cronbach's alpha as a measure of internal consistency. Next, we present descriptive statistics before turning to the main hypothesis of the study. We computed correlations between variables both within and across time, and then used AMOS

software for structural equation modelling (using criteria for assessing model fit from Hu &

Bentler, 1998; 1999) to evaluate longitudinal associations between theory of mind, prosocial

behaviour and peer nominations. Separate analyses were undertaken for the prediction of most-

like (ML) and least-like (LL) nominations in order to allow for distinct patterns regarding the

precursors of peer acceptance and peer rejection.

Data reduction and preliminary analyses

At each time point we constructed an aggregate measure of children's theory of mind, by

standardizing the score for each task and then summing these standardized scores. Cronbach's

alphas indicated that the internal consistency of the theory of mind aggregate was acceptable at

Time 1, $\alpha = .71$, and adequate though modest at Time 2, $\alpha = .66$, and at Time 3, $\alpha = .64$. These

values were not affected by the deletion of single items indicating that each task equally

contributed to the aggregate score. The construction of theory-of-mind aggregates was

supported by the results of two further separate analyses. First, a factor analysis using varimax

rotation yielded a single factor explaining 47%, 43% and 57% of the variance at Times 1, 2, and

3 respectively. Factor loadings were larger than .54 at Time 1, .41 at Time 2 and .53 at Time 3.

Second, the correlations between false belief and social outcomes at each time point (prosocial

behaviour at Time 2, peer acceptance and peer rejection at Time 3) were not significantly

different in strength from the corresponding correlations for emotion understanding, $z \leq 1.13$, *ns,*

95% CIs [-.14, .49], [-.28, .38], [-.36, .29] at Time 1; $z \leq .58$, *ns,* 95% CIs [-.25, .40], [-.23, .41],

[-.41, .24], at Time 2; and $z \leq 1.60$, *ns*, 95% CIs [-.55, .06], [-.20, .44], [-.53, .08] at Time 3.

Given these results, we used an aggregate of theory of mind at all three time points. Similarly,

we constructed an overall index of children's prosocial behaviour at each time point by summing

the standardized scores for the various subscales listed in the Method section. Internal

consistency was good at Time 1, $\alpha = .72$, and excellent at the last two time points, $\alpha > .94$.

Table 1 shows the descriptive statistics for the components of each construct at every time point. Considerable variation in performance on the theory-of-mind and verbal ability tasks was evident at each time point; in addition, a wide range of individual differences was apparent for teachers' ratings of prosocial behaviour. Results showed that less than 3% of children performed at ceiling on false-belief and verbal ability tasks at all time points; between 10% and 18% performed at ceiling on emotion understanding. Regarding teachers' rating of prosocial behaviour, between 7% and 31% of children were evaluated at ceiling on single subscales. However, when we consider the aggregate score distribution, the percentage of children scoring at ceiling noticeably diminished: 0% at Time 1, 7% at Time 2 and 6% at Time 3.

A series of independent-samples t-tests showed no significant gender differences on theory of mind at Time 1, $t(68) = .74$, ns, $d = 0.35$, 95% CI [-0.99, 0.45], at Time 2, $t(68) = 1.06$, ns, $d = 0.26$, 95% CI [-1.02, 0.31], and at Time 3, $t(68) = 1.14$, ns, $d = 0.28$, 95% CI [-1.11, 0.30]; on peer acceptance at Time 2, $t(68) = 1.07$, ns, $d = 0.26$, 95% CI [-0.24, 0.78], and at Time 3, $t(68) = .53$, ns, $d = 0.13$, 95% CI [-0.34, 0.58]; on peer rejection at Time 2, $t(68) = 1.92$, ns, $d = 0.47$, 95% CI [-0.01, 0.80], and at Time 3, $t(68) = .74$, ns, $d = 0.18$, 95% CI [-0.24, 0.52]; on verbal ability at Time 1, $t(68) = .36$, ns, $d = 0.09$, 95% CI [-6.58, 9.51], at Time 2, $t(68) = 1.43$, ns, $d = 0.35$, 95% CI [-2.52, 15.22], and at Time 3, $t(68) = 1.29$, ns, $d = 0.30$, 95% CI [-1.97, 0.42]. The only significant gender differences were found on prosocial behaviour at Time 1, $t(68) = -2.48$, $p < .05$, $d = 0.57$, 95% CI [-0.93, -0.10], and at Time 3, $t(68) = 2.13$, $p < .05$, $d = 0.52$, 95% CI [-2.50, -0.08], with boys (Time 1: $M = -.45$, $SD = 1.49$; Time 3: $M = -.46$, $SD = 2.64$) rated as showing less prosocial behaviour than girls (Time 1: $M = .56$, $SD = 1.96$; Time 3: $M = .83$, $SD = 2.35$).

Associations between variables

Before commenting on the main results, we report the correlations among all the variables considered in the study as a prelude to our model testing. As shown in Table 2, individual differences in verbal ability, theory of mind, prosocial behaviour and peer nominations were all stable across time points (mean r_{T1-T2} = .45, p < .01; mean r_{T2-T3} = .47, p < .01). Interestingly, individual differences in theory-of-mind performance show significant stability over one-year time periods even after the stability of individual differences in verbal ability is taken into account, partial $r \geq .31$, p = .01; the correlation between Time 1 and Time 3 approached significance, partial r = .21, p = .08. Table 2 also shows that verbal ability and theory of mind were significantly associated only at Time 1, and not at subsequent time points. However, there is no significant contrast in the strength of this association across time points, z < 1.06, ns. Verbal ability, moreover, is correlated neither with prosocial behaviour nor with peer nominations within any time point, indicating a separate trajectory for this type of language, in comparison with social behaviour and relationships. Overall, early verbal ability is significantly related with social outcomes at Time 3. Here it is also important to note that teachers' and peers' evaluations of children's social relationships (prosocial behaviour and sociometric nominations respectively) show a good concordance both at Time 2 and Time 3.

Regarding the associations between the key variables of this study, Table 2 illustrates that although the measures of theory of mind, prosocial behaviour, and sociometric nominations were not consistently associated within each time point, there was a clear pattern of correlations among these variables over time, as predicted. Specifically, Time 1 theory of mind was associated with Time 2 prosocial behaviour, which in turn was associated positively with Time 3 ML nominations and negatively with Time 3 LL nominations. Interestingly, a test comparing the absolute value of the correlation between Time 2 prosocial behaviour and Time 3 ML nominations (.29) with the absolute value of the correlation between Time 2 prosocial behaviour

and Time 3 LL nominations (.50) showed a difference approaching statistical significance ($p<$ .09).

In our main analysis, we used structural equation modelling to examine cross-lagged associations among the variables from Time 1 to Time 2 and from Time 2 to Time 3, taking into account the stability of each variable over time and any variance explained by verbal ability. Following recommendations by Hu and Bentler (1999), we used the following absolute fit indices (suitable for models with samples smaller than 250 subjects): the Steiger's root-mean-square error of approximation (RMSEA), the comparative fit index (CFI) and the standardized root-mean-square residual (SRMR). Regarding the RMSEA, values below .05 indicate a very good fit and those below .10 indicate a reasonable fit (Steiger, 1990); regarding the CFI, values above .95 indicate good fit and between .90 and .95 an acceptable fit (Bentler, 1990); finally, the SRMR needs to be below .08 to indicate a good fit (Hu & Bentler, 1998). We also report the χ^2, that should ideally not be significant in a good model, as it indicates no significant difference between the postulated model and the real data. It should be noted that verbal ability was included in our analyses as a control variable, predicting all scores at all the time points. We also allowed error terms for prosocial behaviour, ML and LL nominations to covary within time points, to allow for potential unmeasured variables that could have influenced these relationships.

We conducted separate modelling analyses for predicting LL nominations and for predicting ML nominations, in order to track specific pathways related to peer acceptance and peer rejection, respectively. In each case, we began with a model including all auto-regressive and cross-lagged paths, and then removed the non-significant paths. This resulted in the two models shown in Figure 1 (predicting LL nominations) and Figure 2 (predicting ML nominations). For both models we obtained a reasonable fit. The values for the LL nominations

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model were: χ^2 (34) = 36.72, p = .344, *CFI* = .982, *RMSEA* = .034, *SRMR* = .063; the values for

the ML nominations model were: χ^2 (34) = 37.20, p = .324, *CFI* = .968, *RMSEA* = .037, *SRMR* =

.067. As outlined before, the values of χ^2, CFI, RMSEA, and SRMR demonstrated good fit.

Results show that theory of mind at each time point predicted increased prosocial behaviour at

the subsequent time point. With regard to the prediction of sociometric nominations, the two

models showed distinctive patterns. Specifically, prosocial behaviour at each time point

predicted decreased LL nominations at the subsequent time point. However, prosocial behaviour

predicted increased ML nominations only from Time 2 to Time 3, and there was also an

additional independent effect of Time 2 theory of mind on Time 3 ML nominations.

We next evaluated our hypothesised indirect (mediated) pathways, using 1000 bootstrap

samples to estimate confidence intervals; for the purpose of these analyses, we accounted for the

direct effects of the initial variable on the outcome variable even when they were non-significant.

First, the indirect effect of Time 1 theory of mind on Time 3 LL nominations, mediated by Time

2 prosocial behaviour was found to be significant (standardized indirect effect, z = -.12, p < .01).

Next, we also found a significant indirect effect of Time 1 theory of mind on Time 3 ML

nominations, mediated by Time 2 prosocial behaviour (standardized indirect effect, z = .094, p <

.05).

Moreover, an examination of modification indices of both models showed that adding

any further cross-lagged paths would not significantly improve model fit. Finally, in order to

assess whether the cross-lagged paths were moderated by gender, we evaluated the two final

models before and after forcing all cross-lagged path coefficients to be equal for boys and girls,

and there was no significant deterioration in fit (for the model predicting LL nominations, $\Delta\chi^2$

(4) = 2.26, p > .10; for the model predicting ML nominations, $\Delta\chi^2$ (4) = 2.56, p>.10).

Discussion

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Our results shed light on the socio-cognitive and behavioural predictors of children's peer relationships across the transition to school. First, the analyses revealed that individual differences in children's early theory of mind significantly predict later prosocial behaviour. In addition, children's prosocial behaviour at age 6 significantly predict later peer relationships. Thus, children who showed higher prosocial behaviour in the first year of primary school were more likely to be accepted (and less rejected) by their classmates one year later. Furthermore, cross-lagged analyses revealed that prosocial behaviour mediates the relationship between theory of mind and peer rejection, and that prosocial behaviour and theory of mind both contribute to predicting peer acceptance.

Linking theory of mind and peer relations

A major accomplishment of our longitudinal study is that we have been able to establish associations over three years between theory of mind, prosocial behaviour, and peer relationships. First, our study confirmed the stability of individual differences in the level of theory of mind, prosocial behaviour and peer nominations (both positive and negative) across time. Specifically, rather than seeing development in terms of random fluctuations in task performance over time, our findings add to previous studies showing enduring patterns of individual differences in theory of mind (e.g., Lecce, Zocchi, Pagnin, Palladino, & Taumoepeau, 2010), prosocial behaviour (e.g., Ensor, Spencer, & Hughes, in press) and peer nominations (e.g., Ladd, Birch & Buhs, 1999), and extend the present literature proving that these individual differences are stable over a 2-year period.

Crucially, even after controlling for this developmental stability, our results provided support for the mediational hypothesis about the indirect link between theory-of-mind skills and better peer relations, via higher levels of prosocial behaviour. First, our analyses revealed a longitudinal link between early theory-of-mind skills and peer acceptance/rejection two years

later. As noted earlier, Dockett (1997) found that a significant amount of the variability in peer popularity among preschoolers was explained by theory of mind, suggesting that being popular may somehow be linked to having a greater social sensitivity involving superior mindreading abilities. Our study also adds to other evidence that mindreading abilities are – at least sometimes – linked with individual differences in the success of peer relations (e.g., Badenes et al., 2000; Banerjee et al., in press; Cassidy, Werner, Rourke, Zubernis, & Balaraman, 2003; Peterson & Siegal, 2002; Slaughter et al., 2002). However, our study stemmed from evidence of inconsistencies within that same literature suggesting that links between social understanding and interpersonal relations could not always be found. The present study takes us forward by identifying a crucial mediating construct that helps us to understand the mechanism by which theory of mind could exert an influence on social relationships.

As hypothesized, we found that a key proximal consequence of theory of mind was prosocial behaviour, and that the influence of theory of mind on peer nominations was – to a significant extent – dependent on the translation of theory of mind into socially cooperative and helpful behaviours towards others. Specifically, we found a robust association between children's sociocognitive understanding measured during preschool and first year of primary school, and their prosocial behaviour as rated by their school teachers one year later. This association between early psychological understanding and later behavioural outcomes is quite consolidated in the existing literature. Theorists have suggested that a prerequisite of responding sensitively to others' needs includes the ability to understand and infer emotions as well as the "cognitive act of imagining oneself in another's place" (Hoffman, 1982, p. 284). Indeed, existing research conducted on a wide range of populations suggests that the ability to recognise and interpret emotion cues, to engage in affective perspective-taking, and to understand false belief may all contribute to specific positive social behaviours that can be evident in both family

and classroom contexts (e.g., Cassidy et al., 2003; Denham et al., 1990; Eisenberg & Mussen, 1989; Izard et al., 2001; Lalonde & Chandler, 1995; Watson, Nixon, Wilson, & Capage, 1999).

Our results not only reinforce this message about the socially adaptive value of socio-cognitive achievements, but also demonstrate that this functionality is stable across development. Indeed, we found not only that theory of mind at age 5 predicts prosocial behaviour at age 6, but also that theory of mind at age 6 predicts prosocial behaviour at age 7. Most importantly, our modelling of the data leads us to the conclusion that these effects play a large role in promoting more positive (and less negative) relations with peers. As stressed by Strayer (1980) and by Eisenberg, Cameron, Tryon and Dodez (1981), when children use their social skills in interacting with others, a kind of reciprocity in prosocial acts takes place, and such reciprocity facilitates children's social life. Such a view is confirmed by other studies who have reported a relation between children's prosocial behaviour and peer nominations (Bukowski & Newcomb, 1984; Dekovic & Gerris, 1994; Denham et al., 1990; Newcomb, Bukowski, & Pattee, 1993). Thus, a given child's progress in theory of mind can help us explain subsequent transformations in his or her interpersonal relationships, but this depends on the extent to which the social understanding is manifested in prosocial behaviour.

Notwithstanding the support in our data for the overall mediational hypothesis, our study found that the effects of theory of mind and prosocial behaviour on peer relations were somewhat differentiated according to whether we focused on positive (most-like) peer nominations or on negative (least-like) nominations. This issue arises from several considerations. First, the correlation coefficient of the link between prosocial behaviour at age 6 and peer nominations at age 7 is higher for negative rather than positive nominations. Second, the predictive relationship between prosocial behaviour and peer acceptance is significant between age 6 and 7; while the predictive relationship between prosocial behaviour and peer

rejection is significant not only between age 6 and 7, but also between age 5 and 6. Finally, whereas the effect of early theory of mind on later peer rejection was mediated by prosocial behaviour, the mediating role of prosocial behaviour on later peer acceptance was accompanied by an *independent* contribution of theory of mind.

These results pose interesting questions about the different interpersonal consequences that might conceivably arise from having good theory-of-mind abilities. When it comes to predicting active rejection within a peer group, the role of prosocial behaviour appears to be consistently and highly significant: prosocial behaviours at school with one's peers and, in turn, the positive interactions that arise from such behaviours, significantly reduce the risk of been socially rejected. In other words, children seem to be particularly sensitive to the lack of positive social behaviours, such as helping, cooperating and sharing materials and toys, from an early age (Bigelow, 1977; Damon, 1988). Thus, while further work still needs to account for the additional importance of high antisocial behaviour in bringing about active rejection from peers (see Coie, Dodge, & Kupersmidt, 1990; Keane & Calkins, 2004), our study suggests that prosocial behaviours resulting from good theory-of-mind skills may be crucial for protecting the child from dislike, exclusion, and ostracism from the peer group.

In contrast, prosocial behaviour is clearly not the only route from theory of mind to peer acceptance: in order to be chosen as 'favourite classmates', children might need to show the possession of multiple skills simultaneously. While prosocial behaviour undoubtedly promotes greater peer acceptance, theory of mind might also encourage positive relationships by diminishing behaviour problems and by propelling a wide range of potential skills relating to the quality of conversations (Ensor & Hughes, 2008), conflict resolution strategies (Dunn & Herrera, 1997), and effective participation in group activities (Flavell, Green, & Flavell, 1995). Further

longitudinal research is clearly needed to establish these additional mediators of the association between theory of mind and peer acceptance.

Placing social-cognitive development within social context

Recent theoretical integrations of research findings have suggested that we need to understand the construction of social understanding within the context of social interaction (e.g., Astington, 2003; Dunn, 1996). These approaches, which can be captured within a broad socio-constructivist framework (Carpendale & Lewis, 2004), raise important empirical questions about the role of social interactions (e.g., with parents, siblings, peers and teachers) in the development of social cognition. Moreover, and perhaps even more interestingly, adopting such a perspective encourages us to consider how the understanding of other people's minds can be used to build stable and positive social relationships. This last issue deserves more attention in future research as, we believe, adopting a theory-of-mind-used-in-context perspective has pragmatic and theoretical implications for models of social-cognitive development. Indeed, such a view does not imply that having a better understanding of mind would necessarily result in positive outcomes. On the contrary, as discussed in more detail below, the quantity of mindreading *per se* may have little to do with how this knowledge will be *used* in social interactions; the latter clearly depends on a number of additional variables.

In the present study, we focused specifically on developmental processes that occur over the transition to school, which poses new and important demands for well-regulated behaviour both inside and outside the classroom (see Campbell & von Stauffenberg, 2008; Kellam et al., 1994). An intriguing feature of our results is that although theory of mind had longitudinal effects on subsequent prosocial behaviour and peer nominations, it was not consistently connected to prosocial behaviour or peer nominations *within* time points. This finding fits with the idea that theory of mind favours the *development* of behavioural and cognitive abilities

(Lecce, Caputi, & Hughes, in press), and particularly with the notion that time and experience are needed for children to capitalize on the socio-cognitive skills and knowledge that they have acquired (Hughes, 2011). Indeed, other studies have reported distal effects of individual differences in theory of mind on a range of other outcomes such as sensitivity to teacher criticism (Cutting & Dunn, 2002; Lecce et al, in press), academic achievement (Lecce et al., under review), and metacognition (Lecce et al., 2010). Together, these studies testify to the salience of theory of mind in explaining later skills or attitudes, and encourage researchers to take a dynamic perspective in developmental psychology.

Our findings suggest that the early years of primary school life may be a particularly important period for the manifestation of socio-cognitive skills in real-life peer contexts. Indeed, as noted earlier, some previous studies have suggested that even though core developments in theory of mind occur during the preschool period (e.g., acquiring false belief; Wellman et al., 2001), many of the links between social understanding and peer relations may emerge later or become stronger in childhood, after the age of 5 years (e.g., Banerjee et al., in press; Dekovic & Gerris, 1994; Slaughter et al., 2002). This may be the case for at least two reasons. On the one hand, the development of new cognitive abilities simply may not have immediate consequences for behaviour (i.e., use may lag behind understanding; Hughes, 2011). On the other hand, there are good social-contextual reasons for expecting this pattern: entry into primary school has long been regarded as a key social-developmental transition that requires children to manage interactions with a wide range of social partners in a much more independent and self-organised way than in the preschool years (see Higgins & Parsons, 1983). Future research may be able to tease apart these possibilities by examining the longitudinal effects of theory of mind on social behaviour in different countries where the transition to school occurs in different ways and at

different ages, and by examining the developmental trajectories among samples of children from a wider age range (see further comments in Lecce & Hughes, 2010).

This issue raises a further question about if and precisely how theory-of-mind skills come to be reflected in everyday behaviour. As previously mentioned, simply possessing an understanding of others' mental states does not necessarily imply that this understanding will be *used* in social interactions or that it will be used for positive social purposes. Indeed a growing number of studies shows thata sophisticated theory of mind may facilitate self-reports of negative school experience (Dunn, 1995), efforts to deceive, manipulate and bully others (Arsenio & Lemerise, 2001; Astington, 2003; Gini, 2006; Sutton, Smith, & Swettenham, 1999) or in other words to achieve the goals of a 'nasty mind' (Happé & Frith, 1996). In line with this view, the associations between theory of mind and subsequent peer relationships, rather than being direct, appear to be mediated in the present study by prosocial behaviour. However, it is important to note that the association between mindreading and prosocial behaviour in the present study was moderate in size. One interpretation of the data is that superior theory-of-mind skills may be an important platform for prosocial behaviour (which in turn would promote positive peer relations), but may not in themselves guarantee such an outcome. In addition, it is likely that the association between theory of mind and social outcomes may also be moderated by other factors such as temperamental characteristics, social information-processing, motivational biases, age, and the identity of the social partner (e.g., familiar vs. unfamiliar peer). In fact, Renouf and colleagues (2010) have recently shown that among children with average or low levels of prosocial behaviour, theory-of-mind skills can in fact promote higher levels of indirect or relational aggression towards others. Thus, combining the results from research on social cognition with insights gained from studies of social goals in school children (e.g.,

Wentzel, Barry, & Caldwell, 2004) may be a particularly fruitful approach to understanding when and for whom theory of mind leads to certain social outcomes.

A related question concerns how and to what extent experiences of using prosocial behaviour (and having positive relationships as a result) come to have reciprocal influences on the development of social cognition. In the present study, we did not find that either prosocial behaviour or peer nominations could predict improvements in theory of mind, but some other studies have shown that causal links between early social relationships and later sociocognitive understanding may in fact exist. For example, numerous studies on young children have considered the way in which aspects of the mother-child relationship, and particularly dimensions such as the use of mental-state language during conversations (Dunn, Brown, & Beardsall, 1991), picture description (Ruffman, Slade, & Crowe, 2002), picture-book reading (Adrián, Clemente, & Villanueva, 2007) and free play (Meins et al., 2002), may have a causal role in promoting greater theory-of-mind skills. Most recently, Banerjee and colleagues (in press) have shown that peer rejection appears to predict subsequently poorer understanding of unintentional insults. The absence of this causal influence in the present study suggests that the impact of positive versus negative social relations on social understanding may depend crucially on the timescale for the development of that social understanding and/or the particular aspects of social understanding being measured. For example, it is possible that many of the features of theory of mind assessed in the present study could actually have been influenced by early familial experiences. Furthermore, the social-cognitive consequences of individual differences in peer relations may only be evident when using specific, 'naturalistic' measures of social understanding such as *faux pas*.

Limitations and conclusions

A number of limitations in the present study must be recognized. The first, and perhaps more obvious, limitation concerns the sample size. Having an in-depth three-year longitudinal investigation of social-cognitive development among 70 young children is itself an important achievement, and the fact that our mediational hypothesis was found to be corroborated by the data testifies to the salience of these effects during the transition to school. Nonetheless, having a bigger sample size would clearly increase the statistical power and could therefore reveal relationships that did not emerge as significant in the present study. For example, it is entirely plausible that early prosocial behaviour and peer relationships could affect children's subsequent theory of mind reasoning, as has recently been found in older children (Banerjee et al., in press). In addition, having a bigger sample size would allow a more robust investigation of the role played by possible moderators, such as gender, in the proposed model, as well as to consider not only individual differences in continuous scores on the acceptance and rejection dimensions, but also group differences between sociometric status categories (e.g., Coie et al., 1982).

A second area of limitation concerns the measurement of our core constructs. While the combination of a wide range of tasks assessing the understanding of mental states provides us with confidence about having a comprehensive and age-appropriate measures of social comprehension at each time point, it may be the case that qualitatively distinct features of particular facets of social understanding (e.g., appreciating mixed emotions vs. understanding double-bluffs) will have divergent relations with interpersonal functioning. Along the same lines, teachers' ratings of prosocial behaviour and simple most-like and least-like peer nominations can only give us a partial and rather undifferentiated picture of children's social lives at school. In addition, the evaluations by teachers may have inflated results because they tend to show particularly strong associations with children's cognitive characteristics. Adding observational data would certainly help to draw a clearer picture (Denham, 1986; Pepler &

Craig, 1998), although it is important to note that teachers are known to be reliable observers of children's social behaviour, and that previous studies have found significant agreement between questionnaire and observational measures of children's prosocial behaviour (Cassidy et al., 2003; Rydell, Hagekull, & Bohlin, 1997); indeed, in this study, we found that teachers' ratings were significantly correlated with peer nominations. Nonetheless, a careful multi-informant assessment not only of general peer liking, but also of dyadic friendship processes and reputational features (e.g., Parker & Asher, 1993; Zeller, Vannatta, Schafer, & Noll, 2003) would help us to draw a more refined portrait of children's peer relations.

Finally, it is also worth noting another limitation of our measurement approach, this time relating to verbal ability. This was measured using a receptive vocabulary task at Times 1 and 2 and a grammar task at Time 3. As suggested by Ruffman, Slade, Rowlandson, Rumsey and Garnham (2003), the latter task (TROG) not only evaluates syntactic ability but also requires semantic ability to comprehend the words used in syntax tests. Therefore, it can be considered as a more stringent test of verbal ability. In fact, neither the Time 2 nor the Time 3 measure had a significant independent association with theory of mind. However, we recognise that the change in measure makes longitudinal analyses much more difficult to interpret and leaves open the issue of replicability of our results.

Notwithstanding the limitations presented above, this study extends our knowledge of the links between social understanding and interpersonal relations among children. In view of the fact that poor peer relations during childhood are implicated in the aetiology of later deviance (Hoglund, Lalonde, & Leadbeater, 2008), our study may provide an impetus to the efforts of researchers and practitioners focusing on intervention and training to enhance theory-of-mind skills and thereby promote more positive social behaviours and peer relationships (Kloo & Perner, 2008).

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Table 1

Means, Standard Deviations, and range of possible and actual scores of Theory of Mind (ToM), Prosocial Behaviour (PB), and Verbal Ability (VA) measures at all time points.

	Measure	*M (SD)*	Possible Range	Actual Range
Time 1	ToM - False belief understanding	5.17 (2.00)	0-10	1-10
	ToM - Emotion understanding	9.21 (1.91)	0-12	3-12
	PB - Cooperation subscale (SSRS)	16.40 (2.61)	0-20	9-20
	PB - Prosocial subscale (SDQ)	11.47 (2.12)	5-15	7-15
	VA – PPVT	76.36 (16.47)	0-175	49-114
Time 2	ToM - False belief understanding	6.56 (1.74)	0-10	3-10
	ToM - Emotion understanding	9.77 (1.49)	0-12	6-12
	PB - Cooperation subscale (SSRS)	16.03 (4.39)	0-20	3-20
	PB - Prosocial subscale (SDQ)	12.13 (2.38)	5-15	6-15
	PB - Prosocial scale (CBS)	16.39 (3.43)	7-21	7-21
	VA – PPVT	90.83 (18.60)	0-175	51-133
Time 3	ToM - False Belief understanding	17.61 (1.78)	0-22	14-22
	ToM - Emotion understanding	7.09 (1.42)	0-9	2-9
	PB - Cooperation subscale (SSRS)	16.63 (4.12)	0-20	6-20
	PB - Prosocial subscale (SDQ)	11.82 (2.52)	5-15	6-15
	PB - Prosocial scale (CBS)	16.37 (3.67)	7-21	8-21
	VA – TROG	15.47 (2.51)	0-20	9-20

Table 2

Zero-order correlations between Theory of Mind (ToM), Prosocial Behaviour (PB), Most-Like Nominations (ML), Least-Like Nominations (LL) and Verbal Ability (VA) at each time point (T1, T2, and T3).

	T1 ToM	T1 PB	T1 VA	T2 ToM	T2 PB	T2 ML	T2 LL	T2 VA	T3 ToM	T3 PB	T3 ML	T3 LL	T3 VA
T1 ToM	-	.05	.35**	.34**	.34**	.22+	-.06	.28*	.27*	.35**	.37**	-.31*	.29*
T1 PB		-	.14	-.03	.34**	.20+	-.30**	.21+	.18	.33**	.29*	-.30*	.03
T1 VA			-	.13	.05	.09	-.08	.70***	.20+	.30*	.19	-.14	.28*
T2 ToM				-	.15	.02	-.04	.18	.36**	.29*	.30*	-.19	.14
T2 PB					-	.07	-.36**	.22+	.16	.36**	.29*	-.50***	.16
T2 ML						-	-.25*	.21+	.06	.11	.55***	-.18	.04
T2 LL							-	-.13	-.14	-.32**	-.22*	.62***	-.19
T2 VA								-	.31**	.31**	.33**	-.20+	.44***
T3 ToM									-	.23+	.06	-.07	.22+
T3 PB										-	.44***	-.44***	.18
T3 ML											-	-.37**	.12
T3 LL												-	-.15
T3 VA													-

Note. +*p*< .10; * *p*< .05; ** *p* < .01; *** *p*< .001

Figure Captions

Figure 1. Model showing autoregressive and cross-lagged effects of Theory of Mind, Prosocial Behaviour, and Least-Like Nominations over the three time points (error terms and verbal ability are not shown).χ^2 (34) = 36.72, p = .344, CFI = .982, $RMSEA$ = .034, $SRMR$ = .063. +p< .10; * p< .05; ** p < .01; *** p< .001

Figure 2. Model showing autoregressive and cross-lagged effects of Theory of Mind, Prosocial Behaviour, and Most-Like Nominations over the three time points (error terms and verbal ability are not shown).χ^2 (34) = 37.20, p = .324, CFI = .968, $RMSEA$ = .037, $SRMR$ = .067. * p< .05; ** p < .01; *** p< .001

Time 1   **Time 2**   **Time 3**

| Prosocial Behaviour | .31** | Prosocial Behaviour | .32** | Prosocial Behaviour |

.30**

.20+

| Theory of Mind | .31** | Theory of Mind | .34** | Theory of Mind |

-.30**

-34***

| LL Nominations | .48*** | LL Nominations |

Time 1   **Time 2**   **Time 3**

| Prosocial Behaviour | | Prosocial Behaviour | | Prosocial Behaviour |

.32**   .32**

.32**

.23*

| Theory of Mind | .31* | Theory of Mind | .34** | Theory of Mind |

.23*

.25*

| ML Nominations | .51*** | ML Nominations |