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Theory of mind and peer acceptance in preschool children

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Two studies tested the hypothesis that preschool children's theory of mind ability is related to their levels of peer acceptance. In Study 1, 78 children between the ages of 4 and 6 provided peer nominations that allowed determination of social preference and social impact scores, and classification in one of five peer status groups (following Coie & Dodge, 1983). Children were also tested on five different theory of mind tasks. The results showed that theory of mind scores were significantly related to social preference scores in a subsample of children who were over 5 years old. Further, popular children were found to score higher on theory of mind tasks than children classified as rejected. Study 2 replicated and extended the first study with a new sample of 87 4- to 6-year-old children. Study 2 included measures of peer acceptance, theory of mind ability and verbal intelligence, as well as teacher ratings of prosocial and aggressive behaviours. The results of Study 2 showed that for the total group of children, prosocial behaviour was the best predictor of social preference scores. When the Study 2 sample was split into older and younger children, theory of mind ability was found to be the best predictor of social preference scores for the older children (over age 5), while aggressive and prosocial behaviours were the best predictors of peer acceptance in the younger children. Overall, the pattern of results suggests that the impact of theory of mind ability on peer acceptance is modest but increases with children's age.

Between the ages of 3 and 5, young children acquire a theory of mind, that is, the ability to predict and explain the behaviour and feelings of others based on reference to mental states like beliefs, desire and percepts (Astington, 1993; Wellman, 1990). There are individual differences in theory of mind development, and recent work has shown that those individual differences are related to a variety of social and cognitive factors. For instance, theory of mind ability is related to the production of pretend play (Taylor & Carlson, 1997), levels of school adjustment (Dunn, 1995), social competence and

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social roles in school (Lalonde & Chandler, 1995; Sutton, Smith, & Swettenham, 1999), and family variables such as mother–child interaction styles (Dunn, 1994; Peterson & Slaughter, 2002; Ruffman, Perner, & Parkin, 1999) and number of siblings (Jenkins & Astington, 1996; Ruffman, Perner, Naito, Parkin, & Clements, 1998).

The research to date suggests that individual differences in theory of mind ability bear some relation to individual children's social experiences. The purpose of the present studies is to investigate whether theory of mind ability relates to children's levels of peer acceptance. Peer acceptance refers to the extent to which children are accepted or rejected by their peer group. Since the acquisition of a theory of mind reflects children's understanding of other people's mental states and emotional responses, and is related to perspective-taking and empathy (Flavell & Miller, 1998), it is hypothesized that individual children's theory of mind ability will be related to their levels of peer acceptance. This hypothesized relation could come about through two reciprocal pathways. First, children who are relatively advanced on measures of theory of mind ability may be relatively popular, as their theory of mind skills may enable them to recognize and appreciate the desires, perspectives, emotions and thoughts of their peers, and this level of interpersonal sensitivity might lead to a child's being relatively well liked within his or her peer group. Second, it is hypothesized that adequate relations with peers form an important social context within which children acquire many of their socially competent skills (Asher & Coie, 1990; Coie & Gillessen, 1993; Ladd, 1990), including theory of mind. Children who are popular in their peer groups may exhibit relatively advanced theory of mind skills because they enjoy more opportunities to interact with their peers, and thereby develop their understanding of others' minds.

The method most commonly used to measure children's peer acceptance was developed by Coie and Dodge (1983) and involves all children within the peer group making both positive and negative peer nominations. These nominations allow researchers to calculate individual children's *social preference* and *social impact* within their peer group. Social preference refers to the extent to which a child is liked by his/her peers and is derived by subtracting children's negative peer nominations from their positive peer nominations. Social impact refers to the degree to which a child is noticed by his/her peers and is derived by summing both positive and negative peer nominations (Coie & Dodge, 1983). Based on these two measures, children can be classified as popular, controversial, average, neglected or rejected within their peer groups.

There is a large body of research investigating both cognitive and behavioural factors that influence peer acceptance in school-aged children. Cognitive variables that have emerged as important factors in influencing children's peer status include intelligence, language ability and perspective-taking (Coie, Dodge, & Kupersmidt, 1990). In general, children who are relatively high on these cognitive variables are more likely to be well-liked by their peers. There are also numerous behavioural variables that have been shown to be related to children's peer status. Two behavioural variables that have been consistently shown to affect peer status are aggression and prosocial behaviour. Aggressive behaviour generally refers to those behaviours that are either physically or verbally aggressive to another peer, such as hitting or swearing, or those behaviours that disrupt or disturb a peer such as snatching a book or a toy from another child (Newcomb, Bukowski, & Pattee, 1993). Prosocial behaviour refers to those behaviours that indicate a concern for the well-being of another person such as helping, sharing, comforting and cooperating (Weir & Duveen, 1981). In general, those children who

become popular in their peer group have been found to engage in high levels of prosocial behaviour and low levels of aggressive behaviour, while children who become rejected in their peer group tend to show the opposite pattern of behaviour in interactions with their peers. Further, it has been suggested that rejected and popular children are more likely to differ in their production of prosocial than aggressive behaviours (Bukowski & Newcomb, 1984; Hartup, Glazer, & Charlesworth, 1967), suggesting that theory of mind skills like perspective-taking and empathy that may assist children to behave prosocially (Lalonde & Chander, 1995) could be particularly influential in determining children's peer acceptance.

Dekovic and Gerris (1994) investigated both prosocial behaviour and social–cognitive abilities in school-aged children who were popular and rejected. The social–cognitive tasks they used included affective perspective-taking, interpersonal understanding, prosocial moral reasoning and an empathy task. Their results confirmed that popular children had relatively high levels of social–cognitive functioning and also engaged in high levels of prosocial behaviour, compared to rejected children. These differences between popular and rejected children were found to be larger for the older children (seventh graders) than for the younger children (third graders), possibly reflecting the cumulative nature of peer rejection. This cumulative model rests on the assumption that the development of social–cognitive skills and peer acceptance are mutually reinforcing, as outlined above. Those children who are rejected by their peers are not able to gain access to a peer context that would allow them to develop the very social skills necessary to increase their peer acceptance.

Given this cumulative model, it becomes important to investigate factors that influence peer acceptance and rejection in even younger children, for instance preschoolers, who are entering into their first peer groups at the same time that they are typically developing a theory of mind.

Several recent studies have directly examined links between preschool-aged children's theory of mind ability and peer acceptance. Dockett (1997) tested 3- to 5-year-old children on their understanding of the appearance–reality distinction and false beliefs, and measured their degree of popularity (assessed with positive peer nominations only) within their peer group. The theory of mind scores obtained were found to explain a significant amount of the variance in peer popularity, suggesting that popular children may have a greater sensitivity than unpopular children to other people's differing psychological states.

Watson, Nixon, Wilson, and Capage (1999) found that 4- to 6-year-old children's theory of mind ability, measured by standard false belief tests, was not significantly related to teacher ratings of popularity when the effects of language ability were controlled. Theory of mind scores were, however, uniquely related to teacher ratings of social skills across two different experiments. The lack of relation between theory of mind ability and popularity in this study may indicate that teachers can more accurately rate social skills, reflected in behaviour and attitudes, than popularity.

Badenes, Estevan, and Bacete (2000) investigated relations between 4- to 6-year-olds' theory of mind ability, measured with a battery of tasks and peer acceptance, measured with a peer nomination procedure similar to that of Coie and Dodge (1983). The comparisons among popular, average and rejected boys and girls revealed few differences on theory of mind measures. The popular girls were significantly better than average or neglected girls on a deception task, though performance on the other theory of mind tasks (including false belief) did not vary with peer acceptance. The rejected boys performed significantly worse than their peers on one theory of mind task (the

white lie task) and also demonstrated significantly more hostile attributions in tasks requiring explanations of other people's behaviour. Interestingly, these results held for the older (age 6), but not the younger rejected boys, reinforcing the hypothesis that peer rejection has cumulative effects on children's social development.

Thus, to date, there is no clear consensus on whether and how theory of mind ability is related to peer acceptance in preschoolers, though overall, the results of published studies tend to suggest that popular or socially skilled children (cf. Lalonde & Chandler, 1995) may be relatively advanced in their theory of mind understanding. The two studies reported here were designed to establish whether theory of mind ability influences peer acceptance in preschoolers and to investigate the extent of that influence relative to some of the behavioural variables known to be important predictors of peer acceptance in young children. Specifically, Study 1 investigates the hypothesis that theory of mind ability is positively related to peer acceptance in preschool-aged children. Study 2 investigates the relative importance of theory of mind, verbal ability and aggressive and prosocial behaviours to peer acceptance in preschoolers.

STUDY 1

Method

Participants

The participants in this study were 80 children (41 boys, 39 girls) between the ages of 53 months (4 years, 5 months) and 72 months (6 years, 0 months). The children attended five classes in five different child care centres in middle-class suburbs of a large Australian city.

Class sizes ranged from 12 to 21 children, with the number of boys and girls within each class being almost equal. Twenty-five additional children attended these classes but did not participate in the study due to a lack of parental consent. One girl was lost halfway through the study due to holidays, and another girl was eliminated because she was only 48 months old (5 months younger than the next youngest child) at the time of testing. The final sample ($N = 78$) represented 76.2% of students across the five classes. All children attended the child-care centres at least 3 days per week.

Procedure and measures

Children were tested separately by a female experimenter for approximately 10–15 min on two occasions. On the first occasion, children were given two theory of mind tasks and a peer nomination task that was used to determine peer status. On the second occasion, children were given the remaining three theory of mind tasks and the peer nomination task again, so as to calculate reliability for the peer status classifications. Eleven children had to be followed up as they were absent either on the first occasion ($N = 3$) or on the second occasion ($N = 8$). For the final sample, 1–2 weeks passed between occasions one and two. No more than 4 weeks passed between testing sessions for those children who were tested on a third occasion.

Theory of mind tasks

Five theory of mind tasks were used in the present study: two standard unexpected contents false belief tasks (Gopnik & Astington, 1988), a conflicting emotion task, a conflicting desire task, and a version of the Four Sweets task (Baron-Cohen, 1994). Each of these tasks was designed to measure children's ability to identify two different mental-state perspectives on the same situation. See the Appendix for a full description of tasks and task scripts.

Each task involved a short story about a child who was the same age as the participant, and children in the stories were matched with the gender of the participants. Pictures used within each task were presented on 25 cm × 31 cm pieces of cardboard. The pictures of story characters differed in hair type and colour to allow children to differentiate between different stories. The two false belief tasks were always presented together as they relied on the same materials. The tasks were counterbalanced for order over the two testing occassions using a partial Latin square.

Scoring theory of mind tasks

Each theory of mind task was scored on a pass/fail basis. In order to pass a task, children were required to answer correctly all control questions and test questions.

A total theory of mind score was computed by adding together children's pass/fail scores on the individual theory of mind tasks (e.g. Self belief, Other belief, Emotion, Desire, Four Sweets).[1] This composite theory of mind score was created to reflect children's overall, multifaceted understanding of mental states. Research has shown significant intercorrelations among various theory of mind tasks, suggesting that they tap aspects of a single ability (Gopnik & Astington, 1988; Moore, Pure, & Furrow, 1990; Slaughter & Gopnik, 1996). Further, a reliability analysis on children's performance on the five tasks revealed a Cronbach's alpha of .51, which was considered a reasonable figure for internal reliability on a 5-item scale. The total theory of mind scores ranged from 0 to 5, reflecting levels of children's understanding of mental states.

Measurement of peer status

Children's peer status was determined using the method described by Coie and Dodge (1983). Peer status measures were based on the nominations taken on the testing occasion when all children in the classroom group who were participating in the study were present. The peer nominations of the child who was lost halfway through the study were used in the determinations of status in her classroom group, but her theory of mind data were not included in any analyses because she did not have a full data set. The peer nominations of the child who was eliminated from the study because she was an age outlier were also retained for the calculations of status in her classroom group.

Before testing commenced on the first occasion, children were photographed in groups of one to four using a Polaroid camera. These photographs were then cut up into strips so that children had their own individual photographs. Photographs were cut up so that the presentation of the order of these photographs could be randomized and

[1] *A few children reported unexpected preferences on the control questions of the emotions (N = 2) and/or desires (N = 6) tasks. Since these children therefore did not report a preference that was in conflict with that of the story character, their correct answers to questions about the story characters' desires or emotions were ambiguous; they could simply have reported their own desires or emotions. For those children, the tasks for which they gave ambiguous answers were dropped, and their total theory of mind scores were computed from four (instead of five) tasks, each with a weighted passing score of 1.25.*

so that children did not, for example, nominate three children because they were in the same photograph together. These individual photograph strips were attached to a piece of cardboard (31 cm × 25 cm). After the completion of the two theory of mind tasks on the first and second occasions of testing, children were presented with the photographs of their classroom peers who were also participating in the study. The experimenter guided children through the photographs of their classroom peers and asked them to name each child. All children were familiar with the names of their classroom peers.

Children were then requested to nominate the three children they liked to play with the most (Like Most—LM) and the three children they did not like to play with very much (Like Least—LL). All children made three positive (LM) and negative (LL) nominations on the testing occasion that was used for the categorization of children into peer status groups. All nominations made by each child were considered to be of an equivalent value in the calculation of LM nominations and LL nominations for each child. The LM nominations and LL nominations were then standardized within each individual classroom group. These standardized LM and LL scores were then used to calculate a social preference score (SP) and a social impact score (SI) for each child. Social preference scores were calculated by taking children's individual standardized LL score from their standardized LM score (i.e. SP = LM − LL). Social impact scores were calculated by adding each child's individual standardized LM score to their individual standardized LL score (i.e. SI = LM + LL).

Based on these scores, children were classified into one of five peer status groups following the procedure specified by Coie and Dodge (1983).[2]

Reliability of peer status measures

The correlations between children's social impact and social preference scores derived from nominations made on the first and second testing occasions were .78 and .50, respectively. Agreement for peer status classifications across the two occasions was 73%, with Cohen's kappa = .58. These figures are comparable to those reported by Sanderson and Siegal (1995) who used a measure and a sample similar to those of the present study. The peer status data used in the analyses were based on nominations made on the first occasion.

Results

Correlations

Table 1 shows the zero-order correlations for age (in months), theory of mind scores, social preference scores and social impact scores. The only significant correlation in the matrix is that of theory of mind and social preference (Pearson's $r(76) = .27$, $p < 05$, two-tailed), indicating that children who scored highly on the theory of mind tasks also had relatively high social preference scores.

Next, the correlations between theory of mind and social preference and theory of

[2] *Popular children were those children who had a SP score greater than +1, and had standardized LM score greater than the mean of zero, and a standardized LL score less than the mean of zero. Controversial children were those children who had a SI score greater than +1, and had a standardized LM score and a standardized LL score greater than the mean of zero. Average children were those children who had a SP score between −0.5 and +0.5. Neglected children were those children who had a SI score less than −1, and had a standardized LM score and a standardized LL score below the mean of zero. Finally rejected children were those children who had a SP score below −1 and had a standardized LM score below the mean of zero and a standardized LL score above the mean of zero.*

Table 1. Zero-order correlations for variables in Study 1

	Age	ToM	SP	SI
Age	—			
ToM score	.01	—		
SP score	.04	.27*	—	
SI score	.09	.13	.20	—

* $p < .05$, two-tailed.
Note. $N = 78$.
ToM = theory of mind; SP = social preference; SI = social impact.

mind and social impact were rerun with age partialled out. With age controlled, theory of mind scores and social preference scores remained significantly correlated (Pearson's $r(76) = .27$, $p < .05$, two-tailed). The correlation between theory of mind scores and social impact scores remained non-significant with age partialled out (Pearson's $r(78) = .12$, $p > .10$).

Given that the relation between theory of mind and peer acceptance is hypothesized to strengthen as children get older, the partial correlation between theory of mind and social preference was computed separately for older and younger children. The sample was subjected to a median split such that older children were aged 61 months (5 years, 1 month) or older ($N = 44$; mean age = 65.4 months), and younger children were aged 60 months (5 years) and younger ($N = 34$; mean age = 56.5 months). The mean theory of mind scores for the younger and older subsamples were 2.65 (SD = 1.45) and 2.81 (SD = 1.13) respectively, which is not a significant difference by paired *t*-test ($t(76) = .55$, $p > .10$). The mean social preference scores also did not differ by age group: the mean score for the younger children was −.03 (SD = 1.80), and for the older children, the mean social preference score was .03 (SD = 1.63; $t(76) = .148$).

These analyses showed that theory of mind scores and social preference scores (with age partialled out) were not significantly related in the younger subsample (Pearson's $r(32) = .12$, $p > .10$). For the older subsample, the correlation between theory of mind scores and social preference scores (with age partialled out) was significant (Pearson's $r(42) = .39$, $p < .05$, two-tailed).

Peer status and theory of mind

Table 2 shows the number of children classified into the five peer status groups, together with the average age and the total theory of mind score (out of 5) for each group. Thirteen children could not be classified into any status group. Table 3 shows the proportion of children in each status group passing the individual theory of mind tasks.

In order to evaluate differences in theory of mind ability among the children in different sociometric status groups, pre-planned pairwise comparisons (Keppel & Zedeck, 1989) were conducted. Four *t*-tests were run comparing high peer acceptance (average and popular) children to low peer acceptance (rejected and neglected) children. Since the status of controversial children is unclear with respect to peer acceptance (as they are both liked and disliked by peers), and since the number of controversial children in the sample was small, they were left out of this analysis. The results indicated that popular children's theory of mind scores were significantly higher

Table 2. Mean theory of mind scores for children in five peer status groups in Study 1

Peer status	*N*	Average age (in months)	Theory of mind score (range 0–5)
Popular	19	61.6 (4.2)	3.09 (1.19)
Controversial	8	62.5 (6.4)	3.28 (1.22)
Average	12	64.3 (5.0)	2.94 (1.00)
Neglected	10	59.7 (5.7)	2.53 (1.56)
Rejected	16	59.8 (4.8)	2.17 (1.31)

Note. Standard deviations are shown in parentheses.

Table 3. Proportion of children passing each theory of mind task by peer status group in Study 1

	Self belief	Other belief	Desire	Emotion	Four Sweets
Popular	.84	.63	.53	.83	.58
Controversial	1.00	.88	.38	1.00	.63
Average	.83	.67	.36	.82	.42
Neglected	.60	.40	.44	.56	.20
Rejected	.56	.50	.33	.75	.25

than those of rejected children ($t(33) = 2.18$, $p < .05$). None of the other pairwise comparisons was significant.

Discussion

This study provided some support for the hypothesis that theory of mind ability is related to peer acceptance. The analysis of theory of mind scores by status group showed that popular children, whose peer status classifications reflect relatively many 'like most' peer nominations, scored higher on theory of mind tasks compared to rejected children, whose classification reflects relatively few 'like most' nominations. This pattern supports the hypothesis that popular children have a better understanding of other people's mental states, relative to their rejected peers (Badenes *et al.*, 2000; Dockett, 1997). An examination of children's performance on the individual theory of mind tasks (Table 3) suggests that children who were rejected or neglected by their peers scored lowest on all of the theory of mind tasks, with popular and controversial children scoring highest on all tasks and average children falling between the two extremes.

The results of the correlational analyses showed a similar pattern, in that theory of mind scores were modestly but significantly correlated with children's social preference scores, but not with their social impact scores. This pattern indicates that across the sample, children with a relatively high theory of mind ability tended to receive more 'like most' nominations than 'like least' nominations. The partial correlations confirmed that theory of mind was significantly related to social preference when age was controlled. However, when the sample was split by age, that relation held only for children older than age 5. While the magnitudes of the correlations

between theory of mind and peer acceptance were modest, the pattern of results replicates previous findings of a theory of mind-peer acceptance link (Badenes *et al.*, 2000; Dockett, 1997); and further parallels Dekovic and Gerris' (1994) and Badenes *et al.*'s (2000) findings of an age-dependent relation between theory of mind ability and peer acceptance in preschool and school-aged children. Overall, the results of Study 1 suggest two things: that there is a modest positive relation between theory of mind ability and peer acceptance, and that individual differences in social–cognitive abilities may impact more strongly on peer acceptance as children get older.

While these results are suggestive, a major limitation of Study 1 is the exclusion of some measure of general intellectual ability. Given previous data that have linked verbal ability with theory of mind (Jenkins & Astington, 1996) and linked intelligence with social competence (Putallaz, 1983), the effect of intelligence on the relation between theory of mind ability and peer acceptance should be investigated. Given the modest effects found in Study 1, it seems certain that other variables play a role in determining children's peer acceptance. Thus it would also be valuable to investigate the roles of behavioural variables such as levels of prosocial and aggressive behaviour, which have been shown to have significant influence on children's peer status (Bukowski & Newcomb, 1984; Coie & Kupersmidt, 1983; Dodge, 1983). Study 2 was designed to test the relative importance of theory of mind ability and behavioural variables to preschool children's peer status. Study 2 also included a measure of verbal mental age as a control variable.

STUDY 2

Method

Participants

The participants in this study were 92 children (49 boys, 43 girls) between the ages of 48 months (4 years, 0 months) and 79 months (6 years, 7 months). The children attended five classes, in five different child-care centres in middle-class suburbs of a large Australian city. Class sizes ranged from 12 to 23. Thirty-five additional children attended these classes but did not participate in the study due to lack of parental consent. Five children (3 boys, 2 girls) were lost halfway through the study as a result of sickness or holidays. The final sample ($N = 87$) represented 71% of students in the five classes.

All children, except one, attended the child-care centres and preschool at least 3 days per week. The other child who attended two times per week however, was not eliminated from the study as she had previously attended 4 days per week and was familiar with the majority of children. All children had been known by their teachers for a minimum of 3 months at the time of testing.

Procedure and measures

Children were tested individually by a female experimenter for a total of approximately 40 min per child over three occasions. On the first occasion, children were tested with two false belief tasks and a measure of verbal intelligence. A photograph of each child was taken on the first testing occasion. On the second occasion, children were given

two different false belief tasks and the peer nomination task that was used to determine peer status. On the third testing occasion, children completed the peer nomination task again so as to calculate reliability for the peer status classifications. For the final sample, 2–4 weeks passed between occasions one and three.

The head teacher of each classroom group filled out a Behavioural Questionnaire (see details below) for all children involved in the study.

Theory of mind tasks

Four different false belief tasks were used to measure theory of mind ability. These included two different versions of the standard change in location task and two versions of the unexpected contents task used in Study 1. One of each type of false belief task was administered on occasions one and two. False belief tasks replaced the theory of mind battery of tasks from Study 1 in order to reduce the amount of time required for testing (given the addition of a test of verbal intelligence). This change in procedure was further justified by an analysis of the results of Study 1, which found that false belief scores correlated moderately strongly with overall theory of mind scores ($r(76) = .54$).

Change in location task

This standard task was adopted from Baron-Cohen, Leslie & Frith (1985). The two versions differed only in the characters used (boy dolls versus girl dolls) and the hiding locations employed (box versus bag).

Unexpected contents task

The format of this task was identical to the false belief task used in Study 1. One version involved a bandaid box with a book inside, and the other version involved a crayon box with candles inside.

Scoring false belief tasks

Each false belief task was scored on a pass/fail basis. Children were required to answer correctly both the memory control and test questions. A total false belief score was then computed by adding children's pass/fail scores for the four individual false belief tasks, following widely used procedure (Astington, 1993). A reliability analysis on the four false belief tasks indicated good internal consistency, with Cronbach's alpha = .75.

Verbal intelligence

Children's verbal intelligence was assessed through the administration of the Peabody Picture Vocabulary Test—Revised (PPVT) (Dunn & Dunn, 1981). Raw scores were used in all analyses.

Behavioural Questionnaire

Head teachers in each classroom were asked to complete a Behavioural Questionnaire for each child participating in the study. Three inventories inventories were combined into one 57-item questionnaire containing items relating to the child's prosocial and aggressive behaviours, and Machiavellianism (not reported in this paper). All items on the Behavioural Questionnaire were scored by teachers as 0 'rarely apply', 1 'apply somewhat', or 2 'certainly apply'. Three versions of the questionnaire were developed

to control for potential order effects with aggression, prosocial and Machiavellian behaviour items blocked and counterbalanced with the Latin square technique.

The 20 items assessing prosocial behaviour were taken from the Prosocial Behaviour Questionnaire developed by Weir and Duveen (1981). Examples of items include: 'Will clap or smile if someone else does something well in class', 'Comforts a child who is crying or upset', 'Will invite bystanders to join in a game'. To calculate a total prosocial behaviour score, the scores for each item were added together. The possible range for a prosocial behaviour score was 0–40.

The 25 items assessing children's levels of aggressive behaviour were taken from the aggression subscale of the Child Behaviour Checklist (Achenbach & Edelbrock, 1983). Example items include: 'Destroys property belonging to others', 'Threatens people', 'Temper tantrums or hot temper'. To form a total aggressive behaviour score, the scores from each aggression item in the Behavioural Questionnaire were added together. This score could range from 0 to 50.

Measurement of peer status

As in Study 1, children's peer status was determined using the method described by Coie and Dodge (1983). The peer nominations provided by the five children lost halfway through the study were retained and used in the calculation of peer status.

Reliability of peer status measures

The correlations between children's social impact and social preference scores derived from nominations made on the first and second testing occasions were .65 and .77, respectively. Agreement for peer status classifications across the two occasions was 53%, with Cohen's kappa = .41. These figures are comparable to those found in Study 1. As in Study 1, the nominations made on the first occasion were used to calculate children's peer status.

Results

Correlations among independent variables

Table 4 shows the zero-order correlations among all the variables measured. PPVT scores were significantly related to age, theory of mind scores, prosocial behaviour scores and aggression scores, but not to social preference or social impact scores. Theory of mind scores were significantly positively correlated with age and prosocial behaviour scores but were not significantly correlated with aggression scores, social preference or social impact scores. Social preference scores were positively correlated with prosocial behaviour scores and negatively correlated with aggression scores. Finally, prosocial behaviour scores and aggression scores showed a significant negative correlation.

In order to examine further the links between theory of mind, behaviour and peer acceptance variables, the correlations were re-computed with age and PPVT scores partialled out. When age and PPVT scores were partialled out, theory of mind scores were no longer significantly correlated with prosocial behaviour scores (Pearson's $r(85) = .08$, $p > .10$). The negative correlation between prosocial behaviour and aggression remained significant when age and PPVT were partialled out (Pearson's

Table 4. Zero-order correlation matrix for cognitive and behavioural variables in Study 2

	Age	PPVT	ToM	Aggression	Prosocial	SP	SI
Age	—						
PPVT	.43**	—					
ToM	.34**	.35**	—				
Aggression	−.08	−.20^	−.11	—			
Prosocial	.14	.35**	.35**	−.47**	—		
SP	.14	.19	.11	−.30**	.36**	—	
SI	−.02	−.12	−.02	.10	−.08	.03	—

* $p < .01$, two-tailed test; ^ $p < .06$, two-tailed test.
Note. $N = 87$.
PPVT = Peabody Picture Vocabulary Test; ToM = theory of mind; SP = social preference; SI = social impact.

$r(85) = -.44$, $p < .05$). The correlations between social preference scores and the behavioural variable scores remained significant after partialling out age and PPVT scores: the social preference and aggression partial correlation was $r(85) = -27$, $p < .05$ and the social preference and prosocial behaviour partial correlation was $r(85) = .32$, $p < .05$.

Multiple regression analysis: predicting social preference

To investigate the relative importance of the various cognitive and behavioural variables to children's peer acceptance, a standard multiple regression was performed with social preference as the criterion measure, and PPVT, theory of mind, aggression, and prosocial behaviour scores as the predictors. Age was not entered into the regression in order to limit the number of variables and to reduce collinearity in the model.

All variables were entered into the model at step 1. The overall R^2 was .15 (adjusted $R^2 = .11$) which was significant ($F(4,86) = 3.71, p < .05$). Examination of the individual beta weights revealed prosocial behaviour scores as the only significant independent predictor of social preference scores, with beta = .26, $t(85) = 2.12$, $p < .05$. The beta values for the remaining predictors were as follows: PPVT beta = .06, theory of mind beta = .02, aggression beta = − .16 (all ts < 1.5, ps > .10).

Theory of mind and social preference by age group

Following the procedure established in Study 1, the regression analyses were rerun separately for younger and older children. The sample was split as in Study 1 such that older children were 61 months or older ($N = 41$; mean age = 65.9 months), and younger children were age 60 months and younger ($N = 46$; mean age = 55.9 months).

The regression analyses for the younger subsample revealed that the overall model was significant, with adjusted $R^2 = .18$, $F(4, 46) = 3.39$, $p < .05$. Examination of the individual beta weights revealed that prosocial behaviour score was a significant independent predictor and that aggression score approached significance as an independent predictor of social preference in the children under age 5 years. The prosocial beta = .33, $t(44) = 2.05$, $p < .05$; aggression beta = −.28, $t(44) = 1.84$, $p < .08$. The non-significant betas were as follows: PPVT beta = −.11, theory of mind beta = −.16, both ts(44) < 1.15, ps > .10.

In the older subsample, the overall adjusted R^2 was .08, which was not significant, $F(4,36) = 1.84$, $p > .10$. However, examination of the individual beta weights revealed that theory of mind score was the best predictor of social preference score for children over age 5 years, approaching significance with beta = .32, $t(40) = 1.81$, $p < .08$. The non-significant beta's for the older subsample were as follows: PPVT beta = −.01, prosocial beta = .19, aggression beta = −.01, all $ts(40) < 1.04$, $ps > .10$.

Multiple regression analysis: predicting social impact

A final standard multiple regression was performed on data from the entire sample with social impact as the criterion measure, and PPVT, theory of mind, aggression, and prosocial behaviour scores as the predictors. The overall model was not significant, with the total $R^2 = .02$, $F(4,82) = .43$, $p > .10$. None of the individual beta weights exceeded .11.

Theory of mind and peer status

Table 5 shows the number of children classified into the five peer status groups, together with the average ages, scores on the PPVT, and scores for theory of mind, prosocial and aggressive behaviour. Nine children could not be classified into any status group.

Table 5. Mean age and scores for children in the five peer status groups in Study 2

Peer status	*N*	Age (months)	False belief (range 0–4)	Prosocial (range 0–40)	Aggression (range 0–50)	PPVT (raw score)
Popular	19	**61.5** (6.2)	**3.16** (1.02)	**24.63** (8.20)	**4.42** (6.91)	**54.68** (15.02)
Controversial	9	**61.6** (6.4)	**2.00** (1.58)	**16.11** (6.49)	**14.67** (10.49)	**45.33** (9.45)
Average	16	**61.1** (6.0)	**3.06** (.93)	**16.81** (10.5)	**7.38** (9.34)	**52.80** (16.84)
Neglected	14	**60.5** (6.2)	**2.29** (1.49)	**20.71** (10.18)	**10.57** (13.05)	**50.70** (17.49)
Rejected	20	**59.4** (6.0)	**2.80** (1.44)	**14.00** (10.46)	**15.90** (14.69)	**44.70** (9.85)

Note. Mean scores in bold typeface; Standard deviations are shown in parentheses.

In order to evaluate differences in theory of mind ability among the different status groups while controlling for verbal ability, a one-way ANCOVA was run with theory of mind scores as the dependent variable, peer status groups (five levels) as the factor and PPVT score entered as a covariate. This analysis revealed a significant main effect of PPVT on theory of mind scores ($F(1,68) = 6.75$, $p < .05$) but no independent effect of status on theory of mind scores ($F(4,68) = 1.14$, $p > .10$) and no interaction ($F(4,68) = .629$, $p > .10$). Follow-up tests using Fisher's Protected Least Significant Difference procedure revealed that the PPVT scores of popular and rejected children were significantly different ($p < .05$).

Discussion

The results of Study 2 partially replicate patterns found in Study 1, but highlight the need for consideration of multiple variables in explaining peer acceptance in young children. While the theory of mind scores of the different peer status groups showed a similar pattern to that found in Study 1, with popular children achieving the highest scores and neglected and rejected children earning relatively low scores, when verbal ability was taken into account in the ANCOVA, the differences in theory of mind ability among children in the different peer status groups were not significant. Thus, the results of Study 2 indicated no significant effect of theory of mind ability on children's peer status, over and above the effect of verbal intelligence. This result confirms previous work showing that bright, verbally adept children tend to be relatively popular among their peers (Coie *et al.*, 1990; Putallaz, 1983).

It should be noted that the pattern of results for controversial children in Study 2 was opposite that found in Study 1. In Study 1, controversial children received the highest theory of mind scores of all children, while in Study 2, their scores were the lowest of the peer status groups. The controversial group is typically the smallest peer status group in the population (as in both studies reported here), and the most fluid (Newcombe *et al.*, 1993), with features of both popular (many positive peer nominations) and rejected (many negative peer nominations) groups. Clearly, more work will be required to understand the theory of mind abilities of children whose peer status is controversial.

Variations in the behavioural variables by peer status groups generally replicated the reliable pattern seen in previous studies. Popular children received high prosocial behaviour scores and low aggression scores, while rejected children showed the opposite pattern. Controversial children were also relatively high on aggression. Surprisingly, neglected children in this study were rated as being relatively high on prosocial behaviour, which is not consistent with previous studies; generally, neglected children have been found to engage in relatively low levels of prosocial behaviour (Coie *et al.*, 1990; Newcombe *et al.*, 1993). This anomalous finding could have been produced by the fact that children's ratings determined peer status, but teachers' ratings determined behaviour scores. If neglected children are ignored by their peers, they may spend more time than other children interacting with their teachers, in which case they might be likely to behave prosocially toward their teachers, for instance by being cooperative or helping when asked.

The correlations between behavioural and cognitive variables were also in line with previous research, with prosocial and aggressive behaviour significantly negatively correlated, even when verbal ability and age were controlled. The significant zero-order correlation between theory of mind ability and prosocial behaviour was found not to be significant after age and verbal ability were partialled out. This pattern is in contrast to a recent study by Spatz and Cassidy (1999) in which theory of mind ability was found to be modestly but significantly related to prosocial behaviour even after the effects of language ability were partialled out. Given the theoretical and empirical links between socio-cognitive skill and prosocial behaviour (Dekovic & Gerris, 1994; Shantz, 1983), further investigation of the relation between theory of mind ability and prosocial behaviour is warranted. If the correlation between theory of mind and prosocial behaviour is only modest, the effect may be difficult to replicate and may be strongly influenced by the methods used to measure prosocial behaviour.

Finally, the correlation and regression analyses partially replicated the pattern found

in Study 1. In contrast to Study 1, there was no significant zero-order correlation between theory of mind ability and social preference scores for the entire sample. For the full sample, prosocial behaviour was the only significant predictor of social preference scores, in line with previous work suggesting that levels of prosocial behaviour are among the most reliable behavioural discriminators of popular and rejected children (Bukowski & Newcomb, 1984; Hartup *et al.*, 1967). The regression analyses by age group indicated that the behavioural variables of aggression and prosocial behaviour were the best predictors of social preference for the younger children in the sample. For the older children, in contrast, theory of mind ability was the best predictor of social preference. This pattern replicates Study 1; its potential significance will be discussed below.

GENERAL DISCUSSION

The two studies reported here, like the literature reviewed in the introduction, do not paint a completely clear picture of the relation between theory of mind and peer acceptance, but highlight the complexity of influences on young children's peer acceptance. These studies were designed to assess the relation between theory of mind ability and peer acceptance in preschool-aged children, to try to establish whether, as hypothesized, theory of mind skill is related to peer popularity. The results of the studies provide some support for that hypothesis. Study 1 found a significant difference between popular and rejected children's theory of mind ability, but that result was not replicated in Study 2 when verbal ability was controlled. The pattern of zero-order correlations in Study 2 did not suggest that verbal ability is a mediator of the relation between theory of mind ability and peer acceptance because in Study 2 (unlike Study 1), theory of mind scores and social preference scores did not themselves correlate significantly (Baron & Kenny, 1986). This pattern suggests that the theory of mind discrepancy between popular and rejected children comes down to a significant difference in verbal ability between the two groups, as was found in Study 2.

While the results for theory of mind ability by peer status group were somewhat inconclusive, the results from both studies clearly indicated that theory of mind ability may become an important determinant of peer acceptance for children over age 5. The relevant finding from Study 1 was that theory of mind scores were significantly related to social preference scores only for the older children, and similarly from Study 2, the data indicated that theory of mind ability was the best predictor of social preference in the children over age 5. An age-dependent relationship between theory of mind and peer acceptance was thus replicated across the two studies, even when the important variables of verbal intelligence and prosocial and aggressive behaviour were accounted for in Study 2.

The results of Study 2 indicated that for younger children, behaviour was the most important predictor of peer acceptance. Children under age 5 who were generally well liked by their peers (reflected in relatively many positive peer nominations and few negative nominations) were those who were also rated by their teachers as being highly prosocial and non-aggressive. This finding can be interpreted with respect to children's conceptions of friendship that indicate that young children view friends primarily in terms of their interpersonal behaviour, that is, friends are those peers with whom they play and share toys (Bigelow, 1977; Damon, 1988). Thus, in children under age 5, an

understanding of, and sensitivity to, others' mental states may not be as relevant to determinations of peer status as is behaviour (Selman, 1981).

In children older than age 5, however, theory of mind ability was the best predictor of peer acceptance. Again, this finding can be understood in terms of children's developing conceptions of friendship, as the research indicates that as children get older, they begin to appreciate friends for their attitudes and unique personality attributes. For older children, a friend is someone who shares desires, goals and attitudes (Bigelow, 1977; Damon, 1988). Thus, in children over age 5, the understanding of other people's mental states that characterizes theory of mind may become highly important in peer relationships. Children over age 5 who are lacking, or slower to develop, theory of mind ability may be unable to enter deeply into peer relations, and this feature may cause them to be less popular within their peer groups.

The finding that theory of mind ability relates to peer acceptance in older but not younger children is also in line with previous studies that have demonstrated that the socio-cognitive differences between popular and rejected children are more pronounced in older samples (Badenes *et al.*, 2000; Dekovic & Gerris, 1994). The pattern of results supports the cumulative model of peer rejection and suggests that a delay in acquiring the ability to predict and explain others' behaviour with reference to internal, subjective mental states may have serious implications for children's peer relationships. Children who are delayed relative to their peers in the development of the ability to reason about the internal feelings, thoughts and motivations of others may not be able to function sensitively with potential friends in their peer groups. If these children then become neglected or rejected by their peers, their opportunities to experience social interactions that could facilitate theory of mind development would diminish. Given the demonstrated importance of social interaction on theory of mind development (Dunn, 1995; Ruffman *et al.*, 1998), the potential damaging effects of early peer rejection are substantial.

The results of the present studies suggest that, as children enter school, theory of mind ability may play an important role in the development of healthy peer relations. Thus, 5-year-olds who are delayed on theory of mind ability at school entry might benefit from theory of mind training as they are beginning to enter into peer group relations. Given that intervention programs designed to increase the social acceptance of rejected children have typically been behaviour-based and the results have been inconsistent (see Mize, Ladd, & Price, 1985 for a review), it seems worthwhile to consider the possibility that theory of mind training with vulnerable 5-year-olds could attenuate some cases of peer rejection and avoid its cumulative effects on social–cognitive development.

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Appendix: Theory of Mind Task Scripts for Study 1

False belief tasks

Children were shown a Smarties sweets box and asked, 'What do you think is inside this box?' The experimenter then emptied the box revealing pens inside. The pens were then placed back inside the box and the experimenter presented the closed Smarties box to the children again. Children were then asked a memory control question, 'Can you remember what's really inside this box?' The children were then asked two test questions: 'What did you think was inside this box when I first showed it to you?' (Self question) and 'When I show this box to [story character's name] tonight what will he/she think is inside, before he/she opens it?' (Other question). These two test questions were scored as separate false belief tasks.

Desire task

Children were presented with a story in which the child story character's favourite food was raw vegetables. The children were then asked to help the experimenter decide which of two snacks she should give to the child story character: raw vegetables versus lollies. Children were asked a memory control question: 'Can you remember what [story character's name] favourite food is?' Children were then asked the test question: 'Which snack do you think [story character's name] would want to eat?' This question was followed by two further control questions which asked, 'Which is your favourite of these two foods: raw vegetables or lollies?' and 'Which snack would you want to eat?' These control questions were included to ensure that children were not simply reporting their own mental states, when asked about those of the story character. The forced choice options (raw vegetables and lollies) were counterbalanced across children.

Emotion task

The emotion task used in this study took basically the same form as the desire task. Children presented with a story in which the child story character wanted a pair of black socks for his/her upcoming birthday. However, when the story character opened up his/her birthday present, there was a Barbie doll (for girls) or a toy racing car (for boys) inside. Children were then asked a memory control question: 'What did [story character's name] want for his/her birthday?' Children were then presented with an illustration of the story character with a happy face and an illustration of the story character with a sad face and were asked the test question, 'How do you think [story character's name] felt when he/she saw the [Barbie doll/toy racing car]? Would he/she be happy or sad?' The presentation of the forced choice options (happy and sad) was counterbalanced across children. This test question was then followed by two control questions which asked, 'Which would you want for your birthday: black socks or a Barbie doll/toy racing car?' and 'How would you feel if you got a Barbie doll/toy racing car for your birthday? Would you feel happy or sad?' Again, these control questions were included to ensure that children were not simply reporting their own mental states when asked about those of the story character.

Four sweets task

This task was modified from the task developed by Baron-Cohen (1994). Children were presented with four chocolate bar wrappers secured to a piece of card and asked 'Which chocolate bar do you like the most out of these four?' Children were then told a story about a child who went shopping with his/her mother and was so well-behaved that his/her mother allowed him/her to choose a treat out of four different types of chocolate bars. Children were then presented with a picture that had the story character's face in the centre, with four chocolate bar wrappers secured in each corner. The story character was smiling and looking at one of the chocolate bars. The experimenter always selected versions of the picture in which the story character was

looking at a chocolate bar that was different from the child's previously stated preference. Children were then asked, 'Can you tell me looking at this picture which chocolate bar [story character's name] wanted?' The exact same scenario outlined above was presented to children again, except that in the second story, the child went shopping with his/her grandmother. Children were then asked, 'Can you tell me looking at this picture which chocolate bar [story character's name] wanted this time?'