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Gender-differentiated effects of theory of mind, emotion understanding, and social preference on prosocial behavior development: A longitudinal study

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ABSTRACT

Although key differences have been found in boys' and girls' prosocial behavior toward peers, few studies have systematically examined gender differences in how intrinsic perspective-taking abilities—theory of mind (ToM) and emotion understanding (EU)—and the extrinsic peer environment relate to prosocial behavior. In this prospective longitudinal study, we studied gender differences in the relations between children's observed prosocial behavior and their ToM, EU, and social preference ratings in 114 children (58 boys and 56 girls). We used conventional ToM and EU tasks at 5 and 7 years of age. Observed prosocial behavior in triadic peer interactions was assessed at both time points. Controlling for gender, age, verbal ability, and earlier prosocial behavior, ToM at 5 years was found to predict prosocial behavior at 7 years. Results also revealed gender-differentiated associations at 7 years, whereby only girls' prosocial behavior was positively associated with EU. Results are discussed in terms of gender-differentiated patterns of socialization.

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Introduction

A consistent feature of children's successful peer interactions is prosocial behavior, conceptualized as a voluntary act done with the specific intention to benefit another (Eisenberg, 1986). Although prosocial behavior appears early in life, it nonetheless undergoes considerable change during childhood; it becomes more sophisticated and increasingly nuanced according to gender as boys' and girls' peer interactions take somewhat distinctive pathways (Eisenberg, Fabes, & Spinrad, 2006; Rose & Rudolph, 2006). Early manifestations of prosocial behavior have been consistently associated with children's perspective-taking skills in the context of both empathy development and, more recently, early appearing understanding of others' intentional attitudes, sometimes termed *implicit theory of mind* (Eisenberg et al., 2006; Low & Perner, 2012; Moore, 2007; Vaish, Carpenter, & Tomasello, 2009). In both cases, children typically show their sensitivity to others' emotional predicaments or states of mind through their prosocial acts, often tailoring their action to others' distress or intention, even prior to 2 years of age (Svetlova, Nichols, & Brownell, 2010; Warneken & Tomasello, 2007). However, although it is well known that children's understanding of mind and emotion undergoes profound transformation during the transition to the school period (Harris, de Rosnay, & Pons, 2016; Wellman, 2002), very little is known about how these unfolding perspective-taking abilities continue to influence prosocial behavior development and whether gender socialization increasingly affects the way children use their understanding of mind and emotion in prosocial interactions.

Also of importance to children's early appearing prosocial behavior is the socializing environment; prosocial behavior is socially motivated, driven and reinforced by affiliative interactions with others (Grusec, 2006; Simpson & Willer, 2008), which again may be observed in children younger than 2 years of age. On entry to school, however, for many children there is a profound shift in their social context, being thrust into the busy to and fro of peer interactions and increasingly complex social networks. Although much is known about the importance of children's social relations for their school success and social adaptation, relatively few studies have examined how the peer environment influences prosocial behavior and whether this plays out differently for boys and girls.

In the current study, therefore, we examined whether known correlates of children's prosocial behavior—understanding of mind and emotion and social preference—exert gender-differentiated effects on prosocial behavior development over the first few years of school. We adopted a longitudinal design ideally suited to quantifying changing patterns of prosocial behavior, which was the focus of the investigation, rather than the origins of prosocial behavior per se. Despite the fact that children enter school with a good repertoire of prosocial behaviors, we nonetheless expected that observing children's spontaneous peer interactions during this period, which is a time of rapidly growing understanding of mind and emotion and expanding social relationships, would provide important insight into how prosocial behavior comes to be increasingly gender differentiated.

Gender differences in prosocial behavior

As children mature, peer relations become increasingly gender segregated and the interactions that boys and girls have with their same-sex peers become more differentiated (Maccoby, 1998; Rose & Rudolph, 2006). By middle childhood, boys predominantly socialize in larger peer groups that are more agentic-focused and competitive, whereas girls typically interact in dyadic peer relationships that are more interpersonal by nature (Geary, Byrd-Craven, Hoard, Vigil, & Numtee, 2003; Maccoby, 2002). Indeed, gender differences in prosocial behavior may be present in children as young as 3 years (Sebanc, 2003), but these differences become increasingly pronounced as children enter middle childhood and remain intact through to adolescence (Maccoby, 1990). Increasing age-related gender segregation is thought to be influenced by multiple biological, environmental and cultural factors, including hormonal changes and maturation, emerging differences in the structure and style of play, the development of gender identity, and an increasing awareness of gender stereotypes and socially prescribed gender roles (Eagly, 1987; Maccoby, 1998). Cumulatively, these factors are thought to contribute to the increasingly ingrained gender differences in peer interactions as children spend more

time in the school environment. Thus, although differences in boys' and girls' peer interactions may begin to emerge on school entry, the literature suggests that they become especially pronounced during middle childhood (Golombok, Rust, Zervoulis, Golding, & Hines, 2012; Gray & Feldman, 1997).

In relation to prosocial behavior specifically, previous studies have typically found that girls tend to act more prosocially toward their peers than do boys when rated by peers and teachers (Crick & Grotpeter, 1995; Ladd & Profilet, 1996) and in observational studies (Leaper, 1991; Strough & Berg, 2000). This disparity is confirmed in girls' personal accounts of their friendships; girls more often report that they are the recipients of prosocial acts than do boys (Sandstrom & Cillessen, 2003; Storch, Nock, Masia-Warner, & Barlas, 2003). Against this backdrop, it is important to consider whether those factors shown to be associated with prosocial behavior exert an influence on prosocial behavior development differently for boys and girls.

Links between perspective taking and children's social behavior

During early to middle childhood, children form and refine their ability to predict and explain behavior based on their understanding and interpretation of other people's mental attitudes (Flavell & Miller, 1998; Wellman, 2002). This ability has been largely investigated in two domains: theory of mind (ToM), the understanding of others' mental states such as beliefs and desires, and emotion understanding (EU), the ability to predict and explain emotion in terms of causes, consequences, and contextual determinants (Harris, 2000). Although ToM and EU are conceptually interrelated, they appear to be subtlety yet critically distinctive. ToM reflects an ability to represent and understand the beliefs and desires of others, which enables children to take on the perspectives of others and accordingly attune their behavior (Wu & Su, 2014). EU, while often drawing on ToM insights, captures children's capacity to judge or infer an emotional outcome based on multiple determinants and becomes particularly elaborated during middle childhood when children's adaptive social functioning—that is, the ability to interpret and respond to emotional cues in a socially appropriate way—is critical to their successful peer interactions (Denham, 2007).

On balance, existing research indicates that there is a positive association between prosocial behavior and both ToM and EU (see Eisenberg et al., 2006, for an overview), although it should be noted that some studies have failed to document an association (Hughes, White, Sharpen, & Dunn, 2000; Ruffman, Slade, Devitt, & Crowe, 2006). The somewhat inconsistent nature of these findings suggests that such relations are not incontrovertible and may be influenced by child-level characteristics such as gender. Furthermore, it is unclear whether the nature of the relation between prosocial behavior and ToM is the same as the relation between prosocial behavior and EU (see de Rosnay, Harris, & Pons, 2008, for a review). In addition, positive associations between ToM and prosocial behavior have not consistently been shown to be independent of children's linguistic ability (de Rosnay et al., 2008; Slaughter, Imuta, Peterson, & Henry, 2015). Therefore, it is important to continue to examine the independent influences of ToM and EU on prosocial behavior.

Although previous literature on ToM and EU generally demonstrates boys and girls to be comparable in these two domains (Charman, Ruffman, & Clements, 2002; Pons, Lawson, Harris, & de Rosnay, 2003), there is preliminary evidence to suggest that gender may play a moderating role in the relation between these perspective-taking skills and prosocial behavior. Research examining ToM, EU, and various social outcomes indicates a stronger association for girls compared with boys. For example, a study by Badenes, Clemente Estevan, and García Bacete (2000) found that only girls' peer acceptance was associated with performance on a ToM deception task as they entered middle childhood. Furthermore, in a sample of 9- to 12-year olds, Custrini and Feldman (1989) found that the ability to encode and decode others' emotions was related to social competence in girls but not in boys. Finally, a study by Banerjee, Rieffe, Meerum Terwogt, Gerlein, and Voutsina (2006) showed that peer acceptance for 8- to 11-year-old girls, but not boys, was associated with their emotional state references in a task tapping understanding of negative emotions. The extent to which these latter findings can be generalized to prosocial behavior is unclear because prosocial behavior is a distinct construct that emphasizes a different facet of children's social interactions compared with peer acceptance or social competence (Eisenberg et al., 2006), but it remains noteworthy that gender exerts a moderating influence on the association between EU and social outcomes. To date, no study has

specifically investigated the role of gender in the relation between ToM and EU with prosocial behavior during middle childhood; thus, the current study aimed to address this gap in the literature.

Social preference and prosocial behavior

In addition to intrinsic perspective-taking abilities, prosocial behavior has also been shown to be influenced by extrinsic social factors (Eisenberg et al., 2006). Existing research suggests that peer ratings of classmates' likeability, or their social preference (see Coie, Dodge, & Coppotelli, 1982), can have a reinforcing effect on the extent to which one may act prosocially (Gifford-Smith & Brownell, 2003). Alternatively, this association may occur through a self-fulfilling cycle whereby children who spontaneously display more prosocial behavior elicit more positive peer feedback and enjoy higher levels of peer acceptance, which in turn encourages more prosocial behavior and so on (Eisenberg et al., 2006; Laible, McGinley, Carlo, Augustine, & Murphy, 2014). Indeed, recent longitudinal research has supported this latter scenario, demonstrating a positive bidirectional association between popularity and a proclivity to act more prosocially toward peers (Caputi, Lecce, Pagnin, & Banerjee, 2012; Kornbluh & Neal, 2016). Thus, children's social preference appears to play a critical role in their prosocial behavior.

As to whether there may be gender differences in the association between prosocial behavior and social preference, given established gender differences showing that girls to rely on reciprocal interpersonal relations to a greater extent than do boys (Rose & Rudolph, 2006), it seems plausible that the prosocial behavior of girls may be more influenced by their social preference ratings than that of boys. Indeed, a number of studies have shown that the positive association between popularity and prosocial behavior during middle childhood is stronger for girls than for boys (Banerjee et al., 2006; Kornbluh & Neal, 2016; Lansford et al., 2006).

The current study

This study focused on children's prosocial behavior toward peers during the first few years of school, a time of rapidly increasing gender segregation. Specifically, we sought to examine how children's understanding of mind and emotion (ToM and EU) and important aspects of peer experience (social preference) influence prosocial behavior development in relation to gender. Using a prospective longitudinal design, we examined how the associations between key variables may change or develop as children mature from 5 years to 7 years of age and included age-appropriate measures of both ToM and EU at each time point. We also examined social preference at both time points, derived from nominations of the peers who children most and least liked to play with, which provided an index of children's peer-rated social standing among their classmates. We used an observational measure of prosocial behavior in a triadic free-play session, as opposed to a trait-based measure of prosociality, to examine children's proclivity to act prosocially specifically in the context of peer interactions. Finally, we included a measure of children's verbal ability because verbal ability is a well-known ToM correlate (see Milligan, Astington, & Dack, 2007, for a relevant meta-analysis) and plays an indispensable role in social interactions.

Based on previous findings, it was hypothesized that better ToM and EU would be associated with higher levels of prosocial behavior and that social preference would have independent positive associations with prosocial behavior toward peers at both 5 and 7 years of age. With respect to gender differences, we predicted that girls would display more prosocial behavior than boys at both time points. We also tentatively hypothesized that prosocial behavior would be more robustly associated with ToM, EU, and social preference in girls compared with boys based on previous work examining gender differences in ToM and EU with various social outcomes (Badenes et al., 2000; Banerjee et al., 2006; Custrini & Feldman, 1989) and in sociometric status (Banerjee et al., 2006; Kornbluh & Neal, 2016; Lansford et al., 2006). From a longitudinal perspective, we predicted that this gender differentiation in how our key variables relate to prosocial behavior would be more pronounced at 7 years compared with 5 years, in line with established accentuations of gender differences as children get older and once they have been in the school environment for a longer period (Maccoby, 1998; Rose & Rudolph, 2006).

Method

Participants

A total of 114 kindergarten children (58 boys and 56 girls) were recruited from three inner suburban schools in Sydney, Australia. Children came from a mixture of ethnic backgrounds common to the area, and all had English as a native language. None experienced serious economic disadvantage. Opt-out recruitment was against local ethical guidelines, so only children whose parents gave written consent in kindergarten participated in the current study. Mean age at Time 1 was 5.61 years (*SD* = 0.42).

Children were tested again 24 months later when they were in Year 2. At Time 2, 18 children were unavailable owing to mobility; thus, the Time 2 sample comprised 96 children (49 boys and 47 girls). Mean age at Time 2 was 7.73 years (*SD* = 0.38). Testing at both time points took place during the second half of the school year when familiarity with the classroom peer group was well established.

Procedure

Children were interviewed individually in a quiet room at school for their assessments of verbal ability, ToM, and EU. Task and trial orders were varied, and children were randomly assigned to one of two orders. In the final testing session at both time points, prosocial behavior was observed during a free-play session with groups of 3 children at a time.

Measures

Verbal ability

Children's verbal ability was assessed using the Test of Early Language Development (TELD-3; Hresko, Reid, & Hammill, 1999), which measured expressive and receptive semantic skills. Raw (unstandardized) scores were used in statistical analyses to permit independent analysis of chronological age effects.

Time 1 ToM

Six false-belief understanding tasks were administered: (a) two unexpected contents tasks based on Perner, Leekam, and Wimmer (1987), (b) two unexpected transfer tasks based on Wimmer and Perner (1983), and (c) two nice/nasty surprise tasks based on Hughes and colleagues (2000). Tasks were narrated as storybook vignettes accompanied by colored drawings. For tasks (a) and (b), children were asked a reality control question (e.g., "What is really inside the box?") in addition to a target false-belief question (e.g., "What does Lily think is inside the box?"). Both the control question and the test question needed to be answered correctly for children to be awarded 1 point. The nice/nasty surprise tasks required children to attribute a feeling to the story protagonist based on the match between his or her desires (e.g., the protagonist likes Coke) and his or her expectation (e.g., the protagonist [mistakenly] thinks he or she will get Coke). Children needed to correctly answer the control question and the target question and to attribute an appropriate feeling to the protagonist to be awarded 1 point. All tasks are widely used (Milligan et al., 2007; Wellman, Cross, & Watson, 2001) and have good reliability and internal consistency (e.g., Hughes et al., 2000). A total false belief score summed the six false-belief items and had sound internal consistency, with Cronbach's $\alpha = .78$.

Time 2 ToM

Six vignettes assessing children's faux pas understanding were individually narrated to children based on those developed by Baron-Cohen, O'Riordan, Stone, Jones, and Plaisted (1999). Each vignette detailed an example of a faux pas being committed such as unintentionally spoiling a surprise party. After each vignette, children were presented with six questions to assess whether they had detected and identified the specific faux pas ("Did anyone say something they shouldn't have said or maybe something a bit awkward?"), their identification of the scenario ("What did they say that they should not have said?" and "Why shouldn't they have said it?"), their comprehension of the scenario ("In the

story, who was the surprise party for?"), whether the perpetrator was ignorant when committing the faux pas ("Did Nicky remember the party was a surprise?"), and how the target of the faux pas would feel ("How do you think Helen felt? Why do you think she felt that way?"). For each vignette, children needed to answer all six questions correctly in order to pass. A total faux pas score was summed from the six vignettes. Internal consistency was low (α = .63). However, this value is not unexpected given the low item number for this task (Clark & Watson, 1995) and reflects the diversity of the construct being assessed (Crutzen & Peters, 2015).

Time 1 EU

Based on Pons, Harris, and de Rosnay (2004), three age-appropriate components of emotion understanding were chosen from the Test of Emotion Comprehension (TEC) to assess the emotional constructs of (a) two items assessing emotion based on diverse desires (e.g., attribution of distinct and appropriate emotions to two characters—one who likes lettuce and one who dislikes lettuce—when they receive lettuce), (b) four items assessing emotion based on ignorance (e.g., attribution of emotion to a rabbit eating a carrot without knowing a fox is hiding nearby), and (c) four items assessing understanding hidden emotion (e.g., attribution of emotion to a character who is smiling in order to conceal his or her distress while being teased). Two items assessing false-belief-based emotion were also included (Hughes et al., 2000). All components involved short vignettes about pictured protagonists, and test questions required choosing from four pictured facial expressions. All components assessed equal numbers of positive and negative emotion scenarios. Initial analysis showed that one of the ignorance-based emotion stories failed to correlate with any other task, so it was omitted from analyses. Thus, children received a possible score between 0 and 11. Internal consistency for the total was low (α = .60) but not unexpected considering the diversity of this construct (see Pons & Harris, 2005).

Time 2 EU

An assessment of children's understanding of mixed emotions was individually administered and comprised eight mixed-emotion vignettes (Brown & Dunn, 1996; Kochanska, 1991; Meerum Terwogt, Koops, Oosterhoff, & Olthof, 1986; Nunner-Winkler, 2007; Thompson & Hoffman, 1980). In each vignette, a scenario was described that would cause the protagonist to feel multiple emotions; for example, the protagonist helps her friend read a book during reading time but consequently runs out of time to read her own book, causing her to feel both happy (that she helped her friend) and sad (that she could not read her own book). After each vignette was read aloud, children were asked how the protagonist would feel and why. Children passed only if they correctly identified two divergent emotions for each vignette and gave a coherent justification that was distinct and appropriate for each emotion (children were given no score if they reported feeling two separate emotions for the same reason). A total score out of 8 was summed across vignettes. Internal consistency across the eight items was good (α = .72).

Social preference

At both time points, social preference was assessed using Coie and colleagues' (1982) peer nomination sociometric interview technique. Children were asked to nominate three classmates who they "like to play with the most" and three classmates they "do not like to play with," using photographs of their peers as prompts. Each child's individual "like most" and "like least" scores were standardized within classrooms in order to account for different-sized peer groups. Social preference was calculated by subtracting classroom-standardized "like least" from standardized "like most" nominations.

Prosocial behavior

Children's prosocial behavior was assessed during a free-play session with two other same-sex classmates. Triads were selected based on children's social preference nominations at each time point, such that children were grouped together with two other peers who were not nominated as their best friends. Thus, the triads comprised different combinations of peers for each child at 5 years and at 7 years of age. Each triad was filmed unobtrusively for 7 minutes with no adults present. At 5 years children played with a large toy zoo, and at 7 years they played with a large toy castle. Using Ensor and Hughes' (2010) methods, five prosocial acts were coded for the triad free-play sessions at both time

points: sharing, helping, comforting, praising, and encouraging. These prosocial acts were coded accordingly: focal child offering an object previously in his or her possession to peer (into peer's hand or lap) or intentionally adding an object to an array within which peer was situated (sharing); focal child providing physical/verbal assistance to peer (helping); focal child expressing concern for peer or offering physical/verbal reassurance to peer (comforting); focal child praising congratulating, or complimenting peer (praising); focal child responding to peer's emotion or request in a positive way that encouraged or supported peer's emotion or request (encouraging). Each behavior could arise spontaneously or in response to a peer's request. Displays of each prosocial act were recorded as frequencies regardless of how short or long the displays lasted. A total prosocial behavior score was summed across the five acts, reflecting an overall tendency to assist and share with same-sex peers during free play. Total scores ranged from 0 to 8 at 5 years and from 0 to 15 at 7 years. Coding of the free-play sessions was conducted separately by two of the study's authors, both of whom had been trained on video coding in a previous study. An independent rater (a doctoral student who had also been trained on video coding) coded 20% of the total triad free-play sessions at both time points, and inter-rater reliability was substantial across all five categories, with Cohen's $\kappa = .73$.

Results

Descriptive statistics and preliminary analyses

Table 1 shows means and standard deviations for all key variables for the total sample and by gender (with *t*-values for gender comparisons) at both Time 1 and Time 2. As predicted, girls displayed more prosocial behavior than boys at both Time 1, $t(110) = 2.14$, $p = .035$, $\eta_p^2 = .040$, and Time 2, $t(88) = 2.92$, $p = .004$, $\eta_p^2 = .088$. In addition, girls had higher scores on the EU task at Time 2, $t(93) = 2.05$, $p = .043$, $\eta_p^2 = .043$. No significant difference between boys and girls was found for any other variable.

Separate correlations were run for boys and girls in order to systematically examine potential gender differences (Table 2). First, it is noteworthy that there was little evidence that Time 1 prosocial behavior predicted children's ToM, EU, or social preference. However, for girls, ToM and EU showed distinctive associations with Time 2 prosocial behavior; longitudinally T1 ToM, but not EU, was positively correlated with T2 prosocial behavior, whereas concurrently T2 EU, but not ToM, was positively correlated with T2 prosocial behavior. The differentiated influence of ToM and EU on prosocial behavior was evident in girls despite the robust correlation between these two variables, indicating that their independent assessment was justified. In addition, for girls there was a positive association

Table 1
Means (and standard deviations) of verbal ability, theory of mind, emotion understanding, social preference, and prosocial behavior measures at Time 1 and Time 2 by gender.

Measure	Total	Boys	Girls	*t*-Value (gender comparison)
Time 1: Kindergarten ($M_{age} = 5.61$ years, $SD = 5.02$ months)	$n = 114$	$n = 58$	$n = 56$	
Verbal ability	60.46 (5.16)	59.72 (4.50)	61.21 (5.70)	1.55
Theory of mind	4.23 (1.87)	3.95 (1.88)	4.52 (1.82)	1.64
Emotion understanding	6.04 (2.21)	6.20 (2.09)	5.88 (2.32)	0.77
Social preference	0.02 (1.67)	−0.25 (1.86)	.30 (1.42)	1.76
Prosocial behavior	2.39 (1.82)	2.03 (1.54)	2.76 (2.03)	2.14*
Time 2: Year 2 ($M_{age} = 7.73$ years, $SD = 4.57$ months)	$n = 96$	$n = 49$	$n = 47$	
Theory of mind	2.73 (1.75)	2.47 (1.52)	3.00 (1.94)	1.50
Emotion understanding	2.36 (2.09)	1.94 (2.04)	2.80 (2.07)	2.05*
Social preference	0.00 (1.71)	−0.10 (1.78)	.11 (1.63)	0.61
Prosocial behavior	4.61 (3.17)	3.70 (2.86)	5.57 (3.22)	2.92**

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

Table 2
Correlations among age, verbal ability, theory of mind, emotion understanding, social preference, and prosocial behavior at Time 1 and Time 2 for boys and girls.

	1	2	3	4	5	6	7	8	9	10
1. Age	–	.29*	.06	.33*	.05	−.14	.27	.27	.04	−.18
2. VA	.21	–	.48***	.49***	.03	−.03	.28	.20	−.004	−.15
3. T1 ToM	.22	.54***	–	.46***	.28*	−.06	.37*	.12	.19	.16
4. T1 EU	.39**	.45**	.58***	–	.19	−.06	.37*	.36*	.24	−.22
5. T1 SP	−.03	.28*	.40**	.22	–	.14	.10	.22	.68***	−.08
6. T1 PB	.27*	.31*	.25	.16	.20	–	−.23	.09	.11	−.27
7. T2 ToM	−.02	.62***	.46**	.35*	.31*	.04	–	.12	−.08	.19
8. T2 EU	.01	.45**	.39**	.40**	.32*	.001	.41**	–	.22	−.25
9. T2 SP	.08	.27	.40**	.22	.81***	.20	.31*	.28	–	−.02
10. T2 PB	−.16	.01	.35*	.26	.27	.16	.24	.37*	.39**	–

Note. VA, verbal ability; T1, Time 1; ToM, theory of mind; EU, emotion understanding; SP, social preference; PB, prosocial behavior; T2, Time 2. Boys are above the diagonal, and girls are below the diagonal.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

Table 3
Hierarchical multiple regression analysis predicting Time 1 prosocial behavior from variables at Time 1.

	ΔR^2	β
Step 1	.09*	
Gender		.19*
Age		.07
VA		.16
Step 2	.01	
Gender		.17
Age		.09
VA		.17
T1 ToM		−.02
T1 EU		−.05
T1 SP		.12
Step 3	.03	
Gender		.16
Age		.08
VA		.16
T1 ToM		−.17
T1 EU		−.06
T1 SP		.12
Gender × T1 ToM		.24
Total R^2	.13*	

Note. VA, verbal ability; ToM, theory of mind; EU, emotion understanding; SP, social preference; PB, prosocial behavior. For gender analysis, boys were coded as 0 and girls were coded as 1.
* $p < .05$.

between social preference and prosocial behavior at T2, whereas for boys prosocial behavior was unrelated to ToM, EU, and social preference at both time points.

Associations with prosocial behavior at Time 1 and Time 2

Two planned hierarchical regression models were constructed to evaluate the proposed patterns of association among prosocial behavior, ToM, EU, and social preference at both 5 and 7 years of age (see Tables 3 and 4). We also controlled for possible confounding effects of age and verbal ability. Interac-

Table 4
Hierarchical multiple regression analysis predicting Time 2 prosocial behavior from variables at Time 1 and Time 2

	ΔR^2	β
Step 1	.10	
Gender		.26*
Age		−.17
VA		.001
T1 PB		.06
Step 2	.17*	
Gender		.22*
Age		−.23*
VA		−.26*
T1 PB		.05
T1 ToM		.30*
T1 EU		.02
T1 SP		−.27
T2 ToM		.24
T2 EU		.04
T2 SP		.30
Step 3	.09*	
Gender		.20
Age		−.18
VA		−.33*
T1 PB		.08
T1 ToM		.32*
T1 EU		.04
T1 SP		−.27
T2 ToM		.18
T2 EU		−.20
T2 SP		.19
Gender × T1 ToM		−.04
Gender × T2 EU		.38**
Gender × T2 SP		.17
Total R^2	.37**	

Note. VA, verbal ability; ToM, theory of mind; EU, emotion understanding; SP, social preference; PB, prosocial behavior. For gender analysis, boys were coded as 0 and girls were coded as 1.
* $p < .05$.
** $p < .01$.

tion terms between gender and variables of interest were calculated based on gender differences identified in Tables 1 and 2 in order to further explore these specific findings. Regression analyses with all gender interaction variables included were also conducted, and the overall pattern of findings for both T1 and T2 prosocial behavior remained unchanged. Thus, the final models included only interaction variables where gender differences were identified in preliminary analyses.

In the first model predicting T1 prosocial behavior (Table 3), gender, age, and verbal ability were entered on the first step; T1 ToM, EU, and social preference were entered on the second step; and a separate gender interaction variable with T1 ToM was entered on the final step. The overall model was significant; however, none of the variables in the model was found to be a significant independent predictor of T1 prosocial behavior.

In the second model predicting T2 prosocial behavior (Table 4), gender, age, verbal ability, and T1 prosocial behavior were entered on the first step; T1 and T2 ToM, EU, and social preference were entered on the second step; and three separate gender interaction variables with T1 ToM, T2 EU, and T2 social preference, respectively, were entered on the final step. The model was significant at the second and final steps, and both of these steps significantly improved model fit. In the final step, T1 ToM significantly predicted T2 prosocial behavior, $\beta = .31$, $t(72) = 2.11$, $p = .039$, indicating that children's ToM at 5 years of age had a positive longitudinal influence on their prosocial behavior at 7 years

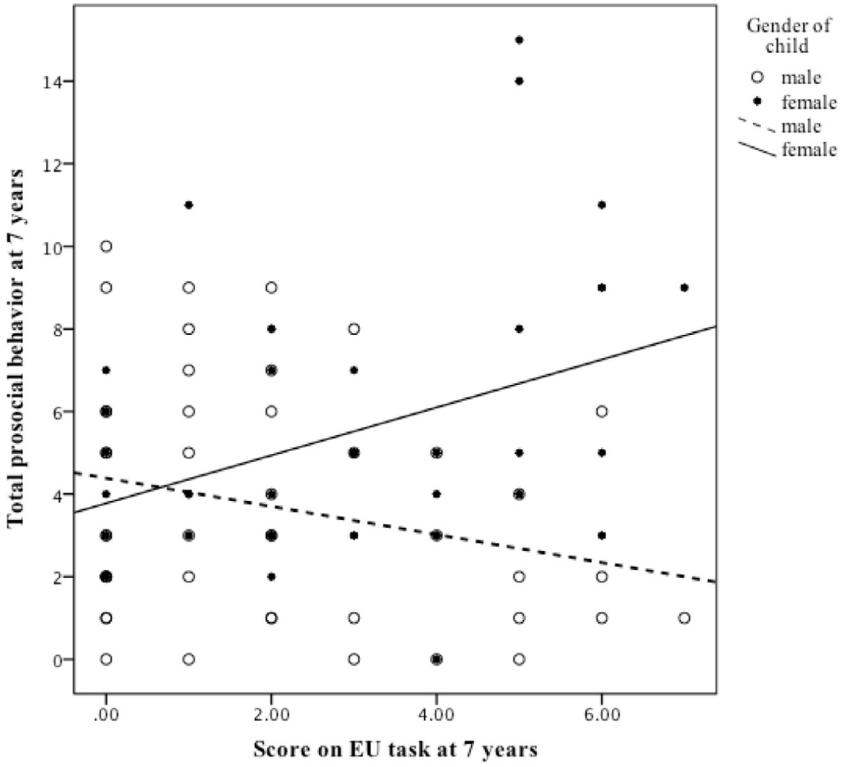

Fig. 1. Interaction between child gender and Time 2 emotion understanding as a predictor of prosocial behavior at Time 2.

irrespective of gender. Unexpectedly, verbal ability was found to negatively predict T2 prosocial behavior, $\beta = -.33$, $t(72) = -2.65$, $p = .010$.

The final step also revealed that the interaction between gender and Time 2 EU was significant, $\beta = .38$, $t(72) = 2.67$, $p = .009$ (see Fig. 1). Subsequent simple slopes analysis of this interaction showed that for girls there was a significant positive association between EU and prosocial behavior, $\beta = .25$, $t(72) = 2.22$, $p = .029$, whereas for boys this association was not significant, $\beta = -.15$, $t(72) = -1.43$, $p = .16$.

Discussion

The current study used a prospective longitudinal design to investigate gender-differentiated associations among prosocial behavior, ToM, EU, and social preference, and how these associations may change from 5 years to 7 years of age. Children's ToM at 5 years significantly and independently predicted prosocial behavior toward peers at 7 years, even after controlling for potentially confounding variables such as age, verbal ability, and earlier prosocial behavior. This finding demonstrates a longitudinal, but not concurrent, association between ToM and prosocial behavior that was not moderated by gender. In addition, at 7 years, prosocial behavior was positively associated with EU for girls but not for boys. Taken together, these findings show that by middle childhood, boys and girls draw on distinct factors when interacting with their same-sex peers.

Theory of mind and prosocial behavior

Our findings add to the growing body of research demonstrating a positive association between children's ToM and their prosocial behavior (e.g., Cassidy, Werner, Rouke, Zubernis, & Balaraman,

2003; Slaughter, Dennis, & Pritchard, 2002; Wu & Su, 2014). Furthermore, our results provide support for the theoretical assumption that underpins the majority of research on ToM—that children's intrinsic capacity to understand the thoughts, beliefs, and desires of others may facilitate their tangible real-life behavior in social interactions. Importantly, skills like ToM are not merely theoretical attributes that exist in a vacuum; rather, they may be critically influential in the practical manifestation of children's social behavior in everyday life. The current study demonstrated a longitudinal, but not concurrent, association between ToM and prosocial behavior. This supports the findings of Caputi and colleagues (2012), who similarly found longitudinal effects of ToM on prosocial behavior from 5 years to 6 years, and from 6 years to 7 years, but did not find any concurrent relationships within time points. Indeed, longitudinal associations have been reported in various studies that examined other real-life social outcomes in relation to ToM such as friendship insight (Dunn, Cutting, & Fisher, 2002), mental-state talk in conversations with friends (Hughes & Dunn, 1998; Hughes, Ensor, & Marks, 2011), and sensitivity to criticism (Cutting & Dunn, 2002; Lecce, Caputi, & Pagnin, 2013). Thus, the findings of the current study, in conjunction with previous research, highlight that the consolidation of social cognitive skills is a developmental process that requires time, experience, and maturation in order for these skills to be maximized in practical social behavior (Hughes, 2011).

Gender-differentiated associations with EU

Based on previous studies that have examined gender differences in the associations among ToM, EU, and various social outcomes (Badenes et al., 2000; Banerjee et al., 2006; Custrini & Feldman, 1989), it was hypothesized that both ToM and EU would be more robustly associated with prosocial behavior for girls compared with boys, and that this association would be more prominent at 7 years of age compared with 5 years once children had spent more time in the school environment. This hypothesis was partially supported by our findings, which demonstrated that girls' EU was positively associated with their prosocial behavior at 7 years, with no such relation for boys. As such, a main effect of gender at 7 years was qualified by the significant difference in how boys' and girls' EU related to their prosocial behavior time point. Indeed, other studies that have examined prosocial behavior in relation to other key variables similarly failed to find a significant independent association with gender once the contributions of other variables were taken into account (e.g., Caputi et al., 2012; Eggum et al., 2011; Ensor & Hughes, 2005).

It appears that by middle childhood, girls may use their EU abilities during practical prosocial acts toward peers in a way that boys do not. This distinction may reflect a greater proclivity for girls, compared with boys, to capitalize on their understanding of others' emotions in their peer interactions. Based on the established gender-differentiated nature of children's peer relations, whereby girls' relationships are more interpersonal by nature and have a stronger focus on emotional transactions (Rose & Rudolph, 2006), it seems likely that there may be a greater actual or perceived need for girls to be able to understand how their peers are feeling and to harness this knowledge to act prosocially and, thus, maintain their interpersonal emotional bonds. From an evolutionary viewpoint, the need for females to interact with and rely on more distally related kin and non-kin members, compared with males, may have contributed to "a unique suite of selection pressures for females to be more sensitive to the display and reception of higher levels of interpersonal investment behaviors" (Vigil, 2007, p. 146). Indeed, research on children's emotional displays indicates that girls are more attuned to the emotional experiences of their peers (Banerjee et al., 2006; Custrini & Feldman, 1989) and are more likely to conceal their negative emotions for the sake of others in a social situation (Cole, 1986; Saarni, 1984) compared with boys.

In addition, it appears that ToM and EU have distinctive relations with prosocial behavior moderated by gender. Our results indicate that earlier ToM understanding is important for boys and girls alike, whereas EU appears to be more influential in the prosocial behavior of girls than in that of boys. This supports the account that EU may reflect a more interpersonally oriented perspective-taking ability that is sensitive to gender differences in social relations, whereas ToM may be a relatively more gender-neutral ability (Braza et al., 2009). Intriguingly, the current study also found differences in how ToM and EU related to prosocial behavior from 5 years to 7 years of age; ToM showed longitudinal, but not concurrent, associations with prosocial behavior, whereas EU showed concurrent, but not

longitudinal, relations. One possible account of this distinction is that ToM and EU may differ in their *scope;* whereas ToM is more narrowly focused on the acquisition of cognitive milestones or conceptual insights that are critical to children's perspective taking, EU incorporates a broader range of psychological phenomena, whereby a prerequisite of interpreting a wide range of idiosyncratic emotional reactions and responding sensitively to others' emotional cues is grounded in ToM abilities (Hoffman, 1982). Consequently, children's EU abilities at 7 years may have drawn on their earlier ToM skills at 5 years, in addition to their concurrent skills concerning the interpretation of and response to emotional cues, reflected in a concurrent, but not longitudinal, association between EU and prosocial behavior at 7 years. Alternatively, it may be the case that earlier ToM skills, but not EU skills, confer a later advantage to children's peer interactions because of a mediated effect on a third variable, which then in turn increases children's later prosocial behavior. Although we did not explicitly investigate any mediational relations in the current study, our longitudinal findings indicate that future research on ToM and prosocial behavior would benefit by examining potential mediational effects of different child and situational factors.

The current study had an unexpected finding at 7 years of age, whereby children's verbal ability was found to negatively predict prosocial behavior. Although this appears to contradict existing research (e.g., Cassidy, Werner, Rourke, Zubernis, & Balaraman, 2003; Slaughter et al., 2002), it should be noted that there is significant variation in how children's linguistic skills relate to their prosocial behavior, depending on the measures used to assess these two constructs (Eisenberg et al., 2006). Perhaps the children in the current study who were more verbally proficient used their linguistic skills to act prosocially toward their peers, which was not captured by our measure of prosocial behavior. Including a verbal-based measure of prosocial behavior may be a fruitful area for future research.

Contrary to the study hypothesis, social preference was not associated with prosocial behavior at either time point. This finding suggests that during middle childhood intrinsic factors such as ToM and EU may play a relatively greater role in influencing prosocial behavior compared with extrinsic factors such as social preference.

Limitations and future directions

It is important to acknowledge the limitations of the current study and the ensuing potential directions for future research. First, although observational measures of prosocial behavior have been found to be less gender biased than report-based measures (Rose & Rudolph, 2006; Zarbatany, Hartmann, Gelfand, & Vinciguerra, 1985), it is possible that our conceptualization of prosocial behavior may have nonetheless implicitly favored girls. There was an observed trend in the triadic play sessions for girls to engage in more logistical interactions concerning rule making and boundary setting for the play compared with boys, which in turn may have given rise to greater numbers of the types of prosocial acts coded in the current study. It would be interesting to examine whether girls still display more prosocial behavior when it is measured as a ratio of time spent engaging in interactions that require children to help and share, rather than an absolute number of acts, or whether this gender difference is merely reflective of the distinct types of interactions in which boys and girls engage.

Second, due to the relatively modest sample size, we were unable to analyze any effects relating to each individual component of our prosocial behavior composite (sharing, helping, comforting, praising and encouraging). It would be worth exploring whether specific types of prosocial acts have unique relations with ToM and EU and whether they show differential associations for boys and girls. It is likely, given that certain prosocial acts rely more heavily on perspective-taking abilities such as comforting (Eisenberg et al., 2006), that psychological understanding may influence specific prosocial acts to a greater extent than others. Similarly, it may be that girls are more inclined to display certain types of prosocial behaviors compared with boys but that boys may in turn display other types of prosocial behaviors more than girls. Thus, gender differences in prosocial behavior may be more complex than simply observing any overall difference in the number of total prosocial behaviors, as an amalgam, and may instead manifest in differences within and between specific prosocial acts.

Finally, prosocial behavior in the current study was measured in interactions with same-sex peers so as to reflect the predominance of gender-segregated peer interactions that typify middle childhood. However, it is possible that this may have overinflated any gender differences in prosocial behavior

given that boys and girls have been found to engage in significantly more gender-stereotyped activities when interacting with same-sex peers compared with mixed-sex peers (Fabes, Martin, & Hanish, 2003). Furthermore, it is difficult to determine whether the gender effect found in the current study was driven by child gender or by peers' gender—namely, the gender of the recipients of children's prosocial behavior. It may be that boys and girls are generally treated differently regardless of who is instigating the prosocial behavior toward them. Indeed, research indicates that boys and girls show differences in the ways they behave toward same-sex versus other-sex peers; boys tend to affiliate more than girls with familiar same-sex peers (Benenson, Quinn, & Stella, 2012), and girls show greater variability in the amount of time spent engaged in play with peers of the opposite sex (Martin & Fabes, 2001). Future research comparing boys' and girls' interactions with same-sex versus other-sex peers, as well as using naturalistic observations of children's interactions in settings such as the school playground, may be beneficial in clarifying these issues concerning peer gender.

Conclusion

The current research is the first longitudinal study to systematically examine gender differences in the relations among observed prosocial behavior with ToM, EU, and social preference during middle childhood. The results indicated that earlier ToM at 5 years of age positively predicted later prosocial behavior for all children irrespective of gender. By contrast, the relation between EU and prosocial behavior at 7 years was moderated by gender, such that there was a positive association between EU and prosocial behavior for girls only. Thus, it appears that ToM and EU have unique gender-differentiated associations with children's prosocial behavior toward peers during middle childhood.

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