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Relations between theory of mind, mental state language and social adjustment in primary-school children

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ABSTRACT

The present study investigated the concurrent relations between theory of mind (ToM), mental state language (MSL) and social adjustment (assessed in terms of emotional instability, prosocial behaviour and aggressiveness) in a sample of 150 children between 8 and 11 years of age. The results showed no correlation between the performance on false belief tasks and the frequency of MSL in a narrative task. False belief understanding was unrelated with all measures of social adjustment, whereas the children's use of MSL was negatively correlated with emotional instability and aggressiveness, above and beyond the influence of receptive language ability. These findings suggest that having a ToM ability is different from spontaneously using it during non-interactive narrative tasks, and that the two ToM measures are differently related to social competence in primary school children.

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KEYWORDS Theory of Mind; false belief understanding; mental state language; social adjustment; primary-school children

Introduction

Theory of mind (ToM) refers to the ability to appreciate the existence of one's own and others' mental states (e.g. intentions, emotions, desires), and use them to explain and predict behaviours (Flavell, 2004). Research conducted under the rubric of the sociocultural perspectives on ToM development has recently provided clear evidence of robust links between variations in children's understanding of mind and individual differences in their social competence (see Hughes & Devine, 2015, for a review), which can be regarded as a complex set of

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interpersonal skills including knowledge of social standards of behaviour, social problem-solving, emotion understanding, perspective taking, and communication and language efficacy (Longobardi, Spataro, Frigerio, & Rescorla, 2015; McCabe & Meller, 2004). In this context, the present study aimed at examining the concurrent relations between ToM, mental state language and social adjustment in a sample of 150 primary-school children between 8 and 11 years of age. In the following paragraphs, we briefly discuss previous findings that are most relevant to these topics and then illustrate our aims.

Relations between false belief understanding and mental state language

A common way to assess ToM understanding in the laboratory is by testing children's performance in first-order and/or second-order false belief tasks, which require them to make inferences about the behaviour of an agent based on that agent's erroneous beliefs (Perner & Wimmer, 1985). However, a number of researchers have drawn a distinction between *having* a ToM ability (as indicated by false belief understanding) and spontaneously *using* it in interactive contexts (e.g. conversations with peers and adults) or non-interactive narrative tasks (Caputi, Lecce, Pagnin, & Banerjee, 2012; Meins, Fernyhough, Johnson, & Lidstone, 2006). The mastery of linguistic expressions representing thoughts, emotions and beliefs has been termed mental state language (MSL; Longobardi, Spataro, Renna, & Rossi-Arnaud, 2014) or psychological lexicon (Grazzani & Ornaghi, 2012).

Although the acquisition of MSL is considered to be an early indicator of ToM and a precursor of metarepresentational ability (Bartsch & Wellman, 1995), the existence of a relation between these two domains has been questioned. Studies examining the linguistic performance of preschool children in interactive contexts (e.g. symbolic play with parents or peers) have typically reported significant positive correlations between ToM skills and the use of MSL (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Hughes & Dunn, 1998). In contrast, studies testing primary-school children in non-interactive tasks have often failed to detect reliable associations (Charman & Shmueli-Goetz, 1998; Tager-Flusberg & Sullivan, 1995). Meins et al. (2006), for instance, reported that individual differences in children's use of MSL, as assessed in two written tasks (book narration and describing the best friend), were independent of their capacities for representing those internal states—as assessed with Happé's strange stories.

Associations between ToM, MSL and social adjustment

Individual differences in ToM ability have been often linked to social adjustment (Jenkins & Astington, 2000; Lalonde & Chandler, 1995; Slaughter, Dennis, & Pritchard, 2002). More specifically, some studies have reported significant, positive associations between ToM performance and *peer popularity*, assessed

by asking children to provide preference nominations (Bosacki & Astington, 1999; Cassidy, Werner, Rourke, Zubernis, & Balaraman, 2003). Using this method, Slaughter et al. (2002, Study 1) found that the ToM scores of 5-year-old children were positively related to social preference, and that popular children scored higher than rejected children on ToM tasks.

Other researchers focused on *prosocial orientation*, defined as the child tendency to engage in positive social interactions with peers (Watson, Nixon, Wilson, & Capage, 1999), including acts such as helping, sharing, comforting and cooperating (Eggum et al., 2011; Lonigro, Laghi, Baiocco, & Baumgartner, 2014). Capage and Watson (2001) showed that the scores of a sample of preschool children between 42 and 83 months of age in two first-order false belief tasks predicted teacher ratings of social competence. Similarly, Eggum et al. (2011) reported that a composite measure of ToM ability at 42 months predicted prosocial behaviour at 72 months. However, other studies failed to detect reliable relations between ToM and prosocial orientation (Bosacki & Astington, 1999). Ruffman, Slade, Devitt, and Crowe (2006), for instance, found that ToM performance did not play a significant role in the prediction of four different measures of conflict/cooperation (conversation with friend, working with friend, arguing/tussling over toy and naughtiness) in 55 preschoolers between 3 and 4 years of age.

A third aspect of social adjustment concerns the frequency of behaviours reflecting externalizing problems (such as *aggressiveness*) or internalizing problems (such as *shyness or withdrawn behaviours*) (Bornstein, Hahn, & Haynes, 2010; Walker, 2005). In this respect, available findings are mixed, with different authors reporting negative (Capage & Watson, 2001), positive (for boys only: Walker, 2005) or even null (Slaughter et al., 2002) correlations between ToM understanding and aggressiveness. On the other hand, ToM ability has been negatively associated with shy/withdrawn behaviours (for boys only: Walker, 2005) and loneliness (for girls only: Devine & Hughes, 2013).

Relatively, few studies have investigated the question of whether children's use of MSL correlates with social adjustment. However, there is moderate evidence to support the conclusion that discourse and/or explanations about emotions and mental states between parents (or peers) and children predict future performance on false belief tasks (Brown, Donelon-McCall, & Dunn, 1996; Ensor, Devine, Marks, & Hughes, 2014), and positively correlate with emotion understanding (Dunn, Brown, & Beardsall, 1991; Grazzani & Ornaghi, 2012) and the frequency of cooperative and prosocial behaviours in preschoolers (Brown et al., 1996; Garner, Dunsmore, & Southam-Gerrow, 2008).

Aims of the present study

Focusing on primary school children, the present study aimed at gathering additional data about the relations between false belief understanding, MSL and social adjustment in a sample of third- to fifth-graders between 8 and 11 years of

age. The multifaceted concept of social adjustment was operationalized in terms of three different constructs—emotional instability, prosocial behaviour and aggressiveness (Caprara & Pastorelli, 1993; Carlo et al., 2012), that were assessed in the real-life context of school. More specifically, our aims were to determine:

(a) whether children's performance in second-order false belief tasks correlated with their use of MSL in a non-interactive narrative task;
(b) whether the above two indices of mind-understanding ability correlated with the three measures of social adjustment (emotional instability, prosocial behaviour and aggressiveness);
(c) whether the potential correlations between false belief performance, the use of MSL and social adjustment remained significant after removing the variance explained by children's language skills. This issue is relevant because previous studies have consistently shown that language represents a strong correlate of prosocial behaviour (Longobardi et al., 2015) and explains many of the relations between ToM and social competence (Cassidy et al., 2003; Ruffman et al., 2006).

Method

Participants

A total of 150 children from two primary schools in the urban area of Rome (Italy), equally divided between the third (50), fourth (50) and fifth (50) grades, participated in the study. There were 77 boys and 73 girls, with a mean age of 8;5 (third-grade; range: 7;9–9;5), (fourth-grade; range: 8;9–10;5), (fifth-grade; range: 10;2–12;6) years, respectively. Their socioeconomic status was medium and medium-high, as defined on the basis of parental education (e.g. graduate or high school) and occupations (e.g. clerical worker/official, teacher, businessman, professional). No child had known or suspected sensory, intellectual, speech, language or learning deficits, based on teachers' and parents' reports. All parents were provided with an information sheet and an explicit consent form.

Instruments and measures

Instruments included a test of receptive language ability, two false belief tasks, a narrative task and a questionnaire measuring social adjustment.

Receptive language

Receptive language ability was assessed with the *Peabody Picture Vocabulary Test* (PPVT-R; Dunn & Dunn, 1981; Italian adaptation by Stella, Pizzioli, & Tressoldi, 2000). The experimenter read a word and simultaneously presented four pictures to the child, who was requested to point to the image that best corresponded to the word. Scores varied between 0 and 175.

Theory of mind

Two second-order false belief tasks were used to evaluate ToM knowledge: the *look-prediction* task and the *say-prediction* task (Liverta Sempio, Marchetti, Castelli, Lecciso, & Pezzotta, 2005; Grazzani & Ornaghi, 2012). Second-order false belief tasks require children to make inferences about someone's false beliefs. In the look-prediction task, the child is asked to predict where the protagonist of a story thinks that another story character will look for an object, whereas in the say-prediction task the child is asked to predict what the protagonist thinks another character will say about a gift he/she is to receive for his/her birthday. In both tasks, the illustrated story was read to the participant who was then required to answer five questions: a memory control question (e.g. Did Mary see John hide the pack of cards under the bed?), a reality control question (e.g. Where does Mary think the pack of cards is?), a first-order false belief question (e.g. "Does John know that Mary saw him hide the pack of cards under the bed?"), a second-order false belief question (e.g. "Where does John think that Mary will first look for the pack of cards when she comes back into the room?") and a justification question. For each question, children were credited with the score "1" if they gave the correct answer, and the score "0" if they gave the wrong response or did not answer. Thus, total scores ranged from 0 to 5 in both the look- and the say-prediction tasks. Scores from the two ToM tasks were not averaged, because they were not significantly correlated ($r = .09$, $p = .26$).

Mental state language

Children were involved in the narrative task "*Invent a story*" (Longobardi et al., 2014): they were told to write a fictional story, starting from a neutral keyword, which could be Animate (e.g. astronaut, robot, whale, policeman, parrot), Artefact (e.g. glue, scissors, snack, rucksack) or Natural (e.g. water, wind, sun, puddle, darkness). The use of the 42 keywords was counterbalanced across participants.

MSL terms were classified in four categories (Longobardi et al., 2014; Ornaghi, Brockmeier & Grazzani, 2011): Emotional (e.g. *happy*, *proud*, *angry*, *to hate*, *to fall in love*), Volitional (e.g. *to intend*, *to decide*, *able*, *skilful*), Cognitive (e.g. *to understand*, *to believe*, *to remember*, *to be sure*, *to think*) and Moral (e.g. *bad*, *nasty*, *to sacrifice*, *to regret, to forgive*). References to MSL were not counted if they appeared within idiomatic expressions, like "you must know that" or "and they lived happily ever after", or were used to denote stereotyped personality traits (e.g. "Giovanni is clever"), without no clear evidence of genuine psychological reference (Lecce et al., 2010). To control for individual differences in the length of written stories, the proportional frequency of MSL was computed as a ratio of the number of MSL terms (collapsed across the five categories) to the total number of words produced in each story (Longobardi et al., 2014; Ornaghi et al., 2011). Reliability was evaluated by having a second trained assistant coding 30% of the narratives. The mean inter-rater agreement was 92% (Cohen's $K = .89$).

Social adjustment

Teachers rated children's social skills by completing the questionnaire *Indices of Social Adjustment Ability in School-Age Children* (Caprara, Pastorelli, Barbaranelli, & Vallone, 1992; Carlo et al., 2012). This instrument is composed of three different subscales: *Emotional Instability* (behaviours denoting a lack of adequate self-control in social situations as a result of scarce capacity to refrain from impulsivity and emotionality; i.e. "The child cannot sit still", "The child disturbs the classmates"; range: 10–30), *Prosocial Behaviour* (behaviours denoting altruism, trust and agreeableness; i.e. "The child tries to help the classmates", "the child caresses and embraces the classmates"; range: 8–24), and *Aggressiveness* (behaviours aimed at hurting others physically or verbally; i.e. "The child kicks and punches the classmates", "The child teases the classmates"; range: 9–27). For each item, teachers indicated the frequency with which the child exhibited a certain behaviour at school, using a three-point Likert scale (1 = never; 2 = sometimes; 3 = often).

Procedure

Children participated in two testing sessions, separated by 1 week. Session 1 was conducted collectively in the classroom and lasted about 45 min, during which children were asked to write the fictional stories. Session 2 was conducted individually in a quiet room of the school and lasted another 45 min: in this phase the experimenter administered the PPVT-R and the false belief tasks. At the same time, teachers completed the questionnaire on social adjustment.

Results

Effects of gender and grade

Table 1 reports means and standard deviations for all measures included in the present study, separately for boys and girls of each grade. These data were analysed with a series of between-participants ANOVAs, considering gender (boys vs. girls) and grade (3rd, 4th and 5th grade) as independent variables. Significant effects of grade were obtained on receptive language, $F(2, 144) = 25.63$, $p < .001$, $\eta_p^2 = .26$; false belief understanding (Say-prediction), $F(2, 144) = 4.35$, $p = .015$, $\eta_p^2 = .06$; emotional instability, $F(2, 144) = 3.90$, $p = .022$, $\eta_p^2 = .05$; prosocial behaviour, $F(2, 144) = 3.49$, $p = .033$, $\eta_p^2 = .04$; and aggressiveness, $F(2, 144) = 6.00$, $p = .003$, $\eta_p^2 = .08$. Scores increased across the three grades for false belief understanding and prosocial behaviour; in contrast, for emotional instability and aggressiveness, there were significant decreases between the 3rd and 4th grades ($p = .020$ and $p = .028$). Significant effects of gender were observed on receptive language, $F(1, 144) = 4.09$, $p = .045$, $\eta_p^2 = .03$; the use of MSL, $F(1, 144) = 8.23$, $p = .005$, $\eta_p^2 = .05$; emotional instability, $F(1, 144) = 10.62$, $p < .001$, $\eta_p^2 = .06$; prosocial behaviour, $F(1, 144) = 5.02$, $p = .027$, $\eta_p^2 = .03$; and aggressiveness, $F(1, 144) = 20.55$, $p < .001$, $\eta_p^2 = .12$. Compared with boys, girls used more MSL

Table 1. Means (and standard deviations) for all measures, as a function of gender and grade.

Measures	3rd Grade	4th Grade	5th Grade
Receptive language			
Boys	116.29 (19.86)	134.69 (14.81)	134.70 (13.92)
Girls	109.30 (17.58)	129.08 (13.15)	131.53 (14.56)
False belief understanding (Look-P)			
Boys	3.62 (.68)	3.76 (.99)	3.91 (.88)
Girls	3.52 (.99)	4.08 (.82)	3.73 (.72)
False belief understanding (Say-P)			
Boys	2.92 (.72)	3.03 (.66)	3.29 (.80)
Girls	2.65 (.88)	3.17 (1.01)	3.23 (.76)
Mental state language			
Boys	.02 (.02)	.03 (.02)	.03 (.01)
Girls	.03 (.03)	.04 (.01)	.04 (.01)
Emotional instability			
Boys	20.77 (6.19)	16.88 (5.68)	20.83 (7.16)
Girls	18.04 (6.45)	15.33 (4.71)	15.57 (5.34)
Prosocial behaviour			
Boys	14.55 (2.85)	15.88 (3.07)	15.29 (2.09)
Girls	15.65 (2.20)	16.91 (2.24)	15.88 (2.08)
Aggressiveness			
Boys	16.40 (2.37)	15.50 (2.61)	17.16 (2.25)
Girls	15.13 (3.26)	13.41 (1.79)	15.00 (2.41)

terms, were more prosocial, and exhibited lower levels of emotional instability and aggressiveness. Surprisingly, boys had slightly larger receptive vocabularies than girls. The two-way interactions between gender and grade were never significant, all Fs(2, 144) < 1.66, p > .19.

Concurrent correlations

Spearman's correlations between the seven measures employed in the current study are illustrated in Table 2. Several important points should be noted. First, receptive language was strongly related to both ToM tasks. Second, performance in the false belief tasks did not correlate with the use of MSL. Third, the frequency of MSL in the narrative task was negatively associated with both emotional instability and aggressiveness. Lastly, ToM performance was unrelated to all measures of social adjustment. Some illustrative examples of children's profiles are reported in the Appendix A.

Comparing children who passed or not passed the second-order false belief question

To further explore the question of whether ToM ability was associated with social competence, we compared the scores of children who passed the second-order false belief question with those of children who did not pass the same question.

Table 2. Pearson's correlations between false belief understanding, mental state language, and the three measures of social adjustment.

Measures	1	2	3	4	5	6	7
1. Receptive language	1.00						
2. False belief understanding (Look-P)	.29***	1.00					
3. False belief understanding (Say-P)	.22**	.09	1.00				
4. Mental state language	−.03	.03	.06	1.00			
5. Emotional instability	−.09	−.10	.06	−.22**	1.00		
6. Prosocial behaviour	−.02	.11	−.01	.09	.12	1.00	
7. Aggressiveness	.04	−.09	.07	−.23**	.78***	.12	1.00

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 3. Means (and standard deviations) for the groups of children who pass or did not pass the second-order false belief question in the look-prediction and say-prediction tasks.

False belief question (2nd order)	Look-prediction		Say-prediction	
	Pass ($N = 107$)	Not Pass ($N = 43$)	Pass ($N = 59$)	Not Pass ($N = 91$)
Receptive Language	128.95 (17.52)	118.81 (18.49)	127.77 (16.91)	124.92 (19.19)
Mental State Language	.04 (.03)	.03 (.02)	.03 (.02)	.03 (.02)
Emotional Instability	18.11 (6.50)	17.84 (6.22)	18.16 (6.48)	17.54 (5.98)
Prosocial Behaviour	15.37 (2.82)	15.80 (2.41)	15.83 (2.73)	15.44 (2.19)
Aggressiveness	15.48 (2.96)	15.43 (2.61)	15.61 (2.71)	15.20 (2.68)

Such a comparison was performed separately for the *look-prediction* and the *say-prediction* tasks.

The results, illustrated in Table 3, confirmed the conclusions reached through the inspection of correlations. Indeed, the two groups did not differ in the use of MSL or in any of the social adjustment measures—$t(148) < .94$, $p > .35$ for the look-prediction task and $t(148) < .91$, $p > .36$ for the say-prediction task. On the other hand, children who passed the second-order false belief question in the look-prediction task showed greater receptive vocabulary, compared to children who did not pass, $t(148) = -3.15$, $p = .002$; the same analysis in the say-prediction task gave non-significant results, $t(148) = -.93$, $p = .34$.

Hierarchical regressions controlling for language ability

One aim of the present study was to determine whether the relations between psychological understanding and social competence remained significant, after removing the variance explained by children's individual differences in receptive language. To this purpose, we computed two hierarchical regressions, considering the teachers' ratings of emotional instability and aggressiveness as the outcome measures, and children's receptive language (entered at the first step)

Table 4. Hierarchical Regressions predicting emotional instability and aggressiveness from receptive language ability and mental state language.

Dependent measure	Predictors	*Final β*	*t*-test	R^2	*F Model*
Emotional instability	*Step 1*			.01	$F_{(1, 148)} = 1.23$
	Receptive language	−.09	−1.11		
	Step 2			.05	$F_{(2, 147)} = 3.69$*
	Receptive language	−.10	−1.19		
	Mental State Language	−.20	−2.47*		
Aggressiveness	*Step 1*			.00	$F_{(1, 148)} = .23$
	Receptive language	.04	.48		
	Step 2			.05	$F_{(2, 147)} = 3.61$*
	Receptive language	.03	.42		
	Mental state language	−.21	−2.64**		

*$p \leq .05$; **$p \leq .01$.

and MSL (entered at the second step) as the predictors. The results, summarized in Table 4, confirmed that the effects due to the use of MSL remained significant, even when receptive language was partialled out.

Discussion

The present study investigated the concurrent relations between false belief understanding, MSL and three different dimensions of social adjustment (emotional instability, prosocial behaviour and aggressiveness) in a sample of typically developing children between 8 and 11 years of age. The most important results were as follows. First, no correlation was obtained between the performance on traditional false belief tasks and the frequency of MSL in a narrative task. Second, ToM ability was unrelated with all measures of social adjustment (Bosacki & Astington, 1999; Ruffman et al., 2006). Third, the children's use of MSL was negatively correlated with emotional instability and aggressiveness, above and beyond the influence of receptive language ability. In what remains, we will discuss each of these findings in turn.

Regarding the first point, our data join an increasing number of studies which demonstrate that having a ToM ability is somewhat different to spontaneously using it during non-interactive narrative tasks (Charman & Shmueli-Goetz, 1998; Meins et al., 2006; Tager-Flusberg & Sullivan, 1995). In discussing the results, Meins et al. (2006) pointed out that their conclusions should have been regarded as preliminary, because sample size was relatively small (38 children). The same problem of statistical power affected the studies by Charman and Shmueli-Goetz (1998) and Tager-Flusberg and Sullivan (1995), which involved 40 and 61 participants, respectively. From this point of view, the current research provides more firm conclusions, based on a relatively large sample of typically developing children (150). Furthermore, besides the absence of a significant correlation, the discrepancy between having and using a ToM ability is also attested by a different pattern of relations with receptive vocabulary. False belief understanding

was positively and strongly correlated with children's performance in the PPVT-R, confirming the critical role of language for the development of ToM (Astington & Jenkins, 1999). In contrast, the use of MSL in the narrative task was unrelated to the size of receptive vocabulary.

We have previously noted that studies involving preschool children have typically reported significant correlations between false belief tasks and the frequency of MSL in interactional context (Dunn et al., 1991; Hughes & Dunn, 1998). According to Meins et al. (2006), one possible explanation for the discrepancy is that false belief understanding might constrain the children's ability to employ MSL terms during the first stages of ToM acquisition, whereas the two domains would become independent in older children who are already in an advanced stage in the process of ToM learning. However, a fair comparison between the two set of studies is difficult, because two factors were simultaneously manipulated – the age of children (preschool vs. primary school) and the type of context in which MSL was assessed (interactional vs. non-interactional). Thus, in future studies it would be helpful to examine the association between ToM and MSL in primary-school children using interactional tasks. We must also note that a recent study with primary-school children have reported moderate, but significant, correlations between false belief understanding and the use of psychological lexicon (Grazzani & Ornaghi, 2012). Methodological differences might account for the discrepancy with the current results, since Grazzani and Ornaghi (2012) employed a "describe-a-friend" narrative task, which is likely to elicit the production of a higher amount of MSL terms, when compared with a fictional task (see Longobardi et al., 2014). A second methodological difference concerns the composition of the ToM battery. We employed two second-order false belief tasks, but did not include measures of emotion comprehension. In contrast, other studies have used more complete batteries examining the children's ability to deceive, to understand what feelings would be experienced by another individual in a certain situation, or to distinguish between visually apparent and real emotions (Cassidy et al., 2003; Hughes & Dunn, 1998; Ruffman et al., 2006). This factor might have reduced the possibility to detect significant correlations with the frequency of MSL, because the latter involved the use of both cognitive and emotional terms.

As concerns the lack of significant correlations between ToM and social adjustment, several explanations can be advanced (see Caputi et al., 2012). One possibility is that false belief tasks represent artificial conditions which are quite different from real-life situations and do not involve the same kind of social abilities that are necessary for the child to build and maintain positive relationships with peers and adults. In agreement, a study by Banerjee, Watling and Caputi (2011; see also Devine & Hughes, 2013) showed that difficulties in understanding *faux pas* – a more ecological social task involving unintentional insult – predicted peer rejection in 8–9-year-old children. An alternative possibility is that the relation between ToM and social skills is mediated by a third variable. In particular,

prosocial behaviour has been found to moderate the associations between ToM and peer acceptance (Caputi et al., 2012), and between ToM and indirect aggression (Renouf et al. 2010). Our data do not concur with this hypothesis, because false belief understanding was unrelated to prosocial behaviour, which in turn was unrelated to emotional instability and aggressiveness (these correlations should be significant for prosocial behaviour to act as a mediator variable: see Frazier, Tix, & Barron, 2004). Finally, the distinction between ToM performance and social adjustment could reflect the above-mentioned dissociation between having a ToM ability and using it in real-life contexts. The present results provide strong evidence in support of this view, since the use of MSL, but not false belief understanding, correlated with emotional instability and aggressiveness.

The latter finding confirms and extends the conclusions reached by recent studies showing that maternal and child conversations about emotion and mental states have a critical role in the development of social competence (Brown et al., 1996; Garner et al., 2008). As illustrated in the Introduction, available studies with preschool children have reported a strong relationship between participation in family discourse about feelings and causality and individual differences in ToM ability and emotion understanding (Dunn et al., 1991; Ensor et al., 2014; Hughes & Dunn, 1998). In particular, it has been demonstrated that the more a mother uses mental state terms when speaking to her child, the more frequently the child will use psychological lexicon and the more advanced will be her/his ability to understand others' mental states and emotions (Howard, Mayeux, & Naigles, 2008; Taumoepeau & Ruffman, 2008). Taken together, these data suggest that the relations between children's use of MSL and some aspects of their social adjustment (emotional instability and aggressiveness) might be traced back to the early influence of parental behaviours on emotion and mental state understanding (Drummond, Paul, Waugh, Hammond, & Brownell, 2014; Ensor et al., 2014). On the other hand, we must acknowledge that our results about the role of language are at odds with those reported in other studies, in which language has been found to correlate highly with social measures (Cassidy et al., 2003), and to explain much of the variance in the relation between ToM and social competence (Bosacki & Astington, 1999; Ruffman et al., 2006). Such a discrepancy might be accounted for by considering the receptive nature of the language assessment employed in the present study. Indeed, it has been maintained that expressive language measures capture more of the common variance between psychological understanding and language, and therefore are more able to predict social behaviour (Cassidy et al., 2003).

In conclusion, we must note that the present study has limitations. Besides the composition of the ToM battery, the most important concern is that the study design was cross-sectional rather than longitudinal. Thus, we could not examine the causal relations between cognitive, emotional and social variables in terms of temporal pathways. Another issue is represented by the exclusive use of questionnaires (rather than direct measures) to assess social adjustment.

Despite these limits, our results have practical implications, in that they suggests that early training interventions aimed at increasing children's knowledge and use of MSL (Ornaghi, Grazzani, Cherubin, Conte, & Piralli, 2015) might have long-term consequences on social and emotional competence.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix A

Measures	Child A (M—4th Grade)	Child B (F—4th Grade)	Child C (F—4th Grade)
Receptive language (range: 0–175)	148	130	146
False belief (Look-P) (range: 0–5)	3	5	5
False belief (Say-P) (range: 0–5)	2	3	3
MSL (range: .00–.11)	.02	.07	.06
Emotional instability (range: 10–30)	30	14	11
Prosocial behaviour (range: 8–24)	14	20	12
Aggressiveness (range: 9–27)	22	11	12

The table shows the profiles of three 4th-grade children from the current study who exemplify the results emerging from a hierarchical cluster analysis. Child A had high levels of emotional instability and aggressiveness, and used few mental state terms in the narrative task (illustrating a profile with negative social adjustment). Child B exhibited low levels of aggressiveness and a high frequency of prosocial behaviours (illustrating a profile with positive social adjustment). Finally, Child C was reported to have low scores in all social measures (illustrating a withdrawn profile).