Relations between Theory of Mind and Academic School Readiness: The Moderating Role of Child Gender

School readiness can be defined as a multidimensional set of early cognitive, emotional and social competencies possessed by the child and that enables him/her to be prepared to participate in and benefit from formal education (Blair, 2002). The present article is focused on early academic readiness, as one of such competences. Indeed, a large body of empirical research emphasizes the importance of early academic readiness, namely the ability to perform basic academic tasks, such as counting and recognizing letters, for subsequent academic achievement and success (Duncan et al., 2007). In fact, a meta-analysis involving 70 longitudinal studies published between 1985 and 1997, revealed that academic/cognitive skills in preschoolers predicted, on average, about 25% of variance in academic/cognitive outcomes in the early years of school (La Paro & Pianta, 2000).

Based on such evidence, recent studies have been focusing on the contributors for early academic success, revealing that early emotional and behavioural regulatory abilities, including the way the child behaves in the classroom (e.g., by being attentive or inhibiting impulsive behaviours), and how s/he interacts with the teacher and peers, are essential elements of academic school readiness (e.g., Blair, 2002; Graziano, Reavis, Keane, & Calkins, 2007). For instance, it is recognized that better socio-emotional skills, including child emotional understanding, the ability to solve social problems, and prosocial behaviour, at age 4, are associated with greater involvement in learning, and, thus, with better reading skills in the last year of kindergarten (Nix, Bierman, Domitrovich, & Gill, 2013). Therefore, children who are more competent in conflict resolution, and in behavioural and emotional regulation, tend to establish better relationships with their teacher and peers, to be more committed to learning, and, thus, to achieve better educational outcomes (Denham, Bassett, Sirotkin, & Zinsser, 2013; Raver, 2002).

If the consequences of a better cognitive and socio-emotional functioning for early academic success are already known, knowledge on the socio-cognitive predictors of academic readiness is

still incipient. A developmental acquisition that can make a difference in terms of academic readiness is theory of mind (ToM), which develops markedly during the preschool years and broadens the horizon in terms of a better understanding of others and consequent adjustment to the surrounding social world (Carlson, Koenig, & Harms, 2013). In fact, between the age of 3 to 5 years, children typically develop an explicit ToM, or the ability to attribute mental states—such as thoughts and feelings—to self and others, and to understand and anticipate behaviour based on those mental states (Astington & Barriault, 2001; Carlson et al., 2013). ToM is a multicomponential ability (Lecce, Bianco, Demicheli, & Cavallini, 2014). One important milestone of ToM acquisition during the opening years of life is the understanding of false belief. It refers to the child ability to comprehend that two people can have distinct beliefs about the same situation, and that those beliefs could even be false. Accordingly, most studies on ToM have measured children's understanding of the mind using false belief tasks. In a typical false belief task, children are presented with short stories and are asked to explain or to predict a behaviour based on the inferred mental states of a character (Wellman & Liu, 2004). Between 4 and 5 years of age, children begin to be successful in this type of tasks. When children start passing false belief tasks, they are said to understand the representational nature of beliefs and, therefore, to have developed a representational ToM (Wellman, Cross, & Watson, 2001). We make the case herein that this competency may translate into advantages in academic school readiness.

Despite this possibility, the fact remains that less attention has been given to the contribution of ToM for academic school readiness, with most studies on this topic focused on the effects of child cognitive functioning, including IQ and executive function (e.g., Blair & Razza, 2007; Fitzpatrick, McKinnon, Blair, & Willoughby, 2014). The existing literature, nevertheless, supports the idea that ToM matters for the development of academic abilities. Some ground-breaking studies are worth mentioning, including the work of Blair and Razza (2007). These investigators found that preschoolers' false belief understanding, assessed when children were between 3 and 5 years of age,

was associated with letter knowledge, math and phonemic awareness later on, when children were in kindergarten, even after controlling for the effect of child verbal ability, age, gender, and family income. Other studies also provide evidence in support of the hypothesis that ToM can be, indeed, a predictor of academic school readiness. Lecce, Caputi, and Hughes (2011), for instance, showed that 5-year-olds who performed better on a battery of ToM tasks were rated by their teachers, around two years later, as reaching higher levels of academic achievement, namely in mathematics, reading, and text comprehension. In another study, Lecce, Caputi and Pagnin (2014) sought to extend those findings, obtaining further evidence by showing that preschoolers' ToM abilities were linked to later academic achievement, when children were 10 years of age, including children's reading comprehension and mathematical abilities. In a similar vein, Astington and Pelletier (2005) reported positive relationships between preschoolers' performance on ToM tasks and reading acquisition, narrative skills and scientific thinking.

The studies cited above clearly suggest that ToM abilities may be predictive of early academic abilities, even before school entry. This is the focus of the present study. However, given that previous research has been documenting gender differences, both in terms of socio-cognitive development and school readiness, it may be the case that child gender also plays a role in the possible relation between ToM abilities and early academic skills. In fact, several studies have been pointing out differences between girls and boys in what regards child socio-cognitive functioning, mostly favouring girls. Research showed that preschool-aged girls tend to fare better than boys in several measures of children's understanding of the mind, such as mental-state talk or performance on the more traditional false belief tasks. More specifically, results from prior investigations suggested that girls showed more sophisticated mental-state talk, making more frequent references to mental states in their discourse, and also employing a greater variety of mental-state terms when verbally interacting with friends (e.g., Hughes & Dunn, 1998; Hughes, Lecce, & Wilson, 2007). Likewise, other studies reported that girls perform better on other ToM measures, namely in the

classical false belief tasks (e.g., Carlson & Moses, 2001; Charman, Ruffman, & Clements, 2002; Peterson, Slaughter, & Paynter, 2007; Yagmurlu, Berument, & Celimli, 2005; Walker, 2005). Some mixed results, however, have been produced, with a set of other studies showing no significant differences between boys and girls on ToM measures (e.g., Holmes, Black, & Miller, 1996; Jenkins & Astington, 1996; Lundy, 2013). Methodological differences across inquiries could account for variations in results, including the use of distinct measures to assess ToM, based on samples of children with different ages. Despite the above mixed results, the fact remains that research has also been pointing out a female advantage in what regards to other cognitive outcomes and, most importantly to present study, to academic competences. Important to highlight is a study by Bierman and colleagues (2009). These investigators explored gender differences in the behavioural and cognitive (including academic knowledge) readiness for school, and found that girls showed higher levels of participation in the classroom and more prosocial behaviours, whereas boys evinced more aggressive behaviours. In addition, these authors observed that the strength of the relation between children's prosocial behaviour and academic knowledge was greater for girls. Other studies have reported similar results, corroborating the idea that girls outperformed boys in early academic performance, as well as in other cognitive competences found to be associated to academic readiness (Carlson, Mandell, & Williams, 2004; Carlson & Moses, 2001; Fitzpatrick, McKinnon, Blair, & Willoughby, 2014; Janus & Duku, 2007; Kochanska et al., 1996; Sasser, Bierman, & Heinrichs, 2015).

The just cited literature certainly calls attention to the need to consider gender-specific effects, in order to better understand the relations between ToM and academic school readiness. Pertinent to this possibility are results derived from another set of studies, reporting gender-specific effects in the links between children's ToM and other important milestones during the early years of life. For instance, links between ToM abilities and prosocial behaviours have been found, but only for girls (Razza & Blair, 2003; Walker, 2005). Conversely, boys' ToM was found to be related to more

aggressive or disruptive and less shy and withdrawn behaviours instead (Walker, 2005). Based on these results, the authors advanced the possibility that girls and boys, even if not differing in terms of their ToM, could use these abilities differently in their daily life, which would be reflected on these different relations with other competences and outcomes. Congruently, girls', but not boys', ToM was found to be related to children's popularity among peers (Badenes, Estevan, & Bacete, 2000; Braza et al., 2009). Providing further support to these findings, a recent meta-analysis carried out by Slaughter and colleagues (Slaughter, Imuta, Peterson, & Henry, 2015) showed that children who evidenced better ToM skills were more positively viewed by their peers, being more popular.

Despite the undoubted importance of the investigations cited above, it is important to appreciate that the research in this field is characterized by a paucity of studies focused on the gender-specific effects in the links between children's ToM and academic school readiness, during the preschool years. This is the issue empirically addressed herein. Given that studies have suggested that boys and girls seem to present differences in regard to several social and cognitive competences that are expected to contribute for their preparation to enter formal schooling, and that they use those abilities differently in their daily life, the current study seeks to clarify whether the effect of preschoolers' ToM skills on academic readiness is moderated by child gender. Furthermore, child IQ and maternal education were included, in the current study, as important control variables, as these variables have been shown to be related to children's ToM and academic performance in previous studies (e.g., Blair & Razza, 2007; Meins & Fernyhough, 1999; Pears & Moses, 2003). To our knowledge, no prior study has explored this idea. In line with extant empirical evidence, we hypothesize that ToM skills would be related to better early academic abilities, and that this effect would be especially pronounced, or even exclusive, among girls.

Method

Participants

The sample was comprised by 75 children (36 girls, 48%; 39 boys, 52%), recruited in child-care centers in northern Portugal, for participation in a larger longitudinal study on the developmental predictors of school readiness. Children were first assessed when they were enrolled in the second preschool year (T1), and again four months before school entry (T2). At T1, children were aged between 53 and 60 months (M = 55.05, SD = 1.53). The majority came from two-parent families (n = 69, 92%) with two or more children (n = 49, 65.3%), and had mothers and fathers with a college degree (n = 63, 84%, and n = 43, 57.3%, respectively). At T2, children were between 63 to 76 months of age (M = 69.44, SD = 3.06).

Procedure

Between December 2010 and April 2013, members of the research team carried out several visits to child-care centres, in order to present a longitudinal study aimed at exploring the adaptation process of young children from the preschool to the school environment. Data collection began in April 2011. In the first assessment (T1), when children were enrolled in the second preschool year, parents were asked to participate with their children in two independent observation sessions—one with the mother and another with the father—in a university laboratory setting. ToM tasks were administered during the visit with the mother, whereas IQ was evaluated during the visit with the father. Parents were asked to fill in a socio-demographic questionnaire. In the third preschool year, and more specifically, four months prior to school entry (T2), children were visited at the day-care centre, where their academic abilities were measured, and their ToM skills were reassessed. All children were native to Portuguese. All evaluations were performed by trained psychologists, who spoke the same native language as the children. At both time points, and before any assessment, parents were asked to sign an informed consent, allowing their own and their child's participation in the study.

Measures

Child Theory of Mind (ToM). Preschoolers' understanding of the mind was assessed through a set of videotaped false belief tasks, which have been widely used (e.g., Duh et al., 2016).

a) ToM at T1 was assessed using six standardised tasks, namely four tasks from a scale for preschoolers (Wellman & Liu, 2004): (i) *Diverse Beliefs Task*, assessing the ability to understand that two people can have opposing beliefs; (ii) *Knowledge Access Task*, assessing the ability to understand that two people can have distinct knowledge about reality; (iii) *Unexpected Contents False Belief Task*, assessing whether the child is able to understand a representational change regarding another person; (iv) *Explicit False Belief Task*, assessing the ability to recognize the false belief of another person; and two additional false belief tasks (Hughes et al., 2000); (v) *Unexpected Contents II* assessing whether the child is able to understand his/her own representational change; and (vi) *Unexpected Location* assessing whether the child understands that one person can have a belief that differs from reality. The presentation order of the first two tasks was fixed, whilst the order of the remaining tasks was counterbalanced. All the tasks were coded in terms of success (1) or failure (0), and to succeed in each of the tasks the child had to correctly answer both the control and the key-questions. A composite ToM measure (at T1) was calculated, consisting on the sum of the child's scores in all six tasks. The final score could range from 0 to 6.

b) ToM at T2 was measured using a set of six standardized tasks, to know, five tasks from a scale for preschoolers (Wellman & Liu, 2004): (i) *Diverse Beliefs*; (ii) *Unexpected Contents False Belief*; and (iii) *Explicit False Belief Task* (all of them administered at T1, and thus already described above); (iv) *Belief-Emotion*, assessing whether the child is able to infer that beliefs can cause emotions; and (v) *Real-Apparent Emotion*, assessing whether the child is able to differentiate between apparent and real emotions. One additional false belief task was used (Hughes et al., 2000): (vi) *Unexpected Location*, already administered at T1 (see above description). Tasks were conducted in a fixed order. All of the tasks were coded in terms of success (1) or failure (0), and to succeed in each of the tasks children had to answer both the control and the key-questions correctly. A

composite ToM measure (at T2) was calculated, consisting of the sum of the child's scores on all six tasks; thus, the range of scores was from 0 to 6.

Twenty-four of the videotapes were randomly selected and coded by two independent trained judges. Interrater reliability was calculated using Cohen's kappa and ranged between .88 and 1.00. In addition, the Cronbach's alpha for the T1 and T2 composite measures was .56 and .55, respectively, which is consistent with reliability coefficients that have been reported in previous studies that used similar ToM measures (Astington & Jenkins, 1999; Meins et al., 2002).

Academic school readiness at T2. The *Lollipop Test* (Chew, 1981; Chew & Morris, 1984; Lemelin et al., 2007) is a well-validated screening test of academic readiness in preschool-aged children. It includes 52 questions, divided in four subtests concerning (a) knowledge about colours and shapes and ability to copy shapes; (b) description of images and spatial recognition; (c) knowledge about numbers and counting; and (d) knowledge about letters and writing. The *Lollipop Test* was developed and validated in the USA, with good levels of concurrent validity with the Metropolitan Readiness Tests (MRT), and with teachers' evaluations. Good indices of reliability have also been obtained in the Portuguese validity study of this measure (Soares, 2015). A total final score was calculated based on the sum of the items. The minimum and maximum scores children could attain were 0 and 69, respectively.

Covariates.

IQ at T1. IQ was assessed using a short version of the *Wechsler Preschool and Primary Scale of Intelligence – Revised* (WPPSI-R, Wechsler, 2003), consisting of the Information and Block Design subtests. The Information subtest requires children to answer questions addressing general knowledge, and the Block Design subtest involves children's ability to copy models using two-coloured blocks. Block Design and Information are the subtests that showed a higher correlation with Performance IQ (r = .66) and Verbal IQ (r = .68), respectively, in the Portuguese validation sample. Additionally, both showed the highest correlations with the Full Scale IQ (r = .70 and r = .67,

respectively) (Wechsler, 2003). The Portuguese version of this measure has an adequate reliability and validity indices, between .70–.97 (Seabra-Santos et al., 2006). In the present study, IQ was estimated based on the scaled scores on these two tasks, following the procedure described by Sattler (1992).

Results

Data analysis proceeded in several steps. Simple bivariate relations were examined between academic school readiness, measured at T2, and age at assessment, IQ, parental education, as well as ToM, assessed at both T1 and T2. Gender differences on study variables were examined. Then, we tested whether child gender moderated the effects of ToM at T1, as well as at T2, on academic school readiness, via two multiple regression analyses.

Preliminary Analyses: Associations among Study Variables and Gender Differences

Descriptive statistics and bivariate associations between study variables can be found in Table 1 and Table 2, respectively. Considering the overall sample, children who demonstrated greater academic school readiness displayed higher IQ scores at T1, $r = .48$, $p < .001$, and had better educated mothers, $r_s = .25$, $p = .028$, but not fathers. No significant associations were found between academic school readiness and child age, or performance on ToM tasks at T1 and T2. ToM at T1 was positive and significantly linked to ToM at T2, $r = .39$, $p = .001$. Preliminary analyses did not reveal mean differences between boys and girls on study variables, including academic school readiness, ToM at T1 and T2, child IQ scores, age, or parental education (all $p < .05$).

<table 1 near here>

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Predicting Academic School Readiness

A first hierarchical multiple regression was computed using child IQ and maternal education as control variables, entered in the first step of the model, as they were significantly associated with academic school readiness. Both child IQ, $\beta = .41$, $p < .001$, and maternal education, $\beta = .25$, $p =$

.018, emerged as significant predictors of academic school readiness. The following steps included child gender and ToM at T1, as well as their interaction, as predictors of academic school readiness. While no significant main effects emerged, the interaction Gender x ToM at T1, proved significant, β = -.67, p = .041, and the model including this interaction term explained 34% of the variance on academic school readiness scores (see Table 3). In order to illuminate the nature of this significant interaction, we plotted regression slopes of ToM at T1 on academic readiness separately for boys and girls (see Figure 1; Aiken & West, 1991). Follow-up analysis indicated that among girls a better performance on ToM tasks, at T1, predicted greater academic school readiness, at T2, β = .37, p = .026, whereas among boys such relation was absent, β = -.15, p = .376.

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<Figure 1 near here>

Then, a second hierarchical multiple regression was carried out. Child IQ and maternal education were included again in the analysis as covariates, followed by child gender and ToM at T2, as well as their interaction, as predictors of academic school readiness. As presented in Table 4, and as expected given the previous correlational and regression analyses, child IQ and maternal education proved again to be significant predictors of academic school readiness, β = .40, p < .001 and β = .26, p = .016, respectively. No significant main effects emerged, however, with regard to child gender or ToM at T2. Likewise, and contrary to our hypothesis, the interaction between child gender and ToM at T2 proved unrelated to academic school readiness.

Discussion

The present study aimed at examining the possible moderating role of child gender in the prospective relations between preschoolers' ToM and academic school readiness. When considering the overall sample, our findings showed that children's ToM skills, assessed during the second and the third preschool year, were not related to later academic readiness, measured four months before

school entry. However, when analyzing the effect of the interaction between gender and ToM at T1 on later academic school readiness, we found that better ToM abilities, measured during the second preschool year, in fact, predicted better academic abilities, but only among girls. It is noteworthy that this result held even after accounting for child IQ and maternal education. However, a similar pattern of results was not found, with respect to the interaction between child gender and ToM, now assessed at T2. Specifically, ToM skills, assessed four months before school entry, did not concurrently predict academic readiness, neither for boys or girls. This result is intriguing, and may be suggesting that the earliest ToM competencies may be more relevant to promoting pre-academic skills, assessed immediately before school entry. Children who showed early better ToM skills may simply have been better positioned to take advantage of the opportunities offered by pre-school, reflecting in their later pre-academic skills.

Nevertheless, it should be noted the predictive power of early ToM skills, measured at T1, on subsequent academic school readiness, specifically among girls. This can be explained based on three arguments. On the one hand, children tend to seek information from people who they think are better able to know the answers to their questions (Homer & Tamis-LeMonda, 2012). Thus, one may speculate that children with better ToM will be more able to seek information from the preschool teacher, someone they recognize as more knowledgeable, which, in turn, will lead to better social and academic school readiness. On the other hand, knowing that there is a close link between the emergence of ToM and advances in language, it is possible to anticipate that children with better social-cognitive and linguistic performance will develop better academic skills (e.g., the beginning of reading or narratives capabilities; Astington & Pelletier, 2005), and show better interpersonal functioning, which is important for the establishment of adaptive and healthy relationships with the preschool teacher and peers (Blair & Razza, 2007). In the same vein, having better ToM implies cognitive flexibility, and even metamemory knowledge (Lecce et al., 2014), as the child has to be able to understand distinct perspectives on the same event (e.g., from their point of view to the point

of view of a character), and have an understanding about the capabilities and limitations of one's own and others memory. Consequently, in addition to language, cognitive flexibility and metamemory may be vital for academic learning and relationships with others, and two of the explanatory processes underlying the relationship between ToM and academic school readiness. However, in our study, this seems to apply only to girls. In spite of the fact that girls and boys did not differ either in terms of ToM and academic abilities, a better performance on ToM tasks at T1 predicted greater academic school readiness among girls. These gender-specific results fall in line with previous findings. In fact, prior studies reported similar results in what regards the links between preschoolers' ToM and social competence, showing relations between preschoolers' ToM and teacher-rated social competence, but only for girls (Razza & Blair, 2003; Walker, 2005). Our study extended such literature, by focusing on an academic (and not social) dimension of school readiness. It may be that girls and boys differ in the ways they apply their ToM skills in their daily interactions, which would explain the differential relations between social cognition and academic school readiness. Thus, it is possible that among the children who show better ToM skills, girls direct these abilities more to their social interactions, towards peers and teachers, investing more in developing better relationships, which, in turn, will influence their learning processes (Razza & Blair, 2003).

This evidence is congruent with an argument put forward by prior research, suggesting that girls would be more "interpersonally oriented" than boys (Banerjee, Rieffe, Terwogt, Gerlein, & Voutsina, 2006; Crick & Dodge, 1994). In fact, previous studies showed that girls and boys evidence different patterns of behaviour and social interactions, and so it can be that these differential results are reflecting gender differences in the way preschoolers interact and relate to each other (Slaughter et al., 2015). Therefore, girls seem to evidence more prosocial behaviours than boys (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; Palermo et al., 2007), and their relationships seem to be characterized by more compromising strategies, when facing conflicts with their peers, and more

empathic understanding (Rose & Asher, 1999; Rose & Rudolph, 2006). Boys, on the other hand, seem to show more aggressive behaviour and to engage in more physical, disconnected and disruptive types of play (Coolahan et al., 2000; Moller, Hymel, & Rubin, 1992; Palermo et al., 2007). Also in this line, a recent meta-analysis carried out by Slaughter and colleagues (2015), showed the link between children's ToM and peer popularity to be stronger for girls than for boys. Again, it is possible that girls rely more on their ToM abilities than boys during their daily interactions (Banerjee et al., 2006; Slaughter et al., 2015), hence also creating more learning opportunities with their teachers and peers, while for boys other mechanisms may operate.

Thus, our findings highlight the relevance of further exploring gender-specific effects when investigating children's social cognition and academic school readiness. It would be interesting to continue to look into these gender-specific links, while also including measures of children's interactions with their peers and teachers, in order to see if these would help clarify these findings. Our results also bring about important practical implications for both the preschool curriculum and for parents' awareness on the role of children's ToM in their subsequent academic school readiness. Regarding the preschool curriculum in Portugal, where the present study was carried out, the available guidelines point to the importance of fomenting academic skills (e.g., pre-literacy and numeracy), as well as personal development. Our results highlighting the role of ToM abilities for academic school readiness, even if only for girls, are of particular relevance for the latter area. This dimension regards children's ability to establish favourable relationships with the preschool teacher and their peers; to be able to work well in groups and to participate in group activities without disrupting them. Therefore, the ability to be aware of others' mental states and intentions, and to understand how these underlie the behaviours of others, should also be a goal in preschool curricula.

Accordingly, our findings also highlight the importance of parents stimulating their preschool child's mentalizing abilities, by, for instance, exposing them to different mental states (thoughts, desires, and feelings) during everyday routines. In fact, research shows that children who have better

ToM skills come from families where there are more references to mental terms (desires, cognitions) in family conversations (e.g., Ruffman, Slade, & Crowe, 2002), and have mothers with higher mind-mindedness—i.e., willingness to think about and interact with their children as beings with their own mind (Meins et al., 2002, 2003). By promoting better ToM in their preschool children, parents may also be promoting children's academic school readiness. By doing so, family and preschool teachers work together with the same purpose: to promote children's subsequent academic success.

Limitations and future directions

There are limitations to this report that should be addressed in future research. Other factors that may contribute to variations in academic school readiness were not explored in this inquiry. For instance, recent research has emphasized the importance of executive function for early math and literacy performance (Blair & Razza, 2007; Fitzpatrick et al., 2014) and social adjustment before school entry (Bierman, Nix, Greenberg, Blair, &, Domitrovich, 2008). Future work, adopting a longitudinal design, may examine the contribution of *both* early ToM and executive functioning to children's later academic school readiness. It would also be interesting for future studies to further explore and extend these findings, by following children from preschool to early school years, and investigate the longitudinal links between children's social cognition and academic functioning, considering possible gender-effects. Also, gathering measures focusing the quality of children's relationships with their teachers and peers and later academic performance, could be relevant in order to shed some more light over these relations. In addition, in future studies, researchers can extend understanding of the influence of ToM on children's social and academic school readiness by investigating whether the present results may be generalizable to children growing up in socioeconomic high-risk settings, as this study was focused on middle-income children. Finally, our study comes to add to an already extensive line of research showing gender-specific effects in several of children's social and cognitive outcomes, highlighting the importance of further exploring such effects when studying children's social cognition and academic school readiness.

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