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DOI:
10.1002/icd.2274

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (Harvard):
Lecce, S & Devine, RT 2021, 'Theory of mind at school: academic outcomes and the influence of the school context', *Infant and Child Development*. https://doi.org/10.1002/icd.2274

Received: 29 April 2021 | Revised: 3 September 2021 | Accepted: 20 September 2021

DOI: 10.1002/icd.2274

THEORETICAL ARTICLE

WILEY

Theory of mind at school: Academic outcomes and the influence of the school context

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Abstract

The recent expansion of research on children's understanding of others' minds (or 'theory of mind', ToM) into middle childhood provides fresh opportunities to consider its origins and consequences. In this paper, we propose that, in addition to supporting children's social interactions, individual differences in ToM benefit academic achievement, in particular, reading comprehension and scientific reasoning. Furthermore, we argue that the school and classroom context can influence individual differences in ToM and its ongoing development in middle childhood. We suggest future directions for research to test these claims, which will provide a new perspective on the consequences of ToM and test the developmental continuity of sociocultural accounts of mindreading.

KEYWORDS
academic outcomes, middle childhood, school context, theory of mind

The past decade has seen an expansion of research on theory of mind (ToM) (i.e., the ability to reason about others' thoughts, feelings, and desires) beyond the traditional confines of early childhood into middle childhood (Devine & Lecce, 2021). Middle childhood (the period of juvenility extending from ages 6 to 12 years) overlaps with formal primary school education in most developed nations (e.g., DelGiudice, 2014; OECD, 2018). Mounting evidence points to continued developmental progression in recursive thinking (Osterhaus & Koerber, 2021a), understanding social gaffes (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999), misunderstanding, double bluff and irony (Devine & Hughes, 2016), and in linking multiple mental states (Lagattuta, Elrod, & Kramer, 2016). This work also points to the

existence of marked individual differences in ToM that reflect genuine variation in the ease and fluency with which children engage in reasoning about others' minds (Bianco, Lecce, & Banerjee, 2016; Hughes & Devine, 2015).

Continued interest in ToM can be explained by at least two factors. First, variation in ToM has important consequences: children who excel on ToM tasks are more likely than their peers to be rated as socially competent by their teachers (Devine, White, Ensor, & Hughes, 2016), accepted by their peers (Banerjee, Watling, & Caputi, 2011), and have reciprocated friendships (Fink, Begeer, Peterson, Slaughter, & de Rosnay, 2015). Second, ToM is malleable: it is shaped by social experience (Devine & Hughes, 2018) and amenable to intervention (Lecce, Bianco, Devine, Hughes, & Banerjee, 2014). In this paper, we propose that, in addition to supporting children's social interactions, individual differences in ToM support children's success at school. Furthermore, we argue that the school context can influence individual differences in ToM and its ongoing development in middle childhood. We first explore evidence linking individual differences in ToM and children's academic achievement. Next, we consider the impact of the school and the classroom context on children's ToM. We conclude with suggestions for future research to test our claims.

1 | DO INDIVIDUAL DIFFERENCES IN THEORY OF MIND MATTER FOR SCHOOL ACHIEVEMENT?

Developmental research on children's ToM has typically emphasized the importance of understanding others' minds for children's social lives (e.g., Lecce & Devine, 2021). However, a growing body of studies indicate that children's ability to read others' minds may also shape academic outcomes (Lecce, 2021). Several theories propose that high-level reading comprehension is linked with the ability to understand others' minds. Specifically, in addition to basic skills (e.g., decoding, vocabulary), reading comprehension hinges on the ability to integrate information not explicitly stated in the text to create a mental model (Kintsch & Rawson, 2005). ToM supports children's comprehension of a text because it allows children to understand the reasons behind unfolding events and the authors' intended message (e.g., Kim, 2015; Pelletier & Beatty, 2015). According to this account, ToM is necessary for high-level reading comprehension because it equips children with the ability to infer authors' intentions, represent the minds of characters depicted in texts, and interpret texts in multiple ways (Kim, 2017).

Direct evidence for an association between reading comprehension and ToM comes from studies showing unique concurrent associations between children's ToM, assessed using the Strange Stories, and reading comprehension of both single (Boerma, Mol, & Jolles, 2017) and multiple texts (Florit, De Carli, Giunti, & Mason, 2020). These associations persist even when possible confounding variables such as prior topic knowledge, word reading fluency, verbal ability, and print exposure are considered. Using longitudinal data, Lecce, Bianco & Hughes, (2021) tested the direction and specificity of the relations between 9- and 10-year-old children's ToM (measured using vignette-based and animation-based tasks) and their reading comprehension. There were bi-directional longitudinal associations between ToM and reading comprehension suggesting that early gains in ToM predict later reading comprehension, which in turn supported gains in ToM. Crucially, there were specific associations between ToM and reading comprehension but not between ToM and mathematical skills, thus reducing the possibility that observed associations between ToM and reading comprehension reflect domain general cognitive processes. Further evidence for the role of ToM in reading comprehension comes from research involving children with autistic spectrum conditions (Minshew, Goldstein, Taylor, & Siegel, 1994). Children with autism score lower on reading comprehension relative to typically developing peers (Lindgren, Folstein, Tomblin, & Tager-Flusberg, 2009). Differences in reading comprehension cannot be explained by differences in general intelligence (Jones et al., 2009) but are instead uniquely associated with ToM above and beyond word recognition and oral language deficits (e.g., McIntyre et al., 2018; Ricketts, Jones, Charman, & Happé, 2013).

Researchers have also investigated the relations between reasoning about others' minds and scientific reasoning. Understanding the nature of mental states is linked with the ability to generate, test, and evaluate hypotheses (e.g., Koerber & Osterhaus, 2019; Kyriakopoulou & Vosniadou, 2020; Osterhaus, Koerber, & Sodian, 2017). One possible explanation for these findings is that being able to engage in recursive reasoning about beliefs allows children

to coordinate hypotheses and evidence. Additionally, understanding that others can have false beliefs may be a prerequisite for understanding that experimental data are open to multiple interpretations (Astington, Pelletier, & Homer, 2002; Osterhaus et al., 2017). Supporting this account, children with advanced ToM show more sophisticated scientific reasoning throughout elementary school and ToM at age 6 predicts scientific reasoning at age 7 (Osterhaus & Koerber, 2021b).

In an effort to explain these results, we propose three possible routes through which children's ToM might influence academic outcomes such as reading comprehension and scientific reasoning. First, ToM may shape academic outcomes via a social-motivational route by enhancing peer relationships, teacher–child relationships, and social competence, which in turn support school engagement (Lecce, Caputi, Pagnin, & Banerjee, 2017). Second, understanding one's own and others' minds may influence academic outcomes through a metacognitive route by increasing children's sensitivity to criticism (Lecce, Caputi, & Hughes, 2011; Lecce, Caputi, & Pagnin, 2014), meta-knowledge about reading (Lecce, Zocchi, Pagnin, Palladino, & Taumoepeau, 2010), and beliefs about learning (Lecce, Caputi, & Pagnin, 2015). Third, ToM may influence academic outcomes through a linguistic route by allowing children access to mental state (Lockl & Schneider, 2006) and figurative language (Del Sette, Bambini, Bischetti, & Lecce, 2020). This framework provides testable hypotheses for future research on the links between children's ToM and later success at school (Lecce, 2021).

2 | DOES THE SCHOOL CONTEXT SHAPE CHILDREN'S THEORY OF MIND?

According to socio-cultural accounts, the ability to reason about others' minds is shaped through social interactions with more skilled members of a culture (Heyes & Frith, 2014). The lion's share of research on how social experiences influence children's ToM has largely focused on the impact of early family experiences on preschoolers (e.g., Devine & Hughes, 2018). The paucity of research on environmental influences on ToM in middle childhood is surprising for at least two reasons. First, school-aged children spend increasing amounts of time with peers and decreasing amounts of time with family members across middle childhood (Larson, Richards, Moneta, Holmbeck, & Duckett 1996). Second, twin studies indicate that environmental factors explain more variance in ToM in middle childhood than in early childhood (Hughes et al., 2005; Ronald, Viding, Happé, & Plomin, 2006). Researching ToM in school-aged children presents an opportunity to extend socio-cultural accounts by testing whether later social experiences continue to shape ToM and by considering a wider range of contextual influences beyond the family.

Attempts to explain cross-cultural differences in school-aged children's ToM have given rise to the so-called pedagogical experience account, which proposes that differences in educational experiences shape ToM in middle childhood (Lecce & Hughes, 2010; Wang, Devine, Wong, & Hughes, 2016). However, it is not yet clear what aspects of children's educational experiences might shape ToM. After all, the school context can be studied at multiple levels ranging from distal to proximal, encompassing structures (e.g., school policy), processes (e.g., quality of teaching), and peers (Eccles & Roeser, 2001). In an effort to refine the pedagogical experience account, we consider emerging evidence linking variation at different levels of the school context with children's ToM.

One structural aspect of the school context potentially linked with children's understanding of others' minds is classroom diversity. Exposure to a wide range of perspectives in the classroom may provide a training ground for children to practice using their insights about the mind (Benner & Crosnoe, 2011). Support for this account comes from longitudinal research showing that 7- to 9-year-old children in inclusive classrooms (made up of children with and without disabilities) exhibited greater gains in ToM performance compared with children in non-inclusive classrooms (Smogorzewska, Szumski, & Grygiel, 2020). Examining other dimensions of classroom diversity (e.g., ethnicity, socio-economic status) will illuminate further how structural aspects of the school context affect children's ToM.

Another route through which the school context can affect children's ToM is through children's interactions with teachers. Socio-cultural accounts emphasize the importance of the quality (e.g., use of open-ended questions) and content (e.g., frequency of language referring to thoughts, emotions, desires) of adult–-child conversations for

children's emerging ToM (e.g., Devine & Hughes, 2018). Accumulating evidence from early childhood education settings indicates that teachers vary considerably in their use of mental-state language (e.g., Barnes & Dickinson, 2018). Moreover, an intervention targeted at enhancing teachers' use of conversations to discuss short mentalistic texts led to increases in 9- and 10-year-old children's ToM (Bianco & Lecce, 2016). Further support for the impact of teacher–child interactions on children's ToM comes from a recent study showing that individual differences in teachers' reported propensity to use mental state language and conversation during instruction was linked with between-classroom differences in 430 7- to 11-year-old children's ToM performance even when child verbal ability and age were controlled statistically (Lecce, Ronchi, & Devine, 2021).

Finally, peer relationships are likely to provide another route via which the school context shapes children's ToM. During middle childhood children spend considerable time with classmates and friends and it is in the context of these social interactions that they have the unique opportunities to refine their mindreading skills. Supporting this view, Banerjee et al. (2011) showed that peer rejection, but not peer acceptance, was prospectively associated with children's ToM highlighting that exclusion from the peer group may deprive children of socialization experiences that prompt the development of ToM. There are marked individual differences in ToM in middle childhood (e.g., Devine, 2021) suggesting that children within classrooms differ from one another in their ability and/or propensity to use their insights about others' minds. These naturally occurring differences may benefit both skilled and less skilled members of a peer group and partly explain why peer interactions matter for children's ToM development. For example, skilled mind-readers' interactions with less able peers can provide opportunities to use ToM to support others' entry into the 'community of minds' (Nelson, 2005). For less skilled peers, exposure to more competent peers might enhance ToM through informal scaffolding opportunities.

3 | CONCLUSIONS AND FUTURE DIRECTIONS

The burgeoning interest in ToM in middle childhood presents exciting opportunities to study ToM at school. We have considered how children's understanding of others' minds underpins academic success and how the school context shapes individual differences in ToM and its ongoing development in middle childhood. Evidence indicates that the consequences of individual differences in ToM are not limited to children's social lives but extend to school success. Further work is needed, however, to understand the nature of the relations between ToM and children's understanding of texts and ability to reason scientifically. Longitudinal work will illuminate the developmental direction of associations (e.g., is mastery of ToM necessary for later high-level interpretation of text?). Short-term interventions targeted at improving ToM (e.g., Lecce et al., 2014) can be leveraged to examine whether there are direct or indirect links between ToM and academic success (e.g., via improvements in children's social competence or access to figurative language).

Research on contextual influences on children's ToM in school settings tests the developmental continuity of relations between social experience and ToM beyond its emergence in early childhood and the breadth of social experiences that influence ToM. Examining structural school features, teacher–child interactions, and peer–peer interactions provides an opportunity to disentangle how environments influence the ongoing development of new insights about others' minds (i.e., new competencies) and, at the same time, explain within-age individual differences in ToM. One intriguing possibility is that 'expert' adults (such as teachers) may prompt children's ToM development by scaffolding their understanding of the relations between different mental states (e.g., Lagattuta et al., 2016) while interactions with peers might provide an opportunity to practice mentalizing, leading to individual differences in ToM. Finally, future work is needed to illuminate how children's own mindreading skills shape the school context. While this has yet to be tested in the literature, the presence of skilled mindreaders in the classroom might influence teachers' classroom practices (e.g., introduced advanced texts) or interactions (e.g., adopting mental state language, and using open-ended questions), which in turn promote children's ToM. To address these questions, future research will require complex multi-level analysis to test how between-classroom differences shape within-classroom

differences in ToM (e.g., Lecce et al., 2021) and dyadic or network analyses to test links between peer interactions and individual differences in ToM (Burnett Heyes et al., 2015; Cook & Kenny, 2005).

AUTHOR CONTRIBUTIONS

SERENA LECCE: Conceptualization; writing-original draft; writing-review & editing. **Rory Devine:** Conceptualization; writing-original draft; writing-review & editing.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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How to cite this article: Lecce, S., & Devine, R. T. (2021). Theory of mind at school: Academic outcomes and the influence of the school context. *Infant and Child Development*, e2274. https://doi.org/10.1002/icd.2274