Can "Theory of Mind" be Taught in School?

Claudia Pik-Ki Chu [iD]

Faculty of Education, University of Cambridge, Cambridge, UK

To cite this article:

Link to the article online:

Link to Apollo

Can "Theory of Mind" be Taught in School?

Claudia Pik-Ki Chu

Faculty of Education, University of Cambridge, Cambridge, UK

Highlights

- "Theory of Mind" plays an important role in children's social development, and it should be taught in school.

- Educators should be aware of the practical issues in teaching Theory of Mind in school.

- Practical issues include limited generalisability of the learning effect, a possible iatrogenic effect, as well as the sociocultural and pedagogical differences across societies in children's Theory of Mind development.

精彩提要*

- 心智理論於兒童的社交發展起了重要作用,並因此應在學校教授。

- 教育者應留意教授心智理論可遇到的問題。

- 以下問題可能會發生:學習效果的普遍性有限,醫源性影響,以及不同社會的文化和教學差異於心智理論的影響。

*Chinese Translation | Claudia Pik-Ki Chu

Can "Theory of Mind" be Taught in School?

Claudia Pik-Ki Chu*

Abstract

"Theory of Mind" (ToM) refers to an individual's ability to understand and attribute one's and other people's mental states, such as thoughts, intentions and beliefs (Baron-Cohen et al., 1985; Premack & Woodruff, 1978). ToM is part of the construct of social cognition, and empirical evidence has suggested ToM plays an important role in children's social development. The significance of ToM in children's development has led researchers to examine individual differences in ToM and their implications (Hughes, 2011). Additionally, researchers have considered whether children who lagged behind in ToM can catch up with their peers, leading to the question as to whether ToM can be taught in school. From a socio-constructivism perspective, it may be useful to teach ToM in school as teachers can provide scaffolding to children, hence reducing gaps in ToM development. This review will explore whether ToM could be and should be taught in school. The review argues that, given its social origin, ToM can be taught in school, and it should be incorporated in the curriculum instead of being taught as an independent subject. However, ToM should be taught in school only if educators are aware of the practical issues in doing so: there might be a limited generalisability of the learning effect, a possible iatrogenic effect, as well as the sociocultural and pedagogical differences across societies in children's ToM development.

概要

心智理論為對他人的心理狀況的理解和推斷 (Baron-Cohen et al.,1985; Premack & Woodruff,1978)，為社會認知的一部分。研究發現心智理論對兒童的社交發展起了重要作用。有鑑於此，研究著眼於心智理論的個體差異及其影響(Hughes,2011)，並思量心智理論落後的兒童能否於進度上趕上同輩。此一系列的研究衍生出一個重要的問題：心智理論可以在學校教授嗎？從社會建構主義的角度來看，由教育者在學校教授心智理論可有助兒童從鷹架支持中得到協助，從而縮減心智理論發展的差異。本文將討論心智理論在學校教授的可行及可取性，並提出因應心智理論的社會起源，心智理論應納入課程中在學校教授。值得留意的是，教授心智理論時可能有以下情況：學習效果的普遍性有限，醫源性影響，以及不同社會的文化和教學差異於心智理論的影響。只有當教育者意識到這些教授心智理論可遇到的問題時，心智理論才能在學校教授。

Introduction

"Theory of Mind" (ToM) can be defined as an individual's ability to understand and attribute one's and other people's mental states, such as thoughts, intentions and beliefs (Baron-Cohen et al., 1985; Premack & Woodruff, 1978). Research has found that ToM not only facilitates peer relationships (Banerjee et al., 2011), emotional understanding (Bender et al., 2011), 2011), and sensitivity to criticism (Cutting & Dunn, 2002), but also fosters children's development and learning in the modern classroom setting where there is an increasing focus on peer-assisted learning (Fuchs et al., 1997) and dialogic pedagogy (Edwards-Groves & Davidson, 2017). There has been an ongoing history of research on ToM training studies, focusing on how ToM can be improved in experimental settings (e.g. Begeer et al., 2011, 2015). Nonetheless, how ToM can be improved in educational settings is still an under-researched area (Smogorzewska et al., 2020). As such, it is essential to consider whether ToM can be taught in school.

Given the insufficient research on teaching ToM in an educational setting, the aim of this article is to provide a comprehensive review of the possibilities and practicalities of teaching ToM in school. This review will explore whether ToM could be and should be taught in school. The review argues that, given its social origin, ToM can be taught in school, and it should be incorporated in the curriculum instead of being introduced as an independent subject. However, ToM should be taught in school only if educators are aware of the practical issues in doing so. There might be a limited generalisability of the learning effect, a possible iatrogenic effect, and the sociocultural and pedagogical differences across societies in children's ToM development.

Theoretical overview of Theory of Mind

The construct

Premack and Woodruff (1978) first proposed the concept of ToM in their study on chimpanzees. Since then, researchers have begun to study ToM in children. Three dominant theories in the literature attempt to explain the origin of ToM: theory-theory, modular theory and simulation theory.

Theory-theory (Gopnik & Wellman, 1992) argues that ToM is an implicit theory formed inside the mind and through interacting with the world. The child acts like a scientist by observing and collecting evidence that may change their perception of the world. Modular theory suggests an innate "theory of mind mechanism" (Leslie, 1994) which is domain-specific. In other words, ToM is a specialised skill. This mechanism is damaged in people with Autistic Spectrum Disorder (ASD) (Karmiloff-Smith et al., 1995; Leslie, 1994), resulting in a deficit in ToM development. In contrast, simulation theory (Harris, 1992) suggests that children form ToM through social experiences, such as imitating people's behaviours. Studies on mirror neurons (Gallese & Goldman, 1998; Iacoboni et al., 2005; Tai et al., 2004) have provided support to the simulation theory of ToM by demonstrating humans' innate capacity for understanding the mental states of others. However, there are limited neuroimaging studies on children and insufficient longitudinal data to understand the relationship between the development of a mirror neuron system and ToM. These theories on the origins of ToM should not be viewed as mutually exclusive. Instead, they should be taken together to provide an integrative account in explaining children's ToM development (Hughes, 2011).

Several tasks have been designed to measure the different domains of ToM: namely, false-belief understanding, which involves knowing that beliefs can differ from reality (Bauminger-Zviely, 2013); appearance-reality distinction, referring to the understanding that what an object appears to be, could be different to what it is in reality (Flavell et al., 1983); and emotion recognition (Baron-Cohen et al., 2001). A brief description of some commonly used ToM tasks is provided in the Appendix. False-belief understanding is widely used as a measurement of ToM. Studies have suggested that typically developing children usually acquire false-belief understanding at the age of three to four (Wellman et al., 2001). Three standard false-belief tasks are the unexpected location task (Wimmer & Perner, 1983), the unexpected content task (Perner et al., 1987), and the Sally-Anne test (Baron-Cohen et al., 1985).

However, there have been controversies on whether false-belief understanding is a valid measurement of ToM. Some have argued that false-belief tasks demand something more than merely ToM. The tasks require children to exercise working memory and inhibitory control (e.g. Bloom & German, 2000; Leslie & Polizzi, 1998). Moreover, with the recent proposal of ToM as a multidimensional construct, a standardised task has not yet been developed to assess such multidimensionality (Westby & Robinson, 2014). Therefore, studies need to use a range of ToM tasks to measure the developmental trajectory of ToM beyond false-belief understanding, especially after the age of five. Some examples are: second-order belief test (Perner & Wimmer, 1985), the TOM test (Muris et al., 1999), faux pas task (Baron-Cohen et al., 1999), strange story (Happé, 1994) and silent films (Devine & Hughes, 2013), director task (Dumontheil et al., 2010; Keysar et al., 2000), and triangles task (Abell et al., 2000).

Developmental significance of Theory of Mind

Deficits in ToM have been observed in several atypically developing or clinical groups with delays in social development, such as those with ASD (Baron-Cohen et al., 1985; Yirmiya et al., 1998), schizophrenia (Benedetti et al., 2009; Brüne, 2005; Sprong et al., 2007), and those who are deaf (Peterson & Siegal, 1995, 2000). In addition to atypical developing groups, studies have established the significance of ToM in several areas of social competence in typically developing children. These areas include but are not limited to peer relationships and bullying, emotional understanding, and sensitivity to criticism.

Peer relationship and bullying

Understanding people's mental states allow children to connect with others and think in their shoes, hence developing friendships. Indeed, a relationship between ToM and peer popularity has been found in the literature. Dockett and Degotardi (1997) measured the sociometric status in a group of five-year-olds and reported a positive association between ToM skills and popularity. Prosocial behaviours were found to be a mediating factor in the link between ToM and peer relationship: children who had a more advanced ToM understanding and were able to generalise the skills in everyday situations (as demonstrated by prosocial behaviours such as co-operation) were more likely to be popular among peers (Caputi et al., 2012). The effect is likely to be longitudinal and persists beyond preschool, with ToM skills having a greater impact on peer relationships when the children become older (Banerjee et al., 2011). In contrast, children with poorer ToM skills were more vulnerable to being victims in adolescence (Shakoor et al., 2012). However, there is also a "dark side" to a stronger ToM, for it may be related to relational bullying, i.e. bullying others by damaging social relationships (Crick & Grotpeter, 1995). In a study on a group of 7-10-year-olds, Sutton et al. (1999) found that bullies, especially relational bullies, demonstrated more advanced ToM skills and were stronger at manipulating social relationships using their ToM skills, hence more capable of demonstrating relational aggression.

Emotional understanding

ToM is also important for emotional understanding, particularly the understanding of belief-based emotions (Bender et al., 2011) and the attribution of moral emotions (Krettenauer et al., 2008). Although false-belief understanding usually emerges between age three to five, the ability to understand belief-based emotions and attribute moral emotions develops at a later stage. Bender et al. (2011) tested a group of 5-7

year-olds on false-belief and belief-based emotions and reported an age-related development in false-belief understanding but not in belief-based emotional understanding. Nunner-Winkler and Sodian (1988) found that 4-5 year-olds can identify morally wrong actions. Still, they could not attribute the correct moral emotion to the morally wrong actions until the age of seven to eight (the response of a "happy-victimiser" described in Krettenauer et al., 2008). These results reflected four-year-olds' inability in understanding belief-based emotions and attributing emotions despite acquiring a false-belief understanding. The discrepancy between the development of false-belief understanding and emotional understanding suggests that ToM may be a precursor for children's emotional development.

Sensitivity to criticism

Cutting and Dunn (2002) found children with more advanced ToM skills were more sensitive to criticism. Children who were more sensitive to criticism at school were more likely to perceive themselves negatively, resulting in lower self-esteem (Cutting & Dunn, 2002; Dunn, 1995). The findings indicated the possible negative aspects of ToM, but more recent research has suggested that sensitivity to criticism may be a mediating factor for academic success (Lecce et al., 2011). As Cutting and Dunn (2002) have suggested, children with higher sensitivity to criticism may be more likely to reflect based on the feedback given.

On top of the established role of ToM in peer relationships, emotional understanding, and sensitivity to criticism, ToM also fosters children's development and learning in the modern classroom setting where there is an increasing focus on peer-assisted learning (Fuchs et al., 1997) and dialogic pedagogy (Edwards-Groves & Davidson, 2017). A well-developed ToM is necessary to enhance the benefits children can receive from these class practices. Therefore, it is essential to consider whether ToM can be taught in school to promote the development of ToM, which then lays the foundation for children's subsequent social and cognitive development.

From developmental changes to individual differences

The development of ToM in early childhood has been well-documented, so recent studies have drawn attention to ToM development in middle childhood and beyond (Smogorzewska et al., 2020). For example, age-related improvement and continuity of ToM have been reported in the middle- and late-childhood (Devine & Hughes, 2013). The findings suggest that ToM does not stop developing nor reach its peak at age four, so there is a need to look at the developmental trajectory beyond early childhood and move beyond using only

false-belief understanding as a measurement of ToM. In addition, over the past three decades, there has been a paradigm shift in studies on ToM (Hughes, 2011).

Given the paradigm shift, research has moved from focusing on the developmental changes of ToM at different stages to an increased emphasis on children's individual differences and resilience in ToM (e.g. Biao et al., 2011). Therefore, a developmental perspective is needed to understand the continuities and changes of ToM and how the variability in ToM predicts social relations and social competence in later stages of life (Devine et al., 2016; Hughes & Leekam, 2004). Moreover, it is important to look at individual differences in children to address whether ToM can be and should be taught in school.

The social root of Theory of Mind

Research in comparative psychology has found that chimpanzees, a highly social species, possessed ToM in understanding goals and intentions but not false-belief understanding (Call & Tomasello, 2008). The findings have suggested that social experience may be the origin of ToM. Understanding the origin of ToM in humans is essential in determining whether ToM can be taught in school and, if it is possible, how. Despite the theoretical controversies on the origin of ToM, in the past three decades, empirical evidence has indicated a promising picture that ToM has a social origin.

With advancements in research methodologies and neurobiology, researchers have begun to disentangle the gene-environment effects on ToM development. In a twin study (Hughes et al., 2005), genes were found to explain only 7% of the individual differences on ToM, suggesting a stronger influence of environmental factors, such as verbal ability (Milligan et al., 2007) and socioeconomic status of the family (Hoff, 2003), on the individual differences in ToM. Other twin studies (Hughes & Cutting, 1999; Ronald et al., 2005) also confirmed the importance of environmental factors on ToM development. Indeed, social experiences play an important role in children's acquisition of ToM (Astington, 1998), and three lines of evidence have been found to support this claim.

Firstly, studies have reported a relationship between conversational experience and ToM development. There is a positive relationship between the amount of mental state talk (e.g. "Why are you feeling sad about your spilt milk?") in the family and the children's subsequent understanding of false-belief and emotions. Dunn, Brown, Slomkowski, Tesla and Youngblade (1991) found that children who engaged in more mental state conversations with their mother and siblings at 33 months showed a stronger understanding of false-belief and emotions at 40 months. In another study, Dunn, Brown, and Beardsall (1991) reported that children's

frequency of mental state talk with their mother and siblings at age three significantly predicted their ability to identify emotions at age six: children who engaged in more mental state conversation in the family performed stronger subsequently. The results demonstrated continuity in children's individual differences on ToM and suggested an important role for conversation in ToM development.

Secondly, family size is related to ToM development (Perner et al., 1994; Ruffman, 2014). Children with siblings scored higher on false-belief understanding tasks, and the relationship between family size and ToM understanding was greater in children with lower language ability (Jenkins & Astington, 1996). Children with a bigger family size may experience more discourse and interaction, which act as a scaffold for their mental state understanding. Jenkins et al. (2003) found that 4-year-olds with older siblings experienced more mental state talk than those without siblings. It is possible that children with siblings engaged in more mental state exchange when dealing with conflicts among siblings. The idea that siblings foster the children's ToM development is consistent with a Vygotskian perspective that social interaction is vital in children's learning (Vygotsky, 1987). Having a sibling also allows children to participate in more pretend play, enhancing ToM development given the representational nature of pretence (Leslie, 1987).

Thirdly, mothers' mind-mindedness was also reported to facilitate children's ToM development. Mind-mindedness refers to the parents' awareness that children are individuals with minds, and so they are more likely to respond to the children's actions and engage them with conversations about feelings, intentions, beliefs and emotions (Meins et al., 1998). In a study by Meins et al. (2002), mothers' mind-mindedness when the children were six months old was linked to their performance on ToM tasks at age four, accounting for 11% of the variance in their task scores. The study demonstrated the influence of exposure to mental state talk during early age, providing strong evidence for the impact of social experience on ToM development.

These findings suggested that social experience, especially in the early home environment, is important for developing ToM. However, it does not mean that children do not develop ToM beyond the home environment. When children start going to school, they begin to establish relationships with peers, and there is an association between peer relationships and ToM development (Hughes & Dunn, 1998), especially on the frequency of mental state talk among peers (Dunn & Cutting, 1999). Since early sibling relationships are predictive of children's subsequent relationships with peers (Dunn et al., 1994), there may be an interplay between the home and school setting

in ToM development. Neither the family nor the school should be fully responsible for the children's ToM development, for the development of ToM is likely to be mediated and moderated by multiple factors in the children's social environment. For example, gender difference is a moderating factor of ToM, with different aspects of parenting linked to the ToM understanding in boys and girls, respectively (Hughes et al., 1999). For boys, parental discipline was found to have a more significant link with ToM, whereas, for girls, parental warmth and affect were more significantly related to ToM. The findings suggested that one cannot simply assume a universal relationship between parenting and ToM: individual differences should be considered when considering the social origin of ToM. Nonetheless, the results from studies that examined the social origin of ToM are consistent with simulation theory (Harris, 1992), indicating the importance of social experience, in particular mental state talk, in ToM development. Studies on the link between social experience and ToM implies that ToM can be taught in school, and some specific teaching strategies will be discussed next.

Strategies to teach Theory of Mind effectively in school

Despite the empirical evidence on the social origin of ToM, the correlational results do not imply causation. Intervention and training studies are necessary to determine the factors that result in improvements in ToM. In the past three decades, a body of literature has developed on ToM training for typically developing children and children with ASD. Although early studies on ToM training were unsuccessful in improving ToM (Taylor & Hort, 1990), recent research has indicated the positive impact of ToM training. This section will review studies on successful ToM training and propose four main strategies (pretence training, language training, thinking skills training and general ToM skills training) that could be applied in school for ToM teaching. A summary of the reviewed studies can be found in the Appendix for reference.

Pretence training

In a pretence training study involving a group of 3-5-year-olds, Allen and Kinsey (2013) reported improvements in the children's performance on appearance-reality distinction and emotion recognition tasks, but not false-belief understanding. To interpret the results, one must first consider the relationship between pretend play and ToM. The significant association between pretend play and ToM was first proposed by Leslie (1987), in which pretend play was suggested to be the children's earliest demonstration of ToM. The article suggested there were similarities between the ways in which children engage in pretend play and develop their understanding of mental states, indicating that pretend play and ToM depend

on a common mechanism of "metarepresentation" (Leslie, 1987, pp.421), which is the understanding of oneself's and others' representations, e.g. mental states (Goswami, 2008; Leslie, 1987). In pretend play, children need to substitute an object with another by "isolating" the representation of the object, in reality, to accommodate for the pretend representation (Goswami, 2008). This process indicates the children's growing ability to understand social cognition and is essential for children's emerging capacity for false-belief understanding and appearance-reality distinction.

Why, then, was there no improvement in false-belief understanding in Allen and Kinsey's (2013) study? A possible explanation of the results is the use of two different false-belief tasks during the pre-and pro-test sessions in the study (the Sally-Anne test and the unexpected content task, respectively). Although it may be justified that using different false-belief tasks can avoid any order and practice effects on the participants, it could be problematic to do so given the different levels of difficulty of the false-belief tasks. In the scale of difficulty proposed by Wellman and Liu (2004), the Sally-Anne test (a test of explicit false-belief) was ranked as more difficult than the unexpected content task (a test of content false-belief). Therefore, differences in the false-belief understanding before and after the training may be undermined. To avoid this problem, future studies that wish to use different false-belief tasks for pre and post-training could adopt a counterbalancing design or use an easier task first followed by a more difficult one.

Notwithstanding these challenges, the training activities in Allen and Kinsey's (2013) study were conducted in the classroom, indicating the possibility of teaching ToM in a school setting. ToM teaching can be incorporated into the curriculum through pretence training, such as acting classes in elementary or high school (Goldstein & Winner, 2012). Through imitating and role-playing, children can exercise their metarepresentational ability and capacity for ToM. Moreover, the study supports previous correlational studies (Astington & Jenkins, 1995; Hughes & Dunn, 1997; Lillard et al., 2013; Taylor & Carlson, 1997) that have reported a relationship between stronger ToM skills more frequent to pretend play. However, since correlation does not indicate causation, the association between pretend play and ToM remains unclear. It is likely that the language properties in pretend play, particularly mental state talk, are also important in facilitating and developing ToM. Hence, ToM teaching in school should not focus merely on pretence activities.

Language training

A large number of studies have reported a relationship between verbal ability and the development of ToM

(Milligan et al., 2007), so it is not surprising that many ToM training studies have used language as an independent variable to manipulate (e.g. Bianco et al., 2019; Gao et al., 2020; Guajardo et al., 2013; Guajardo & Watson, 2002; Lohmann & Tomasello, 2003; Slaughter & Gopnik, 1996). Common teaching strategies include providing feedback on the accuracy of the response, asking the children to reason their answers, explaining the answer, and engaging the children in a discussion. The rationale of these strategies is to emphasise children's mental state talk that is representational in nature (Hofmann et al., 2016).

Three aspects of mental state talk are believed to promote the development of ToM: pragmatic, semantic and syntactic (Astington & Jenkins, 1999; Mori & Cigala, 2016). The pragmatic use of languages, such as discourse and interaction, facilitates children's engagement in exchanging beliefs and ideas with others, which then improves their of other people having different mental states (a conversational approach; e.g. Carpendale & Lewis, 2004). Research on children who are deaf has provided evidence of the important role of the pragmatic element of language in ToM development. Woolfe et al. (2002) reported that deaf children with deaf parents (who were likely to learn sign language from birth) showed a similar level of ToM performance with typically developing 4-year-olds. However, deaf children with hearing parents (who were more likely to be deprived of early social communication) performed as poorly as ASD children on the ToM task. The results reinforced the importance of language experience in ToM development.

The semantic aspect of language, which is the use of a mental state lexicon like "think", "believe", and "know", serves the role to bring the implicit mental state to children's explicit awareness (Astington & Jenkins, 1999). This is evident in studies showing that merely providing feedback on the accuracy of the answer was insufficient for children to improve their ToM skills (e.g. Slaughter & Gopnik, 1996). Explanations on the reasoning and the answers were found to be more effective in ToM teaching. These psychological explanations, which seek to explain people's behaviour based on their mental states (Wellman & Lagattuta, 2004), are essential to ToM development. In particular, it is demonstrated in the training studies that children who engaged in self-explanation rather than experimenter-produced explanation (Guajardo et al., 2013) performed stronger on ToM tasks.

The syntactic aspect of language, which refers to the structure of the language, illustrates and provides a framework for children to understand mental states in sentences such as "A thinks B; C knows D; E believes F". In particular, studies have investigated the relationship between syntax and ToM development (de Villiers &

de Villiers, 2000; de Villiers & Pyers, 2002; Lohmann & Tomasello, 2003). By acknowledging the sentence structure in describing mental states, children can understand how people's behaviours are related to their mental states and hence develop a ToM (de Villiers & Pyers, 2002). Moreover, as Astington and Jenkins (1999) have suggested, understanding the syntax of mental state sentences might be essential for children to describe false-belief understanding explicitly. Studies that have attempted to simplify the question in false-belief tasks have reported improvement on the tasks by children who have previously failed (Lewis & Osborne, 1990; Siegal & Beattie, 1991; Wimmer & Hard, 1991). The findings suggest a linguistic demand on the false-belief tasks, which supports the role of understanding mental state syntax in the development of ToM.

Although there continue to be controversies in determining which of the three aspects are most important to ToM development (Mori & Cigala, 2016), it is likely that teaching strategies focusing on a combination of these aspects would be most effective. This claim is demonstrated in Lohmann and Tomasello's (2003) study, where children engaging in a discussion on deceptive objects, using mental state lexicon in sentence structure, showed the greatest improvement on ToM tasks. This research suggests that teachers could use some mental state verbs explicitly in their instruction and encourage children to generate explanations themselves. Moreover, Kidd and Castano (2013) reported an association between reading literary fiction and stronger ToM, implying that language can enhance ToM development in verbal and written form. Therefore, effective ToM teaching in school should incorporate both verbal and nonverbal language, such as feedback, explanation, discussion and reading. Teachers could engage in more mental state talk in everyday teaching and provide the children with explanations on the mental state verbs and sentences to foster their ToM development.

Thinking skills training

Several studies have adopted a "picture-in-the-head" training strategy, proposed by Swettenham et al. (1996), in training ToM (Fisher & Happé, 2005; Kloo & Perner, 2003; Paynter & Peterson, 2013; Wellman et al., 2002). Children were shown pictures in the dolls' heads to demonstrate the presence of false-belief inside people's minds, enhancing their comprehension of mental states and how other people's false mental states may drive their behaviours. A variation of the strategy using thought bubbles is also effective in training ToM (Wellman et al., 2002). Thinking strategies were usually taught to atypical or clinical groups as compensation for their deficit in ToM (Swettenham, 1996; Wellman et al., 2002), but understanding the possible reasons why such strategies are effective could provide insight into how

effective ToM teaching could be done by the school.

Children's thinking skills may be closely related to their executive functions and metacognition, and there is growing evidence of a relationship between executive functions and ToM (Carlson et al., 2002; Hughes, 1998; Perner & Lang, 1999). Teaching thinking skills may stimulate the development of ToM through improved executive functions skills. Furthermore, executive functions, in particular inhibitory control, may be needed to pass false-belief tasks. Not only do the children need to understand false-belief, but they are also required to inhibit the true belief in demonstrating an explicit false-belief understanding in these tasks. In a microgenetic study, Flynn et al. (2004) found that inhibition followed a gradual development and emerged before false-belief understanding. The results suggested a role of executive functions in children's passing of the false-belief tasks. Consistent with this result, Fisher & Happé (2005) found that children trained on executive functions showed improvements on ToM tasks in the follow-up sessions. In contrast, children trained on ToM showed immediate improvement on the tasks. The findings suggest there are "trickle-down effects" of executive functions. School-based interventions on executive functions (for a review, see Jacob & Parkinson, 2015) may promote ToM, but further research is needed to understand the exact mechanism and the nature of the relationship.

General Theory of Mind skills training

In contrast to typically developing children, a wider range of conversational skills targeted at training ToM may be taught to children with ASD with a delay in language development (Begeer et al., 2011, 2015; Chin & Bernard-Opitz, 2000; Ozonoff & Miller, 1995). These skills can be viewed as part of a general ToM skills training aimed at compensating a deficiency in ToM. Several ToM intervention programmes have been specifically designed for children with ASD (e.g. Gevers et al., 2006; Steerneman et al., 1996). Some general techniques include social skills and conversational skills training, where children will be taught to initiate a conversation, maintain a topic, and take turns in conversation.

The distinction in ToM teaching strategies in children with ASD and typically developing children has two implications for teachers: 1) the differences in the two groups' ToM should be taken into account when considering how ToM can be taught in school because 2) no universal teaching strategies should be applied to different groups. Teaching strategies should consider the students' individual differences and be tailored to their respective needs. A general ToM skills training would be more suitable for children with ASD who show a deficit in ToM.

In summary, training studies have indicated that ToM can be taught in school through pretence training, language training, thinking strategies and general ToM training – but should it be taught?

Caveats when teaching Theory of Mind in school

Practical issues regarding teaching ToM in school should be considered before adopting any teaching strategies. To begin with, it should be noted that many of the training studies were carried out in an experimental setting instead of a naturalistic school setting. Drawing inferences from studies on the effectiveness of the Social and Emotional aspect of learning (Bond et al., 2016; Lendrum et al., 2009), there may be a possible researcher-teacher gap in the implementation and effectiveness of ToM teaching. Teachers may not have sufficient knowledge of how the teaching strategies mentioned above can foster ToM development so that the teaching effect may be smaller than that carried out by a researcher. Despite numerous studies demonstrating that ToM teaching is possible, it is unclear whether children acquire ToM after training.

Training studies with children with ASD reported the children's inability to transfer their learning to other novel ToM tasks or other aspects of ToM (Hadwin et al., 1996; McGregor et al., 1998; Ozonoff & Miller, 1995). This leads to the suggestion that children may have demonstrated rote learning and acquired the rules to pass the ToM tests in the training sessions instead of developing ToM understanding (Swettenham, 1996). In contrast, Slaughter and Gopnik (1996) found that typically developing children could generalise the learning effects to other tasks, suggesting a genuine learning effect, at least in the typically developing sample. However, even typically developing children have difficulty translating the ToM skills learnt to everyday contexts (Fletcher-Watson et al., 2014). In view of this, ToM should be carefully incorporated into the school curriculum, both across different subjects and on a long-term basis, such that the skills could be easily translated to everyday social situations.

There may also be a possibility of an iatrogenic effect in ToM teaching, where the training resulted in detrimental outcomes for children. Ding et al. (2015) reported a causal relationship between ToM teaching and deception. After ToM training, the experimental group improved their ToM skills, but they were also more likely to deceive others in a hide-and-seek task. ToM allows children to understand how different people may have false beliefs and manipulate this piece of information in deception. The negative outcome of ToM teaching is an under-researched area, so future studies are needed before rejecting the teaching of ToM in school, given a relationship between ToM and dishonesty.

Furthermore, educators should be aware of the possible cultural differences in the development of ToM. An earlier study by Avis and Harris (1991) has presented evidence for the universality of ToM, but later studies have suggested a difference in the time scale of ToM development. In their meta-analysis, Liu et al. (2008) reported that children in the USA and Canada performed stronger on false-belief tasks than their peers from China and Hong Kong. Children from China were also found to develop an understanding of knowledge before beliefs, in contrast to the opposite pattern found in children from the USA and Australia (Wellman et al., 2006). A possible explanation for the findings is a sociocultural difference between these countries. For example, Wellman et al. (2006) attributed the findings to less emphasis on individual's mental states in China, so mental state talk in such cultures is less likely to focus on other people's feelings (Lu et al., 2008). More recent studies (Hughes et al., 2014; Lecce & Hughes, 2010; Wang et al., 2016) suggested that another factor - a difference in the pedagogical experience across societies - has a stronger influence on the individual differences of ToM. It is found that children from societies with a school entry age of six (e.g. Italy, Japan and Hong Kong) performed worse on ToM tasks compared to their British peers who normally start school at age five. A school setting provides a context for children to establish peer relationships (which is found to be related to ToM) and opportunities for children to reflect on other people's mental states through various activities. The greater pedagogical influence on children's ToM (compared to sociocultural difference) is reinforced by Wang et al.'s (2016) study on British and Hong Kong children. British children and Hong Kong children attending international schools did not differ in their ToM skills, and these two groups performed significantly stronger on the ToM task compared to the Hong Kong children attending local schools. It is suggested that differences in the pedagogical curriculum can account for the results, as international schools in Hong Kong have a curriculum more similar to the one in Britain (Wang et al., 2016). Hence, children are more likely to actively engage in understanding and attributing mental states. Taken together, cross-cultural studies have highlighted some sociocultural and pedagogical influences on ToM development, and these influences should be considered in ToM teaching across different societies.

In summary, ToM can be taught in school, but it should be done with caution. Teachers and educators should be aware of the following when teaching ToM in school: 1) the limited generalisability of learning effect implies that ToM teaching is a compensation and not knowledge acquisition; 2) there may be the possibility of an iatrogenic effect in ToM teaching; 3) sociocultural and pedagogical factors should be taken into account when devising ToM teaching strategies across different cultures.

Conclusion

To conclude, ToM plays a significant role in children's social development, such as peer relationships and bullying, emotional understanding, and sensitivity to criticism. Recent studies have suggested that ToM should be viewed as a multidimensional construct that develops gradually, and research interests have shifted to focus on individual differences in ToM. Researchers are particularly interested in investigating whether children who lag behind in ToM development can catch up with their peers. This paradigm shift has raised new questions in the field, especially whether ToM can be taught in school.

With empirical evidence on the relationship between ToM and social experiences (e.g. conversational experience, family size, and mother's mind-mindedness), it seems clear that ToM has a social origin and, therefore, can be taught in school. A review of training studies has proposed four possible ToM teaching strategies in school: pretence training, language training, thinking skills training, and general ToM skills training. Instead of being taught as an independent subject, ToM should be incorporated into the curriculum using a combination of teaching strategies tailored for different groups of students. Furthermore, when teaching ToM, educators should be aware of the limited transfer of the learning effect, the possibility of an iatrogenic effect in teaching, and how sociocultural and pedagogical factors can influence the development of ToM. Further directions on teaching ToM are needed to inform the pedagogy, such as improving the generalisability of the learning effect and how ToM can be most effectively taught in school.

Acknowledgements

Disclosure statement

No potential conflict of interest was reported by the author.

References

Abell, F., Happé, F., & Frith, U. (2000). Do triangles play tricks? Attribution of mental states to animated shapes in normal and abnormal development. *Cognitive Development, 15*(1), 1–16. https://doi.org/10.1016/S0885-2014(00)00014-9

Allen, J. R., & Kinsey, K. (2013). Teaching Theory of Mind. *Early Education and Development, 24*(6). https://doi.org/10.1080/10409289.2013.745182

Astington, J. W. (1998). Theory of Mind Goes to School. *Educational Leadership, 56*(3), 46–48.

Astington, J. W., & Jenkins, J. M. (1995). Theory of mind development and social understanding. *Cognition and Emotion, 9*(2–3), 151–165. https://doi.org/10.1080/02699939508409006

Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relationbetween language and theory-of-mind development. *Developmental Psychology, 35*(5), 1311–1320. https://doi.org/10.1037/0012-1649.35.5.1311

Avis, J., & Harris, P. L. (1991). Belief-Desire Reasoning among Baka Children: Evidence for a Universal Conception of Mind. *Child Development, 62*(3), 460–467. https://doi.org/10.1111/j.1467-8624.1991.tb01544.x

Banerjee, R., Watling, D., & Caputi, M. (2011). Peer relations and the understanding of faux pas: Longitudinal evidence for bidirectional associations. *Child Development, 82*(6), 1887–1905. https://doi.org/10.1111/j.1467-8624.2011.01669.x

Baron-Cohen, S. (1992). Out of sight or out of mind? Another look at deception in autism. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 33*(7), 1141–1155. https://doi.org/10.1111/j.1469-7610.1992.tb00934.x

Baron-Cohen, S., & Goodhart, F. (1994). The 'seeing-leads-to-knowing' deficit in autism: The Pratt and Bryant probe. *British Journal of Developmental Psychology, 12*(3), 397–401. https://doi.org/10.1111/j.2044-835X.1994.tb00642.x

Baron-Cohen, S., Leslie, A. M., & Frith, U. (1985). Does the autistic child have a "theory of mind"? *Cognition, 21*(1), 37–46. https://doi.org/10.1016/0010-0277(85)90022-8

Baron-Cohen, S., O'Riordan, M., Stone, V., Jones, R., & Plaisted, K. (1999). Recognition of faux pas by normally developing children and children with Asperger syndrome or high-functioning autism. *Journal of Autism and Developmental Disorders, 29*(5), 407–418. https://doi.org/10.1023/a:1023035012436

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The 'Reading the Mind in the Eyes' Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 42*(2), 241–251.

Bauminger-Zviely, N. (2013). False-Belief Task. In F. R. Volkmar (Ed.), *Encyclopedia of Autism Spectrum Disorders* (pp. 1249–1249). Springer. https://doi.org/10.1007/978-1-4419-1698-3_91

Begeer, S., Gevers, C., Clifford, P., Verhoeve, M., Kat, K., Hoddenbach, E., & Boer, F. (2011). Theory of Mind training in children with autism: A randomised controlled trial. *Journal of Autism and Developmental Disorders, 41*(8), 997–1006. https://doi.org/10.1007/s10803-010-1121-9

Begeer, S., Howlin, P., Hoddenbach, E., Clauser, C., Lindauer, R., Clifford, P., Gevers, C., Boer, F., & Koot, H. M. (2015). Effects and Moderators of a Short Theory of Mind Intervention for Children with Autism Spectrum Disorder: A Randomized Controlled Trial. *Autism Research: Official Journal of the International Society for Autism Research, 8*(6), 738–748. https://doi.org/10.1002/aur.1489

Bender, P. K., Pons, F., Harris, P. L., & de Rosnay, M. (2011). Do young children misunderstand their own emotions? *European Journal of Developmental Psychology, 8*(3), 331–348. https://doi.org/10.1080/17405629.2010.495615

Benedetti, F., Bernasconi, A., Bosia, M., Cavallaro, R., Dallaspezia, S., Falini, A., Poletti, S., Radaelli, D., Riccaboni, R., Scotti, G., & Smeraldi, E. (2009). Functional and structural brain correlates of theory of mind and empathy deficits in schizophrenia. *Schizophrenia Research, 114*(1–3), 154–160. https://doi.org/10.1016/j.schres.2009.06.021

Bianco, F., Lombardi, E., Massaro, D., Castelli, I., Valle, A., Marchetti, A., & Lecce, S. (2019). Enhancing advanced Theory of Mind skills in primary school: A training study with 7- to 8-year-olds. *Infant and Child Development, 28*(6). Scopus. https://doi.org/10.1002/icd.2155

Biao, S., Juzhe, X., Zhihong, Z., & Wei, W. (2011). Theory of mind in resilient children. *Psychological Science (China), 34*(3), 581–587.

Bloom, P., & German, T. P. (2000). Two reasons to abandon the false belief task as a test of theory of mind. *Cognition, 77*(1), B25-31. https://doi.org/10.1016/s0010-0277(00)00096-2

Bond, C., Symes, W., Hebron, J., Humphrey, N., Morewood, G., & Woods, K. (2016). Educational interventions for children with ASD: A systematic literature review 2008–

2013. *School Psychology International, 37*(3), 303–320. https://doi.org/10.1177/0143034316639638

Bowler, D. M. (1992). 'Theory of mind' in Asperger's syndrome. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 33*(5), 877–893. https://doi.org/10.1111/j.1469-7610.1992.tb01962.x

Brüne, M. (2005). Emotion recognition, 'theory of mind,' and social behavior in schizophrenia. *Psychiatry Research, 133*(2–3), 135–147. https://doi.org/10.1016/j.psychres.2004.10.007

Call, J., & Tomasello, M. (2008). Does the chimpanzee have a theory of mind? 30 years later. *Trends in Cognitive Sciences, 12*(5), 187–192. https://doi.org/10.1016/j.tics.2008.02.010

Caputi, M., Lecce, S., Pagnin, A., & Banerjee, R. (2012). Longitudinal effects of theory of mind on later peer relations: The role of prosocial behavior. *Developmental Psychology, 48*(1), 257–270. https://doi.org/10.1037/a0025402

Carlson, S. M., Moses, L. J., & Breton, C. (2002). How specific is the relation between executive function and theory of mind? Contributions of inhibitory control and working memory. *Infant and Child Development, 11*(2), 73–92. https://doi.org/10.1002/icd.298

Chin, H. Y., & Bernard-Opitz, V. (2000). Teaching conversational skills to children with autism: Effect on the development of a theory of mind. *Journal of Autism and Developmental Disorders, 30*(6), 569–583. https://doi.org/10.1023/a:1005639427185

Crick, N. R., & Grotpeter, J. K. (1995). Relational aggression, gender, and social psychological adjustment. *Child Development, 66*(3), 710–722.https://doi.org/10.2307/1131945

Cutting, A. L., & Dunn, J. (2002). The cost of understanding other people: Social cognition predicts young children's sensitivity to criticism. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 43*(7), 849–860. https://doi.org/10.1111/1469-7610.t01-1-00047

de Villiers, J. G., & de Villiers, P. A. (2000). Linguistic determinism and the understanding of false beliefs. In *Children's reasoning and the mind* (pp. 191–228). Psychology Press/Taylor & Francis (UK).

de Villiers, J. G., & Pyers, J. E. (2002). Complements to cognition: A longitudinal study of the relationship between complex syntax and false-belief-understanding. *Cognitive Development, 17*(1), 1037–1060. https://doi.org/10.1016/S0885-2014(02)00073-4

Devine, R. T., & Hughes, C. (2013). Silent films and strange stories: Theory of mind, gender, and social experiences in middle childhood. *Child Development, 84*(3), 989–1003. https://doi.org/10.1111/cdev.12017

Devine, R. T., White, N., Ensor, R., & Hughes, C. (2016). Theory of mind in middle childhood: Longitudinal associations with executive function and social competence. *Developmental Psychology, 52*(5), 758–771. https://doi.org/10.1037/dev0000105

Ding, X. P., Wellman, H. M., Wang, Y., Fu, G., & Lee, K. (2015). Theory-of-Mind Training Causes Honest Young Children to Lie. *Psychological Science, 26*(11), 1812–1821. https://doi.org/10.1177/0956797615604628

Dockett, S., & Degotardi, S. (1997). Some Implications of Popularity at Age Four. *Journal of Australian Research in Early Childhood Education, 1*, 21–31.

Dumontheil, I., Apperly, I. A., & Blakemore, S.-J. (2010). Online usage of theory of mind continues to develop in late adolescence. *Developmental Science, 13*(2), 331–338. https://doi.org/10.1111/j.1467-7687.2009.00888.x

Dunn, J. (1995). Children as psychologists: The later correlates of individual differences in understanding of emotions and other minds. *Cognition and Emotion, 9*(2–3), 187–201. https://doi.org/10.1080/02699939508409008

Dunn, J., Brown, J., & Beardsall, L. (1991). Family talk about feeling states and children's later understanding of others' emotions. *Developmental Psychology, 27*(3), 448–455. https://doi.org/10.1037/0012-1649.27.3.448

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62*(6), 1352–1366.

Dunn, J., & Cutting, A. L. (1999). Understanding others, and individual differences in friendship interactions in young children. *Social Development, 8*(2), 201–219. https://doi.org/10.1111/1467-9507.00091

Dunn, J., Slomkowski, C., Beardsall, L., & Rende, R. (1994). Adjustment in middle childhood and early adolescence: Links with earlier and contemporary sibling relationships. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 35*(3), 491–504. https://doi.org/10.1111/j.1469-7610.1994.tb01736.x

Edwards-Groves, C., & Davidson, C. (2017). *Becoming a meaning maker: Talk and interaction in the dialogic classroom.* Primary English Teaching Association.

Fisher, N., & Happé, F. (2005). A training study of theory of mind and executive function in children with autistic spectrum disorders. *Journal of Autism and Developmental Disorders, 35*(6), 757–771. https://doi.org/10.1007/s10803-005-0022-9

Flavell, J. H., Flavell, E. R., & Green, F. L. (1983). Development of the appearance reality distinction. *Cognitive Psychology, 15*(1), 95–120. https://doi.org/10.1016/0010-0285(83)90005-1

Fletcher-Watson, S., McConnell, F., Manola, E., & McConachie, H. (2014). Interventions based on the Theory of Mind cognitive model for autism spectrum disorder (ASD). *The Cochrane Database of Systematic Reviews, 3*, CD008785. https://doi.org/10.1002/14651858.CD008785.pub2

Flynn, E., O'Malley, C., & Wood, D. (2004). A longitudinal, microgenetic study of the emergence of false belief understanding and inhibition skills. *Developmental Science, 7*(1), 103–115. https://doi.org/10.1111/j.1467-7687.2004.00326.x

Fuchs, D., Fuchs, L. S., Mathes, P. G., & Simmons, D. C. (1997). Peer-assisted learning strategies: Making classrooms more responsive to diversity. *American Educational Research Journal, 34*(1), 174–206.

Gallese, V., & Goldman, A. (1998). Mirror neurons and the simulation theory of mind-reading. *Trends in Cognitive Sciences, 2*(12), 493–501. https://doi.org/10.1016/s1364-6613(98)01262-5

Gao, Q., Huang, Q., Zhang, Q., & Chen, W. (2020). Does executive function influence the development of theory of mind in elementary students? *Current Psychology, 39*(2), 389–396. Scopus. https://doi.org/10.1007/s12144-018-0107-1

Gevers, C., Clifford, P., Mager, M., & Boer, F. (2006). Brief report: A theory-of-mind based social-cognition training program for school-aged children with pervasive developmental disorders: an open study of its effectiveness. *Journal of Autism and Developmental Disorders, 36*(4), 567–571. https://doi.org/10.1007/s10803-006-0095-0

Goldstein, T. R., & Winner, E. (2012). Enhancing empathy and theory of mind. *Journal of Cognition and Development, 13*(1), 19–37. https://doi.org/10.1080/15248372.2011.573514

Gopnik, A., & Astington, J. W. (1988). Children's understanding of representational change and its relation to the understanding of false belief and the appearance-reality distinction. *Child Development, 59*(1), 26–37. https://doi.org/10.2307/1130386

Gopnik, A., & Wellman, H. M. (1992). Why the child's theory of mind really is a theory. *Mind & Language, 7*(1–2), 145–171. https://doi.org/10.1111/j.1468-0017.1992.tb00202.x

Goswami, U. (2008). *Cognitive Development: The Learning Brain* (1st edition). Psychology Press.

Guajardo, N. R., Petersen, R., & Marshall, T. R. (2013). The roles of explanation and feedback in false belief understanding: A microgenetic analysis. *The Journal of Genetic Psychology: Research and Theory on Human Development, 174*(3), 225–252. https://doi.org/10.1080/00221325.2012.682101

Guajardo, N. R., & Watson, A. C. (2002). Narrative discourse and theory of mind development. *The Journal of Genetic Psychology: Research and Theory on Human Development, 163*(3), 305–325. https://doi.org/10.1080/00221320209598686

Hadwin, J., Baron-Cohen, S., Howlin, P., & Hill, K. (1996). Can we teach children with autism to understand emotions, belief, or pretence? *Development and Psychopathology, 8*(2), 345–365. https://doi.org/10.1017/S0954579400007136

Happé, F. G. (1994). An advanced test of theory of mind: Understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal of Autism and Developmental Disorders, 24*(2), 129–154. https://doi.org/10.1007/BF02172093

Harris, P. L. (1992). From Simulation to Folk Psychology: The Case for Development. *Mind & Language, 7*(1–2), 120–144. https://doi.org/10.1111/j.1468-0017.1992.tb00201.x

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*(5), 1368–1378. https://doi.org/10.1111/1467-8624.00612

Hofmann, S. G., Doan, S. N., Sprung, M., Wilson, A., Ebesutani, C., Andrews, L. A., Curtiss, J., & Harris, P. L. (2016). Training children's theory-of-mind: A meta-analysis of controlled studies. *Cognition, 150*, 200–212. https://doi.org/10.1016/j.cognition.2016.01.006

Hughes, C. (1998). Executive function in preschoolers: Links with theory of mind and verbal ability. *British Journal of Developmental Psychology, 16*(2), 233–253. https://doi.org/10.1111/j.2044-835X.1998.tb00921.x

Hughes, C. (2011). *Social understanding and social lives: From toddlerhood through to the transition to school* (pp. xiii, 238). Psychology Press.

Hughes, C., & Cutting, A. L. (1999). Nature, nurture, and individual differences in early understanding of mind. *Psychological Science, 10*(5), 429–432. https://doi.org/10.1111/1467-9280.00181

Hughes, C., Deater-Deckard, K., & Cutting, A. L. (1999). 'Speak roughly to your little boy?' Sex differences in the relations between parenting and preschoolers' understanding of mind. *Social Development, 8*(2), 143–160. https://doi.org/10.1111/1467-9507.00088

Hughes, C., Devine, R. T., Ensor, R., Koyasu, M., Mizokawa, A., & Lecce, S. (2014). Lost in Translation? Comparing British, Japanese, and Italian Children's Theory-of-Mind Performance. *Child Development Research, 2014*, e893492. https://doi.org/10.1155/2014/893492

Hughes, C., & Dunn, J. (1997). "Pretend you didn't know": Preschoolers' talk about mental states in pretend play. *Cognitive Development, 12*(4), 477–497. https://doi.org/10.1016/S0885-2014(97)90019-8

Hughes, C., & Dunn, J. (1998). Understanding mind and emotion: Longitudinal associations with mental-state talk between young friends. *Developmental Psychology, 34*(5), 1026–1037. https://doi.org/10.1037/0012-1649.34.5.1026

Hughes, C., Jaffee, S. R., Happé, F., Taylor, A., Caspi, A., & Moffitt, T. E. (2005). Origins of Individual Differences in Theory of Mind: From Nature to Nurture? *Child Development, 76*(2), 356–370. https://doi.org/10.1111/j.1467-8624.2005.00850_a.x

Hughes, C., & Leekam, S. (2004). What are the Links Between Theory of Mind and Social Relations? Review, Reflections and New Directions for Studies of Typical and Atypical Development. *Social Development, 13*(4), 590–619. https://doi.org/10.1111/j.1467-9507.2004.00285.x

Iacoboni, M., Molnar-Szakacs, I., Gallese, V., Buccino, G., Mazziotta, J. C., & Rizzolatti, G. (2005). Grasping the intentions of others with one's own mirror neuron system. *PLoS Biology, 3*(3), e79. https://doi.org/10.1371/journal.pbio.0030079

Jacob, R., & Parkinson, J. (2015). The Potential for School-Based Interventions That Target Executive Function to Improve Academic Achievement: A Review. *Review of Educational Research, 85*(4), 512–552. https://doi.org/10.3102/0034654314561338

Jenkins, J. M., & Astington, J. W. (1996). Cognitive factors and family structure associated with theory of mind development in young children. *Developmental Psychology, 32*(1), 70–78. https://doi.org/10.1037/0012-1649.32.1.70

Jenkins, J. M., Turrell, S. L., Kogushi, Y., Lollis, S., & Ross, H. S. (2003). A longitudinal investigation of the dynamics of mental state talk in families. *Child Development, 74*(3), 905–920. https://doi.org/10.1111/1467-8624.00575

Karmiloff-Smith, A., Klima, E., Bellugi, U., Grant, J., & Baron-Cohen, S. (1995). Is there a social module? Language, face processing, and theory of mind in individuals with williams syndrome. *Journal of Cognitive Neuroscience, 7*(2), 196–208. https://doi.org/10.1162/jocn.1995.7.2.196

Kazak, S., Collis, G. M., & Lewis, V. (1997). Can young people with autism refer to knowledge states? Evidence from their understanding of 'know' and 'guess'. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 38*(8), 1001–1009. https://doi.org/10.1111/j.1469-7610.1997.tb01617.x

Keysar, B., Barr, D. J., Balin, J. A., & Brauner, J. S. (2000). Taking perspective in conversation: The role of mutual knowledge in comprehension. *Psychological Science, 11*(1), 32–38. https://doi.org/10.1111/1467-9280.00211

Kidd, D. C., & Castano, E. (2013). Reading literary fiction improves theory of mind. *Science (New York, N.Y.), 342*(6156), 377–380. https://doi.org/10.1126/science.1239918

Kloo, D., & Perner, J. (2003). Training transfer between card sorting and false belief understanding: Helping children apply conflicting descriptions. *Child Development, 74*(6), 1823–1839. https://doi.org/10.1046/j.1467-8624.2003.00640.x

Krettenauer, T., Malti, T., & Sokol, B. (2008). The development of moral emotions and the happy victimiser phenomenon: A critical review of theory and applications. *European Journal of Developmental Science, 2*(3), 221–235.

Lalonde, C. E., & Chandler, M. J. (1995). False belief understanding goes to school: On the social-emotional consequences of coming early or late to a first theory of mind. *Cognition and Emotion, 9*(2–3), 167–185. https://doi.org/10.1080/02699939508409007

Lecce, S., Caputi, M., & Hughes, C. (2011). Does sensitivity to criticism mediate the relationship between theory of mind and academic achievement? *Journal of Experimental Child Psychology, 110*(3), 313–331. https://doi.org/10.1016/j.jecp.2011.04.011

Lecce, S., & Hughes, C. (2010). 'The Italian job?': Comparing theory of mind performance in British and Italian children. *British Journal of Developmental Psychology, 28*(4), 747–766. https://doi.org/10.1348/026151009X479006

Lendrum, A., Humphrey, N., Kalambouka, A., & Wigelsworth, M. (2009). Implementing primary Social and Emotional Aspects of Learning (SEAL) small group interventions: Recommendations for practitioners. *Emotional and Behavioural Difficulties, 14*(3), 229–238. https://doi.org/10.1080/13632750903073509

Leslie, A. M. (1987). Pretense and representation: The origins of 'theory of mind.' *Psychological Review, 94*(4), 412–426. https://doi.org/10.1037/0033-295X.94.4.412

Leslie, A. M. (1994). Pretending and believing: Issues in the theory of ToMM. *Cognition, 50*(1), 211–238. https://doi.org/10.1016/0010-0277(94)90029-9

Leslie, A. M., & Polizzi, P. (1998). Inhibitory processing in the false belief task: Two conjectures. *Developmental Science, 1*(2), 247–253. https://doi.org/10.1111/1467-7687.00038

Lewis, C., & Osborne, A. (1990). Three-Year-Olds' Problems with False Belief: Conceptual Deficit or Linguistic Artifact? *Child Development, 61*(5), 1514–1519. https://doi.org/10.2307/1130760

Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychological Bulletin, 139*(1), 1–34. https://doi.org/10.1037/a0029321

Liu, D., Wellman, H. M., Tardif, T., & Sabbagh, M. A. (2008). Theory of mind development in Chinese children: A meta-analysis of false-belief understanding across cultures and languages. *Developmental Psychology, 44*(2), 523–531. https://doi.org/10.1037/0012-1649.44.2.523

Lohmann, H., & Tomasello, M. (2003). The role of language in the development of false belief understanding: A training study. *Child Development, 74*(4), 1130–1144. https://doi.org/10.1111/1467-8624.00597

Lu, H., Su, Y., & Wang, Q. (2008). Talking about others facilitates theory of mind in Chinese preschoolers. *Developmental Psychology, 44*(6), 1726–1736. https://doi.org/10.1037/a0013074

McGregor, E., Whiten, A., & Blackburn, P. (1998). Teaching theory of mind by highlighting intention and illustrating thoughts: A comparison of their effectiveness with 3-year olds and autistic individuals. *British Journal of Developmental Psychology, 16*(3), 281–300. https://doi.org/10.1111/j.2044-835X.1998.tb00753.x

Meins, E., Fernyhough, C., Russell, J., & Clark-Carter, D. (1998). Security of attachment as a predictor of symbolic and mentalising abilities: A longitudinal study. *Social Development, 7*(1), 1–24. https://doi.org/10.1111/1467-9507.00047

Meins, E., Fernyhough, C., Wainwright, R., Das Gupta, M., Fradley, E., & Tuckey, M. (2002). Maternal mind-mindedness and attachment security as predictors of theory of mind understanding. *Child Development, 73*(6), 1715–1726. https://doi.org/10.1111/1467-8624.00501

Milligan, K., Astington, J. W., & Dack, L. A. (2007). Language and theory of mind: Meta-analysis of the relation between language ability and false-belief understanding. *Child Development, 78*(2), 622–646. https://doi.org/10.1111/j.1467-8624.2007.01018.x

Moore, C., Bryant, D., & Furrow, D. (1989). Mental terms and the development of certainty. *Child Development, 60*(1), 167–171. https://doi.org/10.2307/1131082

Mori, A., & Cigala, A. (2016). Perspective Taking: Training Procedures in Developmentally Typical Preschoolers. Different Intervention Methods and Their Effectiveness. *Educational Psychology Review, 28*(2), 267–294. https://doi.org/10.1007/s10648-015-9306-6

Muris, P., Steerneman, P., Meesters, C., Merckelbach, H., Horselenberg, R., van den Hogen, T., & van Dongen, L. (1999). The TOM Test: A New Instrument For Assessing Theory of Mind in Normal Children and Children with Pervasive Developmental Disorders. *Journal of Autism and Developmental Disorders, 29*(1), 67–80. https://doi.org/10.1023/A:1025922717020

Nunner-Winkler, G., & Sodian, B. (1988). Children's understanding of moral emotions. *Child Development, 59*(5), 1323–1338. https://doi.org/10.1111/j.1467-8624.1988.tb01501.x

O'Neill, D. K., & Gopnik, A. (1991). Young children's ability to identify the sources of their beliefs. *Developmental Psychology, 27*(3), 390–397. https://doi.org/10.1037/0012-1649.27.3.390

Ozonoff, S., & Miller, J. N. (1995). Teaching theory of mind: A new approach to social skills training for individuals with autism. *Journal of Autism and Developmental Disorders, 25*(4), 415–433. https://doi.org/10.1007/BF02179376

Paynter, J., & Peterson, C. C. (2013). Further evidence of benefits of thought-bubble training for theory of mind development in children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 7*(2), 344–348. https://doi.org/10.1016/j.rasd.2012.10.001

Perner, J., & Lang, B. (1999). Development of theory of mind and executive control. *Trends in Cognitive Sciences, 3*(9), 337–344. https://doi.org/10.1016/s1364-6613(99)01362-5

Perner, J., Leekam, S. R., & Wimmer, H. (1987). Three-year-olds' difficulty with false belief: The case for a conceptual deficit. *British Journal of Developmental Psychology, 5*(2), 125–137. https://doi.org/10.1111/j.2044-835X.1987.tb01048.x

Perner, J., Ruffman, T., & Leekam, S. R. (1994). Theory

of Mind Is Contagious: You Catch It from Your Sibs. *Child Development*, 65(4), 1228–1238. https://doi.org/10.1111/j.1467-8624.1994.tb00814.x

Perner, J., & Wimmer, H. (1985). "John thinks that Mary thinks that…" attribution of second-order beliefs by 5- to 10-year-old children. *Journal of Experimental Child Psychology*, 39(3), 437–471. https://doi.org/10.1016/0022-0965(85)90051-7

Peterson, C. C., & Siegal, M. (1995). Deafness, Conversation and Theory of Mind. *Journal of Child Psychology and Psychiatry*, 36(3), 459–474. https://doi.org/10.1111/j.1469-7610.1995.tb01303.x

Peterson, C. C., & Siegal, M. (2000). Insights into Theory of Mind from Deafness and Autism. *Mind & Language*, 15(1), 123–145. https://doi.org/10.1111/1468-0017.00126

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences*, 1(4), 515–526. https://doi.org/10.1017/S0140525X00076512

Ronald, A., Happe, F., Hughes, C., & Plomin, R. (2005). Nice and nasty theory of mind in preschool children: Nature and nurture. *Social Development*, 14(4), 664–684. https://doi.org/10.1111/j.1467-9507.2005.00323.x

Ruffman, T. (2014). To belief or not belief: Children's theory of mind. *Developmental Review*, 34(3), 265–293. https://doi.org/10.1016/j.dr.2014.04.001

Russell, J., Mauthner, N., Sharpe, S., & Tidswell, T. (1991). The 'windows task' as a measure of strategic deception in preschoolers and autistic subjects. *British Journal of Developmental Psychology*, 9(2), 331–349. https://doi.org/10.1111/j.2044-835X.1991.tb00881.x

Shakoor, S., Jaffee, S. R., Bowes, L., Ouellet-Morin, I., Andreou, P., Happé, F., Moffitt, T. E., & Arseneault, L. (2012). A prospective longitudinal study of children's theory of mind and adolescent involvement in bullying. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 53(3), 254–261. https://doi.org/10.1111/j.1469-7610.2011.02488.x

Siegal, M., & Beattie, K. (1991). Where to look first for children's knowledge of false beliefs. *Cognition*, 38(1), 1–12. https://doi.org/10.1016/0010-0277(91)90020-5

Slaughter, V. (1998). Children's Understanding of Pictorial and Mental Representations. *Child Development*, 69(2), 321–332. https://doi.org/10.1111/j.1467-8624.1998.tb06191.x

Slaughter, V., & Gopnik, A. (1996). Conceptual coherence in the child's theory of mind: Training children to understand belief. *Child Development*, 67(6), 2967–2988.

Smogorzewska, J., Szumski, G., & Grygiel, P. (2020). Theory of mind goes to school: Does educational environment influence the development of theory of mind in middle childhood? *PLoS ONE*, 15(8), e0237524. https://doi.org/10.1371/journal.pone.0237524

Sodian, B. (1991). The development of deception in young children. *British Journal of Developmental Psychology*, 9(1), 173–188. https://doi.org/10.1111/j.2044-835X.1991.tb00869.x

Sprong, M., Schothorst, P., Vos, E., Hox, J., & van Engeland, H. (2007). Theory of mind in schizophrenia: Meta-analysis. *The British Journal of Psychiatry: The Journal of Mental Science*, 191, 5–13. https://doi.org/10.1192/bjp.bp.107.035899

Steerneman, P., Jackson, S., Pelzer, H., & Muris, P. (1996). Children with Social Handicaps: An Intervention Programme Using a Theory of Mind Approach. *Clinical Child Psychology and Psychiatry*, 1(2), 251–263. https://doi.org/10.1177/1359104596012006

Sutton, J., Smith, P. K., & Swettenham, J. (1999). Social cognition and bullying: Social inadequacy or skilled manipulation? *British Journal of Developmental Psychology*, 17(3), 435–450. https://doi.org/10.1348/026151099165384

Swettenham, J. (1996). Can children with autism be taught to understand false belief using computers? *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 37(2), 157–165. https://doi.org/10.1111/j.1469-7610.1996.tb01387.x

Swettenham, J. G., Baron-Cohen, S., Gomez, J. C., & Walsh, S.

(1996). What's inside someone's head? Conceiving of the mind as a camera helps children with autism acquire an alternative to a theory of mind. *Cognitive Neuropsychiatry*, 1(1), 73–88. https://doi.org/10.1080/135468096396712

Tai, Y. F., Scherfler, C., Brooks, D. J., Sawamoto, N., & Castiello, U. (2004). The Human Premotor Cortex Is 'Mirror' Only for Biological Actions. *Current Biology*, 14(2), 117–120. https://doi.org/10.1016/j.cub.2004.01.005

Taylor, M., & Carlson, S. M. (1997). The relation between individual differences in fantasy and theory of mind. *Child Development*, 68(3), 436–455.

Taylor, M., & Hort, B. (1990). Can children be trained in making the distinction between appearance and reality? *Cognitive Development*, 5(1), 89–99. https://doi.org/10.1016/0885-2014(90)90014-K

Vygotsky, L. S. (1987). *The Collected Works of L. S. Vygotsky: Problems of General Psychology, Including the Volume Thinking and Speech* (R. W. Rieber & A. S. Carton, Eds.). Springer US. https://doi.org/10.1007/978-1-4613-1655-8

Wang, Z., Devine, R. T., Wong, K. K., & Hughes, C. (2016). Theory of mind and executive function during middle childhood across cultures. *Journal of Experimental Child Psychology*, 149, 6–22. https://doi.org/10.1016/j.jecp.2015.09.028

Wellman, H., & Liu, D. (2004). Scaling of theory-of-mind tasks. *Child Development*. https://doi.org/10.1111/J.1467-8624.2004.00691.X

Wellman, H. M., Baron-Cohen, S., Caswell, R., Gomez, J. C., Swettenham, J., Toye, E., & Lagattuta, K. (2002). Thought-bubbles help children with autism acquire an alternative to a theory of mind. *Autism*, 6(4), 343–363. https://doi.org/10.1177/1362361302006004003

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: The truth about false belief. *Child Development*, 72(3), 655–684. https://doi.org/10.1111/1467-8624.00304

Wellman, H. M., Fang, F., Liu, D., Zhu, L., & Liu, G. (2006). Scaling of theory-of-mind understandings in Chinese children. *Psychological Science*, 17(12), 1075–1081. https://doi.org/10.1111/j.1467-9280.2006.01830.x

Wellman, H. M., & Lagattuta, K. H. (2004). Theory of mind for learning and teaching: The nature and role of explanation. *Cognitive Development*, 19(4), 479–497. https://doi.org/10.1016/j.cogdev.2004.09.003

Westby, C., & Robinson, L. (2014). A developmental perspective for promoting theory of mind. *Topics in Language Disorders*, 34(4), 362–382. https://doi.org/10.1097/TLD.0000000000000035

Whiten, A. (1993). Evolving a theory of mind: The nature of non-verbal mentalism in other primates. *Understanding Other Minds: Perspectives from Autism*, 367–396.

Wimmer, H., & Hard, R. (1991). Against the Cartesian view on mind: Young children's difficulty with own false beliefs. *British Journal of Developmental Psychology*, 9(1), 125–138.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, 13(1), 103–128. https://doi.org/10.1016/0010-0277(83)90004-5

Woolfe, T., Want, S. C., & Siegal, M. (2002). Signposts to development: Theory of mind in deaf children. *Child Development*, 73(3), 768–778. https://doi.org/10.1111/1467-8624.00437

Yirmiya, N., Erel, O., Shaked, M., & Solomonica-Levi, D. (1998). Meta-analyses comparing theory of mind abilities of individuals with autism, individuals with mental retardation, and normally developing individuals. *Psychological Bulletin*, 124(3), 283–307. https://doi.org/10.1037/0033-2909.124.3.283

Zaitchik, D. (1990). When representations conflict with reality: The preschooler's problem with false beliefs and 'false' photographs. *Cognition*, 35(1), 41–68. https://doi.org/10.1016/0010-0277(90)90036-j

Appendices

Appendix 1 List of studies selected for the literature review: Language training

Studies	Sample	Conditions	ToM measures
Bianco et al. (2019)	TD; n = 49, 7-8	Conversation on language; conversation on physical aspects	Strange stories task
Guajardo et al. (2013)	TD; n = 33, 3-5	Self-generated explanation or explanation produced by the experimenter; Explanation without feedback or feedback without explanation	Unexpected content task; Unexpected location task; Knowledge access task (Wellman & Liu, 2004)
Guajardo & Watson (2002)	TD; n = 54, 3-4	Stories and discussion; No training	Unexpected location task; Unexpected content; Deception tasks (Lalonde & Chandler, 1995)
Lohmann & Tomasello (2003)	TD; n = 138, 3	Discussion of deceptive objects using mental state talk and feedback; Discussion of deceptive objects without mental state talk; Mental state discussions without deceptive objects (sentential complement); Children only asked to pay attention to the deceptive objects	Representational change task (Gopnik & Astington, 1988); Appearance-reality task; Unexpected location task
Slaughter & Gopnik (1996) - Study 1	TD; n = 33, 3-4	Report owns' false belief and other people's or report perceptions and desires; Number conservation	Unexpected content task
Slaughter & Gopnik (1996) - Study 2	TD; n = 39, 3-4	Feedback; Number conservation	Unexpected content task; Appearance-reality task; Subjective probability task (Moore et al., 1989); Sources task (O'Neill & Gopnik, 1991)

ToM = Theory of Mind, ASD = autistic spectrum disorder; TD = typically developing, EF = executive functions

Appendix 2 List of studies selected for the literature review: Thinking skills training

Studies	Sample	Conditions	ToM measures
Fisher & Happé (2005)	ASD; n = 27, 6-15	"Picture-in-the-head" training strategy; EF training; No intervention	Unexpected location task; Unexpected content task; False photograph task; Penny-hiding deception (Baron-Cohen, 1992); Seeing leads to knowing (Baron-Cohen & Goodhart, 1994); Knowing/guessing (Kazak et al., 1997); "Reading the mind in the eyes" test
Kloo & Perner (2003)	TD; n = 44, 3-4	EF training; Highlight false belief; Number conservation and relative clause	Unexpected location
Paynter & Peterson (2013)	ASD; n = 24, 4-12	Used thought bubbles (picture-in-the-head strategy) to teach false beliefs; No intervention	Sally-Anne test; Unexpected content task
Wellman et al. (2002) - Study 1	ASD; n = 7, 8-18	Used thought bubbles (picture-in-the-head strategy) to teach false beliefs	Sally-Anne test; Unexpected content task
Wellman et al. (2002) - Study 2	ASD; n = 10, 5-17	Used thought bubbles (picture-in-the-head strategy) to teach false beliefs	Sally-Anne test; unexpected content task; unexpected location task; seeing leads to knowing (Baron-Cohen & Goodhart, 1994)

ToM = Theory of Mind, ASD = autistic spectrum disorder; TD = typically developing, EF = executive functions

Appendix 3 List of studies selected for the literature review: General ToM skills training

Studies	Sample	Conditions	ToM measures
Begeer et al. (2011)	High Functioning ASD; n = 40, 8-13	ToM training; Waitlist control group	ToM test
Begeer et al. (2015)	ASD; n = 97, 7-12	ToM training; Waitlist control group	ToM test
Chin & Bernard-Opitz (2000)	ASD; n = 3, 5-7	Training on initiating a conversation, taking turns, and listening in the conversation, maintaining, and changing a conversation topic	Sally-Anne test; Unexpected content task; Second-order belief test
Ozonoff & Miller (1995)	ASD; n = 9, 13-14	Social skills training: conversational skills, first and second-order perspective taking; No intervention	Unexpected content task; Second-order belief test; Strange story, Overcoat story (Bowler, 1992)

ToM = Theory of Mind, ASD = autistic spectrum disorder; TD = typically developing, EF = executive functions