

A prospective longitudinal study of children's theory of mind and adolescent involvement in bullying

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Background: Theory of mind (ToM) allows the understanding and prediction of other people's behaviours based on their mental states (e.g. beliefs). It is important for healthy social relationships and thus may contribute towards children's involvement in bullying. The present study investigated whether children involved in bullying during early adolescence had poor ToM in childhood. **Method:** Participants were members of the Environmental Risk (E-Risk) Longitudinal Twin Study, a nationally representative sample of 2,232 children and their families. We visited families when children were 5, 7, 10 and 12 years. ToM was assessed when the children were 5 years using eight standardized tasks. Identification of those children who were involved in bullying as victims, bullies and bully-victims using mothers', teachers' and children's reports was carried out when they were 12 years' old. **Results:** Poor ToM predicted becoming a victim (effect size, $d = 0.26$), bully ($d = 0.25$) or bully-victim ($d = 0.44$) in early adolescence. These associations remained for victims and bully-victims when child-specific (e.g. IQ) and family factors (e.g. child maltreatment) were controlled for. Emotional and behavioural problems during middle childhood did not modify the association between poor ToM and adolescent bullying experiences. **Conclusion:** Identifying and supporting children with poor ToM early in life could help reduce their vulnerability for involvement in bullying and thus limit its adverse effects on mental health. **Keywords:** Theory of mind, bullying involvement, child development.

Introduction

Theory of mind (ToM) refers to the everyday understanding and prediction of other people's behaviours based on their mental states (e.g. beliefs). Core ToM skills include the understanding of false-beliefs, typically developed by age 4 (Wimmer & Perner, 1983). More advanced skills such as understanding the influence of emotions on other people's beliefs and embedded mental states ('he thinks she thinks...') are typically developed by age 7 (Perner & Wimmer, 1985). The development of these skills helps shape healthy social interactions and considered important for decoding social cues and adjusting behaviours accordingly (Astington, 2001). Therefore, children who show delays in developing ToM skills may be exposed to negative social interactions and have difficulties in establishing good relationships later in life.

Bullying is a negative social experience involving on average 27% of children and adolescents every year worldwide as victims, bullies or bully-victims (children who have been bullied and have bullied others) (Craig et al., 2009). Children with poor ToM may be at greater risk of involvement in bullying because ToM skills underpin everyday social interactions. First, poor understanding of other people's

intentions and emotions may jeopardize children's ability to detect social cues that indicate nonreciprocal interactions, thus placing them at risk of being victimized or exploited. Second, poor ToM may increase the risk of bullying victimization by affecting children's ability to negotiate conflicts or stand up for themselves, resulting in being viewed as easy targets for threats and abuse. Third, according to the social skills deficit model, children may be biased when they process social cues and interpret ambiguous situations as being hostile (Dodge, 1980). Children may engage in bullying behaviours as a way of dealing with perceived conflicts.

Given the robust associations between bullying and mental health problems (Arseneault, Bowes, & Shakoor, 2010), it is important to investigate mechanisms by which children become involved in bullying. A better understanding of the developmental processes that influence children's involvement in bullying may contribute to minimizing its adverse effects on mental health. Studies investigating ToM amongst victims of bullying and bullies are limited. Findings mostly relate to bullies, with victims representing an additional group, and little consideration being given to bully-victims. Research shows that victims of bullying have poor ToM (Gini, 2006; Sutton, Smith, & Swettenham, 1999). Findings are mixed for bullies with some studies reporting advanced ToM skills for bullies who play a leadership

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role (Renouf et al., 2010; Sutton et al., 1999) and others showing deficits (Monks, Smith, & Swettenham, 2005). Being cross-sectional or spanning only a short period of time, these studies are limited in the extent to which they can inform about the influence of ToM on involvement in bullying over time. Using longitudinal data from 2,232 children, we tested the hypothesis that youth involved in bullying as victims, bullies and bully-victims in early adolescence had poor ToM in childhood.

The development of ToM is facilitated by factors including children's language abilities (Cutting & Dunn, 1999; Happé, 1995), conversations about emotions within the family (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991) and number of child-aged siblings (1–12 years) (McAlister & Peterson, 2006). Reports of positive associations between the number of siblings and ToM are mixed, with suggestions that it may be the quality of the interactions with siblings that are important, rather than just their presence (Hughes & Ensor, 2005). Furthermore, ToM and involvement in bullying have common antecedents such as family disadvantage and quality of mother–child relationship (Bowes et al., 2009; Cutting & Dunn, 1999; Wolke, Woods, Stanford, & Schulz, 2001). We therefore tested whether ToM was independently associated with involvement in bullying over and above child-specific and family factors.

Children with emotional and behavioural problems are more likely to have had a history of poor ToM (Hughes & Ensor, 2006) and to have been involved in bullying (Arseneault et al., 2006; Barker et al., 2008). This highlights adjustment problems as a potential mechanism that may exacerbate the effect of poor ToM upon children's involvement in bullying. For example, children with poor ToM who find it difficult to socialize and are therefore seen as being 'odd', may become easier targets for victimization if they are also highly anxious and therefore unlikely to stand up for themselves. Similarly, children with poor ToM who have difficulty making the correct attributions for others' behaviour may especially be likely to bully others if they are already prone to aggression. Using prospective data across 4 time points, we investigated if having adjustment problems in middle childhood moderated the risk of being involved in adolescent bullying amongst children with poor ToM.

Methods

Sample

Participants were members of the Environmental Risk (E-Risk) Longitudinal Twin Study, which tracks the development of a nationally representative birth cohort of 2,232 British children. The sample was drawn from a larger birth register of twins born in England and Wales in 1994–1995 (Trouton, Spinath, & Plomin, 2002). Briefly, the E-Risk sample was constructed in 1999–

2000 when 1,116 families with same-sex 5-year-old twins (93% of those eligible) participated in home-visit assessments. Families were recruited to represent the UK population of families with newborns in the 1990s, based on (a) residential location throughout England and Wales and (b) mother's age (i.e. older mothers having twins via assisted reproduction were under-selected and teen-aged mothers with twins were over-selected). We used this sampling strategy (a) to replace high-risk families who were selectively lost to the register via nonresponse and (b) to ensure sufficient numbers of children growing up in high-risk environments. Follow-ups were conducted when children were 7 (98% participation), 10 (96%) and 12-years (96%). Parents gave informed consent and children gave assent. The Joint South London and Maudsley and the Institute of Psychiatry Research Ethics Committee approved each phase of the study.

Age-5 children's ToM

We administered a total of eight ToM tasks in a set order of increasing difficulty when children were 5 years old (Hughes et al., 2005). All test questions were presented in a forced-choice format (or with a forced-choice prompt) and were accompanied by at least one control question to check story comprehension and recall. Children only received credit on a test question if they also passed the accompanying control question(s). Four 'standard' ToM tasks tapped children's ability to attribute a 1st order false-belief to a story character (e.g. a mistaken belief about an object's identity or location). Four 'advanced' ToM tasks tapped children's ability to make inferences from an attributed false-belief (e.g. to predict how a character would feel as a result of his/her false-belief) or to attribute a 2nd order false-belief (i.e. a mistaken belief about a belief) to a story character. Children who responded correctly to 'advanced' ToM questions were asked to justify their response and received a bonus point for each correct justification. Children's scores across the eight different tasks and the four bonus points were summed, ranging from 0 to 12 [$M = 4.52$, standard deviation (SD) = 3.28] where lower scores represent poor ToM. The standard and advanced false-belief tasks show acceptable 1 month test–retest reliability ($>.7$) in 5-year-old children across a wide range of abilities (Hughes et al., 2000).

Age-5 covariates

To assess children's IQ, each child was individually tested at age 5 using a short form of the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R; Wechsler, 1990) comprising Vocabulary and Block Design subtests. Children's IQs were prorated following procedures described by Sattler (1992). Scores ranged from 55 to 151 ($M = 100$, $SD = 15$).

We assessed children's *early involvement in bullying* during interviews with mothers when children were 7 years. We asked mothers whether either twin had been bullied by another child between 5 and 7 years. A total of 19% of children had been bullied by 7 years ($N = 411$). We also asked mothers and teachers whether children had been bullying others at age 7. A child was considered to be a bully if reported by either source.

A total of 24% of children bullied others according to mothers and/or teachers ($N = 519$). We combined groups of children who had been victimized by bullies and children who had been bullying others to generate three groups of children involved in bullying: victims ($N = 273$, 13%), bullies ($N = 381$, 17%) and bully-victims ($N = 138$, 6%).

We assessed *emotional and behavioural problems* when children were 5 years using the Child Behavior Checklist for mothers (Achenbach, 1991a) and the Teacher's Report Form for teachers (Achenbach, 1991b). Mothers were given the instrument as a face-to-face interview and teachers responded by mail. The reporting period was 6 months before the interview. Informants were asked to rate each item as being 'not true', 'sometimes true' or 'very true'. Mothers' and teachers' reports were standardized and summed to create a composite measure. The emotional problems scale is the sum of items on the Withdrawn and Anxious/Depressed scales, including items such as 'cries a lot', 'withdrawn, doesn't get involved with others' and 'worries'. Combined mother and teacher scores ranged from 0 to 58 ($M = 12.13$, $SD = 8.35$). The internal consistency was 0.85. The behavioural problems scale is the sum of items in the Aggressive and Delinquent behaviours scales (minus the item that assessed bullying), including items such as 'argues a lot' and 'is defiant, talks back'. Combined mother and teacher scores ranged from 0 to 93 ($M = 17.97$, $SD = 13.28$). The internal consistency was 0.92.

Details and descriptive statistics of measures used to assess *family factors* at age 5 are reported in Table 1.

Age-7 and -10 emotional and behavioural problems

We assessed *emotional and behavioural problems* when children were 7 and 10 years similarly to when they were 5 years. Combined mother and teacher scores of emotional problems at age 7 ranged from 0 to 66 ($M = 11.60$, $SD = 8.56$) and from 0 to 67 ($M = 11.57$, $SD = 8.90$) at age 10. The internal consistency was 0.87 at age 7 and 0.89 at age 10. Combined mother and teacher scores of behavioural problems at age 7 ranged from 0 to 98 ($M = 15.99$, $SD = 13.23$) and from 0 to 113 ($M = 15.35$, $SD = 14.00$) at age 10. The internal consistency was 0.94 at age 7 and 0.92 at age 10.

Age-12 adolescent involvement in bullying

We assessed experiences of *bullying victimization* using both mothers' and children's reports at age 12. We explained that, 'Someone is being bullied when another child (a) says mean and hurtful things, makes fun or calls a person mean and hurtful names; (b) completely ignores or excludes someone from their group of friends or leaves them out on purpose; (c) hits, kicks, shoves a person or locks them in a room; (d) tells lies or spreads rumours about them; and (e) does other hurtful things like these. We call it bullying when these things happen often, and when it is difficult to make it stop. We do not call it bullying when it is done in a friendly or playful way.' Mothers were asked whether either twin had been bullied by another child, responding 'never', 'yes' or 'frequently'. The test-retest reliability of bullying victimization was 0.87 using a sample of 30 parents

Table 1 Measures of family factors at age 5

Family factors	Measure	Informant	Mean (SD) or %	Range	Inter-rater reliability (r)	Reference citations
Maternal warmth	Maternal expressed emotion scale based on the 5 min speech sample method	2 raters	3.3 (1.00)	0–5	0.9	(Caspi et al., 2004)
Child maltreatment	Adapted parenting interview schedule	Mother and Clinicians	13.76 ('probable' or 'definite child maltreatment')	–	0.8	(Dodge et al., 1990; Jaffee et al., 2004)
Number of siblings	Life History Calendar	Mother	–	0–10	–	(Caspi et al., 1996)
Socioeconomic deprivation	Standardized composite of income, education and social class modelled on the British Social Attitudes survey series	Mother	2.0 (0.82)	1–3	–	(Jowell et al., 1997)

who were interviewed twice, 3–6 weeks apart. During private interviews with children, they indicated whether they had been bullied by another child during secondary school. When a mother or a child reported bullying victimization, the interviewer asked them to describe what had happened. Notes taken by the interviewers were later checked by an independent rater to verify that the events reported could be classified as instances of bullying operationally defined as evidence of repeated harmful actions, between children, where there is a power differential between the bully and the victim (Shakoor et al., 2011). Age-12 reports of bullying victimization from the two informants were summed to create two groups: nonvictim ($N = 1,138$; 53%), and victims as reported by either or both mothers and children as ‘occasionally’ or ‘frequently’ ($N = 1,008$; 47%). The inclusion of both mothers’ and children’s reports of bullying victimization allow us to capture bullying incidents that could easily go unnoticed by mothers or be under-reported by children. This is reflected in our high prevalence rate.

We assessed *bullying perpetration* at age 12 using items from the Child Behavior Checklist (Achenbach, 1991a) and Teacher’s Report Form (Achenbach, 1991b). A child was considered to be a bully if so reported by either mother or teacher. A total of 471 children (22%) bullied others according to mothers and/or teachers.

Based on information regarding bullying victimization and perpetration, we created three groups: victims ($N = 704$; 33%) are children who have been victimized but who have not bullied others; bullies ($N = 167$; 8%) are children who have only bullied others; and bully-victims ($N = 304$; 14%) are children who have been bullied and have bullied others. Children not involved in bullying either as victims, bullies, or bully-victims form the comparison group ($N = 971$; 45%).

Statistical analyses

First, we tested whether poor ToM at age 5 was associated with children becoming involved in bullying at age 12. We used multinomial logistic regression analyses predicting victims, bullies and bully-victims, with children not involved in bullying as the comparison group. We tested if the associations differed by gender by including an interaction term (gender \times ToM) in the regression models. Results indicated nonsignificant effects thus all analyses were conducted collapsed across gender. We further examined the independent associations between ToM and adolescent involvement in bullying controlling for the child-specific factors in one model and family factors in another.

Second, we tested whether adjustment problems during middle childhood (7 and 10 years) played a role in the association between poor ToM at 5 and later involvement in bullying at 12. We examined if emotional and behavioural problems in middle childhood moderated the risk of adolescent involvement in bullying amongst children with poor ToM. Using multinomial logistic regression models predicting involvement in bullying, we tested whether emotional or behavioural problems had an independent effect on children’s involvement in bullying. We then tested for a moderating effect by including interaction terms between ToM and emotional and behavioural problems in the regression models.

Participants were twin pairs growing up in the same family. To control for these non-independent observations, analyses were adjusted with tests based on the sandwich or Huber/White variance estimator (Williams, 2000).

Results

Did adolescents involved in bullying have poor ToM as children?

Compared to adolescents not involved in bullying, age-12 victims, bullies and bully-victims had poorer ToM at age 5 (Table 2). We observed significantly poorer ToM among victims ($d = 0.26$), bullies ($d = 0.25$) and especially bully-victims ($d = 0.44$). Even after controlling for child-specific and family factors (Table 3), multivariate analyses indicated that poor ToM was independently associated with victim and bully-victim status at age 12. Amongst bullies the association between poor ToM and being a bully was statistically accounted for by the confounding effects of socioeconomic deprivation (SES) and child maltreatment.

Do adjustment problems in middle childhood modify the association between early ToM and adolescent involvement in bullying?

We explored whether the association between poor childhood ToM and adolescent involvement in bullying varied according to the presence of emotional and behavioural problems in middle childhood. We did not find any significant moderating effects of adjustment problems. However, having emotional and behavioural problems during middle childhood

Table 2 Associations between age-5 theory of mind and involvement in bullying at age 12

Involvement in bullying	Theory of mind		
	Mean (<i>SD</i>)	RR (95% CI)	Effect size (<i>d</i>)
Not-involved	5.06 (3.31)	–	–
Victims	4.22 (3.23)	0.93 (0.90, 0.96)	0.26
Bullies	4.24 (3.16)	0.93 (0.88, 0.98)	0.25
Bully-victims	3.64 (3.06)	0.88 (0.84, 0.92)	0.44

Not-involved children were the comparison group in multinomial logistic regression analyses adjusted for gender. CI, confidence intervals; RR, relative risk ratio, *SD*, standard deviation.

Table 3 Associations between age-5 theory of mind and involvement in bullying at age 12 controlling for child-specific and family factors

	Groups of children involved in bullying		
	Victims RR (95% CI)	Bullies RR (95% CI)	Bully-victims RR (95% CI)
Bivariate association with ToM	0.93 (0.90, 0.96)	0.93 (0.88, 0.98)	0.88 (0.84, 0.92)
Controlling for age-5 child-specific factors			
ToM	0.93 (0.90, 0.97)	0.94 (0.89, 1.00)	0.93 (0.88, 0.98)
Gender	0.95 (0.75, 1.21)	0.64 (0.44, 0.93)	0.67 (0.48, 0.95)
IQ	1.00 (0.99, 1.01)	1.00 (0.99, 1.02)	0.99 (0.97, 1.00)
Emotional problems	1.01 (0.99, 1.02)	1.00 (0.98, 1.02)	1.01 (0.99, 1.03)
Behavioural problems	1.03 (1.02, 1.04)	1.04 (1.03, 1.06)	1.06 (1.05, 1.08)
Early involvement in bullying:			
Victims	1.66 (1.21, 2.27)	1.60 (0.92, 2.79)	2.21 (1.40, 3.48)
Bullies	0.90 (0.65, 1.24)	1.75 (1.10, 2.79)	2.31 (1.57, 3.40)
Bully-victims	2.89 (1.48, 5.67)	4.76 (1.95, 11.61)	10.07 (4.97, 20.40)
Controlling for age-5 family factors			
ToM	0.93 (0.90, 0.96)	0.96 (0.90, 1.01)	0.93 (0.88, 0.97)
Maternal warmth	0.96 (0.85, 1.09)	0.89 (0.73, 1.08)	0.70 (0.60, 0.82)
Child maltreatment	1.09 (0.76, 1.57)	1.70 (1.03, 2.78)	1.66 (1.08, 2.54)
Number of siblings	0.97 (0.88, 1.06)	1.03 (0.85, 1.24)	1.15 (1.03, 1.29)
Socioeconomic deprivation	0.88 (0.75, 1.03)	0.77 (0.59, 1.00)	0.63 (0.50, 0.79)

Not-involved children were the comparison group in multinomial logistic regression analyses. CI, confidence intervals; RR, relative risk ratio; ToM, Theory of mind.

had an independent effect upon children becoming involved in bullying (Table 4). Findings indicated that the likelihood of children with poor ToM becoming involved in bullying during adolescence either as victims, bullies or bully-victims was the same whether or not they had emotional or behavioural problems in middle childhood.

Discussion

Findings from our nationally representative cohort showed that adolescent victims, bullies and bully-victims had poor ToM in early childhood. Poor ToM contributed to the risk of children becoming victims and bully-victims in early adolescence over and above child-specific and family factors such as low IQ, child maltreatment, maternal warmth and gen-

der. This risk was not moderated by children's emotional and behavioural problems during middle childhood. Poor ToM in childhood appears to be a robust developmental marker for later victim or bully-victim status. Our findings suggest that targeting developmental delays in ToM early in children's schooling years could help reduce their vulnerability for becoming involved in bullying as they embark on their teen years.

Victims and bully-victims

Consistent with other studies, our findings indicated an association between victimization and poor ToM (Gini, 2006; Sutton et al., 1999). Moreover, we found a prospective longitudinal association whereby youth who had poor ToM in early childhood were

Table 4 Associations between age-5 theory of mind and involvement in bullying at age 12 testing for the moderating effect of middle childhood adjustment problems

	Groups of children involved in bullying		
	Victims RR (95%CI)	Bullies RR (95%CI)	Bully-victims RR (95%CI)
Moderating effect			
ToM	0.94 (0.91, 0.97)	0.95 (0.90, 1.00)	0.91 (0.86, 0.95)
Age-7–10 emotional problems	1.05 (1.03, 1.07)	1.05 (1.02, 1.07)	1.08 (1.06, 1.11)
ToM × emotional problems	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
ToM	0.94 (0.90, 0.97)	0.96 (0.91, 1.01)	0.91 (0.86, 0.96)
Age-7–10 behavioural problems	1.03 (1.02, 1.05)	1.08 (1.06, 1.10)	1.11 (1.09, 1.13)
ToM × behavioural problems	1.00 (1.00, 1.00)	1.00 (1.00, 1.01)	1.00 (1.00, 1.01)

Analyses were conducted controlling for the confounding effects of gender, and early involvement in bullying. Not-involved children were the comparison group in multinomial logistic regression analyses. For the moderation analyses ToM, emotional and behavioural problems were centred. CI, confidence intervals; RR, relative risk ratio; ToM, Theory of mind.

more likely to become victims of bullying in early adolescence. Our findings extend those of previous studies by showing that children with poor ToM are more likely to become victims of bullying in early adolescence over and above the effects of other factors. In particular, the independent risk posed by ToM over and above IQ is of interest. First, it demonstrates that although IQ and ToM are correlated ($r = 0.44$), ToM has an independent effect on later involvement in bullying and should therefore be considered as an independent cognitive domain for studies of bullying. Second, our findings suggest that there is something specific about children's inability to understand other people's mental states, as opposed to general cognitive/intellectual difficulties, that place them at an increased risk of being victimized. For example, the inability to understand others' mental perspective may contribute to victims' behaviours being viewed as confrontational, insulting and irritating by their peers (Olweus, 1993).

Our findings showed that adolescent bully-victims had the poorest ToM at age 5 years. Bully-victims are the group of children involved in bullying who fare the worst, with the highest level of mental health problems (Nansel et al., 2001) and our findings highlight ToM as a potential early marker of this highly vulnerable group. Our observation of poor ToM amongst victims and bully-victims, suggests that there may be differences in the manner in which poor ToM influence children's social relationships, consequently affecting their risk of becoming victims or bully-victims. For example, because children with poor ToM find it difficult to consider other people's perspectives when decoding social cues, they may have to rely on their own experiences and related apprehensions. These experiences may be negative resulting in children interpreting ambiguous situations as threatening and responding aggressively (Runions & Keating, 2007). This could explain why some victims of bullying end up bullying others too. Our findings of poor ToM amongst bully-victims may help in further understanding why children who are victims go on to bully others (Barker et al., 2008).

Bullies

Adolescent bullies also had poor ToM in childhood. However, the risk associated with having poor ToM was statistically explained by child maltreatment and SES, indicating that growing up in deprivation and being maltreated overrides the risk posed by having poor ToM for becoming a bully. Our findings support associations between SES, child maltreatment and bullying (Shields & Cicchetti, 2001; Wolke et al., 2001), and suggest that for children with poor ToM, these factors play a more influential role in children's risk of becoming bullies. Evidence showing that family factors are associated with both ToM and involvement in bullying further emphasizes the need to take these factors into account when con-

ducting research and setting up intervention programmes. Targeting only children's ToM to reduce their risk of being bullies may not be sufficient.

The observation that bullies had poor ToM in childhood does not support the notion of bullies being 'skilled social manipulators' with high levels of ToM (Sutton et al., 1999). One possible reason for this differentiation may lie in the characterization of the bullies. Previous studies distinguished between children who initiate bullying as a 'ring leader' from other bullies (Sutton et al., 1999). We did not make this distinction with E-Risk participants. Advanced ToM skills might be important for 'ring leaders', specifically as this role involves elements of the manipulation of others to engage in negative behaviours. The same, however, may not be true for children who are being led by others to bully. Furthermore, research shows that as children get older, prevalence rates of indirect bullying behaviours such as social exclusion increase (Craig et al., 2009). This element of manipulation could require an understanding of others' mental states and ToM skills may become necessary for some forms of indirect bullying behaviours at an older age. Examining various forms of bullying behaviours and taking family factors into account may help clarify mixed findings leading to better understanding of the role of ToM in the development of bullying behaviours.

The role of adjustment problems

Adjustment problems in middle childhood did not moderate the associations between poor ToM and adolescent involvement in bullying although they contributed to children's risk of being involved in bullying independently of having poor ToM. This suggests that other mechanisms independent of emotional and behavioural problems may help explain how poor ToM increases children's risk of becoming victims or bully-victims. Poor ToM has been associated with poor emotion recognition, poor communication, and poor executive function in children. Each of these plausibly plays an important role in peer interaction and bullying involvement (Filippova & Astington, 2008; Henning, Spinath, & Aschersleben, 2011). Poor ToM has also been documented amongst individuals with atypical neurological development (e.g. dys/agenesis of the corpus callosum; Booth, Wallace, & Happé, 2011; right hemisphere damage; Siegal & Varley, 2002). Poor ToM at age 5 may be a marker for other cognitive or neural abnormalities contributing to the risk of later involvement in bullying.

Limitations

The present study has some limitations. First, our measure of involvement in bullying did not distinguish between different types of bullying

behaviours and victimization (i.e. relational vs. physical bullying). This would have allowed us to test further the role of ToM in relation to the type and complexity of different bullying behaviours. Second, we studied a cohort of twins and we cannot be certain that our results generalize to singletons. Similar prevalence rates of involvement in bullying between the E-Risk Study and samples of singletons suggest that our findings are not specific to twins (Craig et al., 2009). Furthermore, although there is evidence to suggest that children with siblings are more likely to perform better on ToM tasks (McAlister & Peterson, 2006) the same has not been shown for twins (Cassidy, Fineberg, Brown, & Perkins, 2005).

Conclusion

Our findings highlight the importance of early differences in social cognition amongst children who later become involved in bullying. Identifying such risk factors and underlying mechanisms will enhance our knowledge of the aetiology of involvement in bullying and provide more specific targets for interventions. Supporting children with poor ToM early on in their schooling years may help improve their social interactions and reduce their vulnerability for later involvement in bullying. For example, evidence suggests that discussing scenarios of false-belief and mental states improves children's under-

standing of false-belief and use of mental state terms (Appleton & Reddy, 1996; Guajardo & Watson, 2002). Employing such training strategies could help improve ToM skills, which in turn may help reduce children's vulnerability for becoming victims or bully-victims later in life.

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Key points

- Adolescent victims, bullies and bully-victims had poor theory of mind (ToM) in early childhood.
- Poor ToM in childhood increased the risk of becoming victims and bully-victims in early adolescence over and above child-specific (e.g. IQ) and family factors (e.g. child maltreatment).
- For reducing bullying behaviours, interventions would benefit from focusing on children exposed to poor socioeconomic deprivation and child maltreatment, as the risk posed by these factors overrides that posed by children's poor ToM.
- Adjustment problems in middle childhood did not modify the risk of adolescent involvement in bullying amongst children with poor ToM.

References

- Achenbach, T.M. (1991a). *Manual for the child behavior checklist/ 4-18 and 1991 profile*. Burlington, VT: University of Vermont, Department of Psychiatry.
- Achenbach, M.T. (1991b). *Manual for the teacher's report form and 1991 profile*. Burlington, VT: University of Vermont, Department of Psychiatry.
- Appleton, M., & Reddy, V. (1996). Teaching three-year-olds to pass false belief tests: A conversational approach. *Social Development, 56*, 275–291.
- Arseneault, L., Bowes, L., & Shakoor, S. (2010). Bullying victimization in youths and mental health problems: 'Much ado about nothing'? *Psychological Medicine, 40*, 717–729.
- Arseneault, L., Walsh, E., Trzesniewski, K., Newcombe, R., Caspi, A., & Moffitt, T.E. (2006). Bullying victimization uniquely contributes to adjustment problems in young children: A nationally representative cohort study. *Pediatrics, 118*, 130–138.
- Astington, J.W. (2001). The future of theory of mind research: Understanding motivational states, the role of language, and real world consequences. *Child Development, 72*, 685–687.
- Barker, E.D., Boivin, M., Brendgen, M., Fontaine, N., Arseneault, L., Vitaro, F., ... & Tremblay, R.E. (2008). Predictive validity and early predictors of peer-victimization trajectories in preschool. *Archives of General Psychiatry, 65*, 1185–1192.
- Booth, R., Wallace, G.L., & Happé, F. (2011). Connectivity and the corpus callosum in autism spectrum conditions: Insights from comparison of autism and callosal agenesis. *Progress in Brain Research, 189*, 303–317.
- Bowes, L., Arseneault, L., Maughan, B., Taylor, A., Caspi, A., & Moffitt, T.E. (2009). School, neighborhood, and family factors are associated with children's bullying involvement: A nationally representative longitudinal study. *Journal of the American Academy of Child and Adolescent Psychiatry, 48*, 545–553.

- Caspi, A., Moffitt, T.E., Morgan, J., Rutter, M., Taylor, A., Arseneault, L., ... & Polo-Tomas, M. (2004). Maternal expressed emotion predicts children's antisocial behavior problems: Using monozygotic-twin differences to identify environmental effects on behavioral development. *Developmental Psychology*, *40*, 149–161.
- Caspi, A., Moffitt, T., Thornton, A., Freedman, D., Amell, J.W., Harrington, H., ... & Silva, P.A. (1996). The life history calendar: A research and clinical assessment method for collecting retrospective event-history data. *International Journal of Methods in Psychiatric Research*, *6*, 101–114.
- Cassidy, K.W., Fineberg, D.S., Brown, K., & Perkins, A. (2005). Theory of mind may be contagious, but you don't catch it from your twin. *Child Development*, *76*, 97–106.
- Craig, W., Harel-Fisch, Y., Fogel-Grinvald, H., Dostaler, S., Hetland, J., Simons-Morton, B., ... & Pickett, W.; the HBSC Violence & Injuries Prevention Focus Group, & the HBSC Bullying Writing Group. (2009). A cross-national profile of bullying and victimization among adolescents in 40 countries. *International Journal of Public Health*, *54*, 216–224.
- Cutting, A.L., & Dunn, J. (1999). Theory of mind, emotion understanding, language, and family background: Individual differences and interrelations. *Child Development*, *70*, 853–865.
- Dodge, K.A. (1980). Social cognition and children's aggressive behavior. *Child Development*, *51*, 162–170.
- Dodge, K.A., Bates, J.E., & Pettit, G.S. (1990). Mechanisms in the cycle of violence. *Science*, *250*, 1678–1683.
- 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*, 1352–1366.
- Filippova, E., & Astington, J.W. (2008). Further development in social reasoning revealed in discourse irony understanding. *Child Development*, *79*, 126–138.
- Gini, G. (2006). Social cognition and moral cognition in bullying: What's wrong? *Aggressive Behavior*, *32*, 528–539.
- Guajardo, N.R., & Watson, A.C. (2002). Narrative discourse and theory of mind development. *The Journal of Genetic Psychology*, *163*, 305–325.
- Happé, F. (1995). The role of age and verbal ability in the theory of mind task performance of subjects with autism. *Child Development*, *66*, 843–855.
- Henning, A., Spinath, F.M., & Aschersleben, G. (2011). The link between preschoolers' executive function and theory of mind and the role of epistemic states. *Journal of Experimental Child Psychology*, *108*, 513–531.
- Hughes, C., Adlam, A., Happé, F., Jackson, J., Taylor, A., & Caspi, A. (2000). Good test-retest reliability for standard and advanced false-belief tasks across a wide range of abilities. *Journal of Child Psychology and Psychiatry*, *41*, 483–490.
- Hughes, C., & Ensor, R. (2005). Executive function and theory of mind in 2 year olds: A family affair? *Developmental Neuropsychology*, *28*, 645–668.
- Hughes, C., & Ensor, R. (2006). Behavioural problems in two-year-olds: Links with individual differences in theory of mind, executive function and negative parenting. *Journal of Child Psychology and Psychiatry*, *47*, 488–497.
- 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*, 356–370.
- Jaffee, S.R., Caspi, A., Moffitt, T.E., & Taylor, A. (2004). Physical maltreatment victim to antisocial child: Evidence of an environmentally mediated process. *Journal of Abnormal Psychology*, *113*, 44–55.
- Jowell, R., Cutice, J., Park, A., Brook, L., Thomson, K., & Bryson, C. (1997). *British social attitudes: The 14th report*. Aldershot, England: Ashgate.
- McAlister, A.R., & Peterson, C.C. (2006). Mental playmates: Siblings, executive functioning, and theory of mind. *British Journal of Developmental Psychology*, *24*, 733–751.
- Monks, C.P., Smith, P.K., & Swettenham, J. (2005). Psychological correlates of peer victimisation in preschool: Social cognitive skills, executive function and attachment profiles. *Aggressive Behavior*, *31*, 571–588.
- Nansel, T.R., Overpeck, M., Pilla, R.S., Ruan, W.J., Simons-Morton, B., & Scheidt, P. (2001). Bullying behaviors among US youth: Prevalence and association with psychosocial adjustment. *Journal of the American Medical Association*, *286*, 2094–2100.
- Olweus, D. (1993). *Bullying at school*. Cambridge, UK: Blackwell.
- Perner, J., & Wimmer, H. (1985). "John thinks that Mary thinks that...." Attribution of second-order beliefs by 5–10 year old children. *Journal of Experimental Child Psychology*, *39*, 437–471.
- Renouf, A., Brendgen, M., Séguin, J.R., Vitaro, F., Boivin, M., Dionne, G., ... & Pérusse, D. (2010). Interactive links between theory of mind, peer victimization, and reactive and proactive aggression. *Journal of Abnormal Child Psychology*, *38*, 1109–1123.
- Runions, K.C., & Keating, D.P. (2007). Young children's social information processing: Family antecedents and behavioral correlates. *Developmental Psychology*, *43*, 838–849.
- Sattler, J. (1992). *Assessment of children: WISC-III and WPPSI-R supplement*. San Diego: Author.
- Shakoor, S., Jaffee, S.R., Andreou, P., Bowes, L., Ambler, A.P., Caspi, A., ... & Arseneault, L. (2011). Mothers and children as informants of bullying victimisation: Results from an epidemiological cohort of children. *Journal of Abnormal Child Psychology*, *39*, 463–471.
- Shields, A., & Cicchetti, D. (2001). Parental maltreatment and emotion dysregulation as risk factors for bullying and victimization in middle childhood. *Journal of Clinical Child Psychology*, *30*, 349–363.
- Siegal, M., & Varley, R. (2002). Neural systems involved in "theory of mind". *Nature Reviews Neuroscience*, *3*, 463–471.
- Sutton, J., Smith, P.K., & Swettenham, J. (1999). Social cognition and bullying: Social inadequacy or skilled manipulation? *British Journal of Developmental Psychology*, *17*, 435–450.
- Trouton, A., Spinath, F.M., & Plomin, R. (2002). Twins early development study (TEDS): A multivariate, longitudinal genetic investigation of language, cognition and behavior problems in childhood. *Twin Research*, *5*, 444–448.
- Wechsler, D. (1990). *Wechsler preschool and primary scale of intelligence-revised*. London: The Psychological Corporation, Harcourt Brace Jovanovich.
- Williams, R.L. (2000). A note on robust variance estimation for cluster-correlated data. *Biometrics*, *56*, 645–646.
- Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition*, *13*, 103–128.
- Wolke, D., Woods, S., Stanford, K., & Schulz, H. (2001). Bullying and victimization of primary school children in England and Germany: Prevalence and school factors. *British Journal of Psychology*, *92*, 673–696.

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