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Are Theory-of-Mind and bullying separately associated with later academic performance among preadolescents?

Abstract

Background: Bullying and poor Theory-of-Mind (ToM) are both considered to negatively impact academic performance. However, it is unclear if they have separate effects. Aim: The aim of the current study was to examine the potentially separate associations of bullying and ToM with academic performance. Sample: a general population sample of 1170 children aged 11-12 years. Methods: Information on bullying, type of involvement (none, victim (only), bully (only), victim-bully (both)), ToM and estimated intelligence, were obtained at face-to-face assessments. Information on academic performance was obtained from Danish school registers. Results: ToM was positively associated with academic performance, and involvement in bullying was negatively associated with academic performance. Academic performance differed between type of involvement in bullying. Pairwise post hoc analyses showed that in the full sample the only significant difference was between those not involved and those involved as victim (only). This was also the case for girls. Adjusting for potential shared variance with gender, estimated intelligence and ToM being victim (only) and victim-bully (both) were negatively associated with academic performance compared to no involvement. Thus, being a victim (or victim-bully) contributes negatively to academic performance beyond the effects of ToM and intelligence, and regardless of gender. Similarly, ToM remained positively associated with academic performance after adjusting for shared variance. Conclusion: ToM and involvement in bullying were both separately associated with later academic performance. These results remained even after adjusting for shared variance, and for shared variance with gender and estimated IQ.

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INTRODUCTION

Academic performance is associated with intelligence level (Duckworth & Seligman, 2005; Furnham, Monsen, & Ahmetoglu, 2009), but might also be affected by other aspects of cognitive functioning and mental health, such as Theory-of-Mind (ToM) (Blair & Razza, 2007) and involvement in bullying (J. Nakamoto & Schwartz, 2010; Schwartz, Gorman, Nakamoto, & Toblin, 2005). ToM is the ability to infer intentions, desires and beliefs (Frith & Frith, 2012), and the development of this ability appears to have far ranging repercussions for children's academic and social functioning at school (Fleury et al., 2014; B Patnaik, 2008b). ToM in preschool age has been found to be positively associated with later literacy and mathematical ability (Blair & Razza, 2007) and with later academic achievement more broadly (Kloo & Perner, 2008a). Among university students a ToM score among the lowest 30% have been shown to be associated with a three times higher probability of failing an exam compared to those with a higher ToM (Zeppigno et al., 2014). The association between ToM and academic performance may partly be explained by (1) episodic memory of social events, depending on reflective awareness of mental states (i.e. ToM) (B Patnaik, 2008a; Suddendorf & Corballis, 1997), and (2) episodic learning, playing a significant role in the acquisition of general and factual knowledge (Herbert & Burt, 2004; Pillemer & Kuwabara, 2012). That is, ToM improves episodic memory and learning thereby also improves the acquisition of knowledge. Also, children who are more competent in attributing second- and higher-order beliefs (i.e. ToM) enhance their communication skills by increased awareness about the mental states of the listener (B. Patnaik, 2008), which in itself can improve academic results. The development of ToM may also be linked to scientific reasoning and critical thinking, as these skills depend on the ability to reflect on one's own beliefs, to recognize where they are mistaken, and to take another's perspective (Astington, 1998). However, these conclusions are made based on sample sizes that are for the most part relatively small. Besides,

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not all studies found such associations between ToM and academic performance (J. Nakamoto & Schwartz, 2010; Schwartz et al., 2005).

Academic performance may also be impacted by bullying, which has been defined as a subset of aggressive behavior that involves intentional harm towards another person, that is repeated over time (Smith et al., 2002; Yeo, Ang, Loh, Fu, & Karre, 2011). A meta-analysis revealed a small but statistically significant association between being bullied and poorer academic achievement (J. Nakamoto & Schwartz, 2010). Children who are victims of bullying are more likely than their non-bullied peers to dislike school, avoid attending school, have higher absenteeism rates, and receive poorer grades and lower standardized test scores (Kowalski & Limber, 2007). It has been hypothesized that being bullied results in poor academic performance in the classroom through a negative impact on psychosocial adjustment (J. Nakamoto & Schwartz, 2010; Schwartz et al., 2005). Also, victimization can lead to significant emotional distress (Hawker & Boulton, 2000), which is thought to exert a pernicious influence on children's school performance (J. Nakamoto & Schwartz, 2010). Victimization by peers can be conceptualized as both a predictor and an outcome of poor academic adjustment (J. Nakamoto & Swartz, 2010). Although the vast majority of studies focus on the effect of being a victim, some evidence suggests that being a bully may also be negatively associated with academic performance (Glew, Fan, Katon, Rivara, & Kernic, 2005) and that bullies may not differ much from victims in this respect (Fanti & Georgiou, 2013). However, the studies are not conclusive, and other studies reject these findings and find only victimization to be associated with poorer academic performance (Fanti & Georgiou, 2013).

ToM and bullying may be associated, as studies show that children with poor ToM are more often involved in bullying (Shakoor et al., 2012; Smokowski & Kopasz, 2005). Children with poor ToM

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skills are at greater risk of being involved in bullying, because ToM skills underpin efficient everyday social interactions (Shakoor et al., 2012). First, poor ToM can lead to misunderstanding of other people's intentions and emotions, and thereby put them at risk of being victimized. Second, poor ToM may increase the risk of victimization through a negative effect on a child's ability to negotiate conflicts or stand up for itself, resulting in being perceived as an easy target for threats and abuse (Shakoor et al., 2012). The children who bully may also have alterations in ToM. According to the social skills deficit model (Dodge, 1980), children who bully lack well-developed social perspective-taking skills and are less able to form accurate perceptions of the intentions and motivations of others. Consequently, they may interpret ambiguous situations as hostile (Crick & Dodge, 1996). Thus, children with poor ToM skills may engage in bullying behaviors as a way of dealing with perceived conflicts (Shakoor et al., 2012). In sum, the association between poor ToM and involvement in bullying has been shown for victims as well as for bullies (Smokowski & Kopasz, 2005).

Finally, the associations between ToM, bullying, and academic performance may be affected by gender, as gender is associated with both involvement in bullying (Scheithauer, Hayer, Petermann, & Jugert, 2006), academic performance (Steinmayr & Spinath, 2008) and ToM (T. Charman, T. Ruffman, & W. Clements, 2002a; Walker, 2005). Relatively little research has been performed on the effect of gender on ToM development, but some studies have found a slight advantage for girls among children aged 2-8 years old (Calero, Salles, Semelman, & Sigman, 2013; T. Charman, T. Ruffman, & W. Clements, 2002b). Superiority of girls in this regard has long been commonly admitted. However, studies suggest that, although girls may have a small advantage in the early stages of ToM development, by the age of five this trend has begun to reverse in favor of boys (Charman et al., 2002b; Walker, 2005), and later this may reverse again (E. M. Blijd-Hoogewys & van Geert, 2016).

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The overall aim of the present study was to examine the relationships between bullying, ToM, and academic performance in a large sample of preadolescents from the general population. More specifically, we wanted to know if ToM and different types of involvement in bullying remain associated with academic performance when effects are mutually adjusted and when taking the shared effect of gender, and intelligence into account.

METHODS

Participants

The current study uses data collected as part of the 11-12-year follow-up of the Copenhagen Child Cohort 2000 (CCC2000). CCC2000 is a general population birth cohort, consisting of 6090 children born in 16 municipalities in the Copenhagen County in the year 2000, who are followed prospectively from birth (Skovgaard et al., 2005). The cohort comprises 9% of all children born in Denmark in year 2000 (Olsen et al., 2007), and is overall representative for children born that year, except a relatively higher frequency of ethnic minorities at baseline in the Copenhagen County (Skovgaard et al., 2005). The 11-12-year follow-up took place from May 2011 to October 2012. Cohort members were traced through the Danish Civil Registration System. A total of 6071 children were alive at age 11 years. Of those, 4847 were eligible for follow-up, as 217 had emigrated, 14 were not traceable, and 993 had claimed ‘research protection’ (an option to avoid inquiries from research and consumer surveys). The parents of eligible children were contacted by a letter inviting them to sign up their child for a face-to-face assessment at the research clinic. Families living far away were offered home visits. Parents were contacted up to four times by letter and/or telephone. Gifts were offered in reward for participation. Of the 4847 eligible children, 1630 (34%) attended the clinical assessment, and 1170 of them

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(72% of the children attending the clinical assessment and 24% of all eligible) had full data on the acquired measure of academic performance (Figure 1). Participating children showed minor differences regarding socio-demographic and perinatal characteristics, including slightly lower frequencies of biological and psychosocial adversities as compared to the rest of the cohort. Specifically, the differences included a lower proportion of families of non-Danish origin and mothers of low education (Jeppesen et al., 2015)

[insert Figure 1: Chart of participation]

Instruments

Theory-of-Mind

The *ToM Storybook Frederik (ToM-Frederik)* is the Danish version (Clemmensen, Bartels-Velthuis, et al., 2016) of the *ToM Storybook Frank* (E. M. A. Blijd-Hoogewys & Bartels-Velthuis, 2007), which tests the understanding of first-order false belief, deception, second-order false belief, white lie, irony, double bluff, and 'faux pas'. Children were presented with 16 pictures while listening to a recording of the storybook read aloud by a professional actor. Children were asked a total of 16 'test' and 8 'justification' questions, covering a number of aspects of ToM. The 16 'test' answers were scored 1 (for a correct understanding of the situation) or 0 (for an incorrect answer) and added for a total test sum score (range 0-16). The answers to the 'justification' questions (such as "Why did the mother say that?", "Why does Frederik think that?") were classified according to 23 predefined categories and scored ('0', '1', '2', and for some items '3') on an ordinal scale (predefined for each pictured situation), which resulted in a total justification sum score (range 0–20). Scores on the justification

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items depend on the level and quality of references made to the thoughts, beliefs, feelings, or intentions of the story characters or of the participating child (Clemmensen et al., 2014). The justification and test scores were summed to form the total ToM score (range 0–36), with a higher score indicating better ToM performance. ToM ratings were carried out in close collaboration with the Dutch authors of the ToM Storybook Frederik, who initially conducted a training seminar. Subsequently, a Danish rating group, headed by the first author, carried out consensus ratings on a subsample of 200 children. In case of doubt in the Danish rating group, the developers of the test were consulted. The remaining children were rated by the first author, supervised by the developers of the test. Both a member of the Danish research group and the first author rated, separately, a subsample of 50 children to establish an inter-rater reliability estimate. The inter-rater reliability was excellent (Pearson's $r = 0.94$) (Clemmensen, van Os, et al., 2016).

Bullying

Bullying was assessed with the Olweus Bully/Victim Questionnaire (Gothwal, Sumalini, Irfan, Giridhar, & Bharani, 2013) for self-reported involvement in bullying, as a victim and/or as a bully, during the past two months. The questionnaire covers physical, verbal, and relational forms of bullying to which we added questions on cyber bullying (Kowalski & Limber, 2007). Those who reported being bullied two times a month or more and who did not report to have bullied others were classified as 'victim (only)'. Those who reported taking part in bullying two times a month or more and who did not report being victimized were classified as 'bully (only)'. Finally, those who reported both having bullied and being bullied themselves two times a month or more were classified as 'victim-bully' (i.e. a dual status) (Craig et al., 2009). In addition to the categories above, we also dichotomized the children in 'no' versus 'any' involvement in bullying.

Intelligence

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Performance on the Block Design (BD) subtest of the Wechsler Intelligence Scale for Children - Third Edition (WISC-III)(Wechsler, 1991) was used as an estimate of intelligence level, with application of the age-adjusted standard score. This subtest score is highly correlated with the Full Scale Intelligence Quotient (FSIQ) (Wechsler, 2003), and is the best single predictor of Performance IQ (Joy, Fein, Kaplan, & Freedman, 2001).

Academic performance

During elementary school, Danish schoolchildren complete mandatory national tests in different disciplines (such as Reading and Geography). Results from the 6th grade Math test were acquired from the Danish Ministry for Children, Education and Gender Equality and applied as a measure of academic performance. This test was chosen because early math skills have greater predictive power for later achievement, than reading skills (Duncan et al., 2007). The test score (scale from 0-100) was calculated as the mean of the norm-based scores (which displays test results relative to the national results of 2010) for “Numbers and algebra”, “Geometry and measurement” and “Mathematics in use”.

The face-to-face assessment (including Bullying, ToM and BD) at the 11-12-year follow-up was conducted over a period of 18 months, while the participants attended the 4th ($n = 110$), 5th ($n = 930$) or 6th grade ($n = 94$) respectively. Thus, the time interval between these data and data from the Math test differed between participants. However, the face-to-face assessment was always conducted before the Math test.

Ethics

The study was approved by the Danish Data Protection Agency, the Capital Region of Denmark and the National Committee on Health Research Ethics was consulted in accordance with national guidelines. The written information clearly stated that (1) study participation was voluntary, (2) consent

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could be withdrawn at any time, and (3) all data would be anonymized. The parent(s) and the child agreed to participate by signing up for the face-to-face assessment of the child at the hospital. The ethics committee approved this consent procedure.

Statistical analyses

Analyses were carried out using Stata 15 (StataCorp, 2015). The raw data approximated a normal distribution. Bivariate differences were tested with independent samples t-tests for continuous variables and chi-squares for categorical variables, and correlations with Pearson's r . ANOVA was applied to assess differences among group means for three or more groups. Post-hoc estimations were carried out to analyze differences between subgroups within the model of the ANOVA. Stepwise backwards elimination multiple linear regression analyses were conducted to analyze the separate effect of bullying and ToM on math test score when adjusted for shared variance. Math test score was included as the dependent variable and bullying and ToM, as well as BD and gender, as independent variables. Backward elimination regression analysis involves starting with all candidate variables, testing the effect of deleting each variable, then deleting the variable (if any) that improves the model (i.e. increase R^2) the most by being deleted, and repeating this process until no further improvement is possible. With this stepwise process, we could then test which variables were significantly associated with Math test score whilst adjusting for all other included variables. Cohen's d was applied as a measure of effect size for t-tests and ANOVA. Additionally, R^2 , expressing the proportion of variance in the dependent variable explained by the independent variables in the final model, was applied as a measure of effect size for multiple linear regression analyses. Fisher's r to z transformation was applied to assess potential significant differences between correlation estimates. Two-sided statistical significance was set at $p < 0.05$.

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RESULTS

The 1170 participants in the study had a mean age of 11 years 7 months ($SD=0.38$ years) and 55% were girls. Basic test results for the full sample are presented in Table 1. There were no significant gender differences in either Math score ($t(1168)=0.43$, $p=0.67$), involvement in bullying ($\chi^2(1)=0.02$, $p=0.88$), or ToM score ($t(1168)=0.79$, $p=0.43$). However, there was a significant gender difference in type of involvement in bullying ($\chi^2(3)=18.21$, $p<.001$, Table 3), as boys more often reported being a bully, whereas girls more often reported being a victim.

(insert Table 1: Univariate test scores and gender distribution)

From the full sample, 13% ($N=149$) were involved in bullying, and these had a significantly lower Math test score than those not involved. This was not the case for boys, but only for girls (Table 2).

(insert Table 2: Associations between math test score and bullying)

An ANOVA showed the Math test score to differ significantly between type of involvement in bullying. Stratifying by gender, this was the case for girls, but not for boys. Subsequent pairwise post hoc analyses showed, that only the difference between those not involved and those involved as victim (only) was significant, in the full sample as well in the subsample of girls (Table 3).

(insert Table 3: Bivariate associations of type of involvement in bullying and math test score)

ToM was significantly positively associated with the Math test score in the full sample and for both genders. However, the associations were weak (Table 4) and the difference between the strength of the correlations of boys and girls was not significant ($z=-0.98$, $p=0.33$).

(insert Table 4: Associations between math test and ToM scores)

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There were no significant differences in ToM score for those who were not involved in bullying compared to those who were, for either the full sample (M(SD)=19.46(4.0) vs 19.08(4.5), $t(1168)=1.08$, $p=0.43$), or for girls (M(SD)=19.38(3.9) vs 19.02(4.7), $t(641)=0.73$, $p=0.47$) and boys (M(SD)=19.58(4.1) vs 19.15(4.2), $t(525)=0.79$, $p=0.43$) separately. Looking at type of involvement in bullying, there were no significant differences in ToM score for either the full sample or for boys. However, for girls the group of participants involved as victim-bully(both) had a significantly higher ToM than each of the other groups (Table 3).

Stepwise multiple regression analyses with backward elimination (see Table 5) revealed that any involvement in bullying versus no involvement was negatively associated with Math test score, whereas ToM and BD score were both positively associated. The effect of gender was non-significant and thus this variable was removed from the model. Repeating the analyses with involvement in bullying subcategorized by type of involvement, the group of victims (only) as well as the group of victim-bullies (both) were significantly negatively associated with Math test score compared to the group of those not involved. Again, the effect of gender was non-significant, and so was the effect of being bully (only). As a result, both variables were removed from the model. Both models predicted about 25% of the Math test score variability (Model 1: R^2 adjusted=0.24, Model 2: R^2 adjusted=0.24).

(insert Table 5: Linear regression analyses of the effect of Gender, Block Design, Bullying and Theory-of-Mind on Math Test score)

DISCUSSION

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This study investigated the effect of bullying and ToM on academic performance among adolescents and found bullying, ToM, and estimated intelligence to explain a total of about 25% of the variance in later math test score.

In accordance with previous findings (Glew et al., 2005), involvement in bullying was associated with later lower academic performance as measured by the national Math test. This was the case for the full sample, and for girls, but not for boys. The effect sizes were close to medium. Further bivariate analyses showed that victims (only) had a significantly lower Math test score than those not involved, whereas the difference between both bullies (only) and victim-bullies (both) and those not involved were non-significant. Again, this was the case for the full sample, and for girls, but not for boys with no significant differences. When adjusting for potential shared variance between gender, bullying, estimated intelligence and ToM, analyses revealed both victim (only) and victim-bully (both) to be uniquely and significantly associated with lower academic performance. Thus, bullying contributes negatively to academic performance beyond the significant and positive effects of better ToM and higher intelligence. Being involved as a victim seems key, as being involved as a bully (only) does not appear to effect the academic performance. This is in line with most findings, although some studies have found that being a bully may also be negatively associated with academic performance (Glew et al., 2005). Victims performing poorer academically might partly be because they lack the problem-solving skills to get rid of the bullies and getting out of the victim role.

ToM was positively associated with academic performance for both genders, suggesting that more efficient ToM is involved in better academic performance, which is in line with previous findings (Kloo & Perner, 2008a) (Blair & Razza, 2007). This association remained significant when adjusting for potential shared variance with gender, estimated intelligence and bullying. Thus, ToM was

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uniquely and positively associated with academic performance, pointing to the importance of social cognition as a factor in academic performance.

Contrary to previous findings, there was no significant association between involvement in bullying and ToM. Looking at type of involvement in bullying there were also no significant differences in ToM for either the full sample or for boys. However, for girls the group of participants involved as victim-bully(both) had a significantly higher ToM than each of the other groups. However, this result should be taken with caution as the number of girls involved as victim-bully is as low as 5 (Table 3). The lack of an association might also be due to a low sensitivity to minor ToM deficits for the ToM test applied. The test is an untimed task where latency is not registered, and as previous studies have reported that performance speed is important when identifying deficits in ToM and similar abilities such as facial affect identification (Tardif, Laine, Rodriguez, & Gepner, 2007), this might help explain the unexpected lack of significance.

A number of interventions targeting bullying have been proven effective (Ttofi, Farrington, Losel, & Loeber, 2011). ToM has also been shown to improve with training (Kloo & Perner, 2008a), in both children from the general population (Kloo & Perner, 2008b) and in children with autism spectrum disorders (Fisher & Happe, 2005). The training effect might to some degree be task-specific and whether or not this also will improve academic performance has not yet been studied. Future studies may examine this issue, as interventions against bullying and to improve ToM may both have a considerable effect on academic performance. Nevertheless, to further understand the effect of bullying on academic performance, contextual factors such as quality of classmate relationships, and appreciation and support from teachers should be taken into account (Strom, Thoresen, Wentzel-Larsen, & Dyb, 2013), in addition to the currently used individual factors (e.g. ToM and intelligence) (Strom et

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al., 2013). Furthermore, the effect of these factors might be mediated by personality and learning approaches (Duckworth & Seligman, 2005).

Strengths and limitations

The main strengths of the current study are the large sample of pre-adolescents from the general population investigated at a key developmental period, and the inclusion of data from both face-to-face assessments, reflecting central neuro- and social-cognitive functions, and data from Danish population registers reflecting academic performance data. However, the study also has some limitations. First, the Math test performance was applied as a proxy measure of academic performance, which encompasses many other skills such as language skills. ToM deficits are also impacted by language skills (Fleury et al., 2014). Therefore, the observed association between ToM and academic performance might have been stronger if academic performance had been indexed by a reading test. Nevertheless, as mentioned in the method section, a meta-analysis found that early school-entry math skills have greater predictive power of later achievement, than reading skills (Duncan et al., 2007), thereby supporting the choice of the Math test score as a measure of academic performance. Also, the quality of the chosen data is high as they are from a mandatory test administered nationwide and applied for international comparisons, covering three aspects (“Numbers and algebra”, “Geometry and measurement” and “Mathematics in use”). Bullying was assessed via self-report, and the bully (only) rate was considerably lower than the victim (only) rate. This is perhaps partially because children who bully would not readily confide this directly to an adult. However, the rate of bullying, regardless of the role of involvement, was 13% in the present sample and in line with the prevalence rates previously observed in Northern European countries (Craig et al., 2009). Finally, we applied BD as an estimate of intelligence and although this test is a strong indicator for intelligence, a full IQ

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test would have been preferable, but as this is a large general population study, this was beyond realistic limits of resources.

Conclusion

In this large prospective population-based study of 1170 Danish preadolescents aged 11-12 years, ToM and any involvement in bullying were both associated with later academic performance. This was also the case after adjusting for shared variance and estimated intelligence and gender. ToM had a positive association with later academic performance; and any involvement in bullying had a negative association with later academic performance. Being involved as a victim seems key as being a bully was not associated with later academic performance, but being a victim was.

Together with estimated intelligence, bullying and ToM explain 25% of the variation in academic performance. Thus, interventions focusing on these aspects of social well-being have the potential to improve academic performance substantially. Given that ToM and involvement in bullying have separate contributions to academic performance, future interventions to improve academic performance could target on both reducing bullying and improving ToM.

CONFLICT OF INTEREST

None

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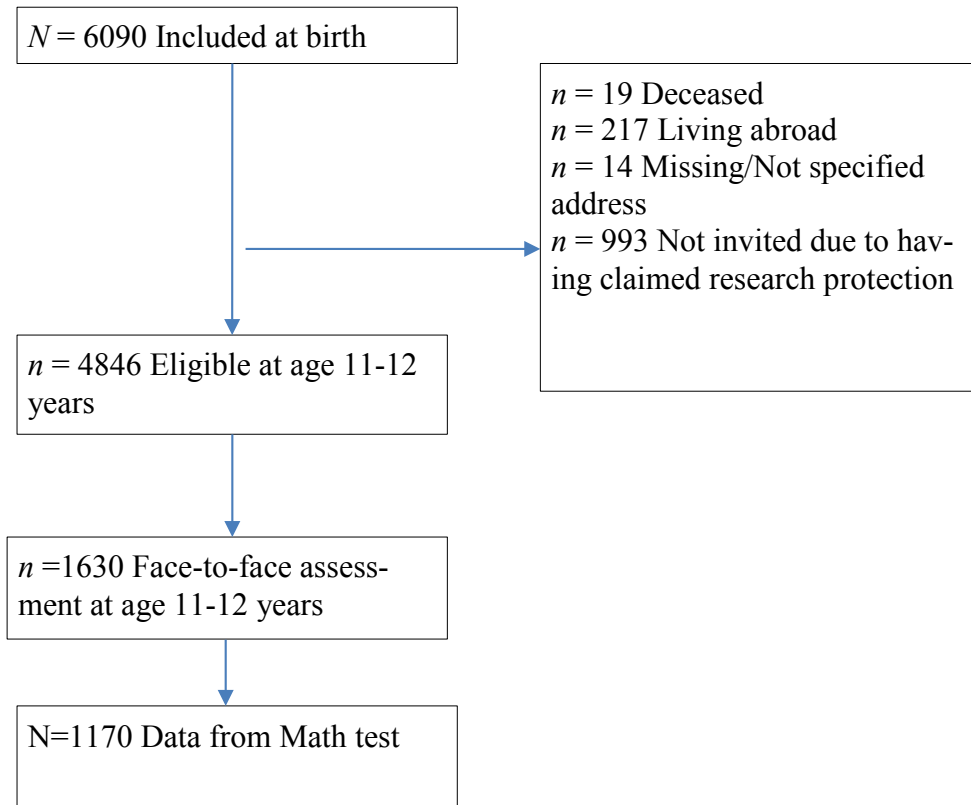
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Figure 1: Chart of participation



Theory-of-Mind, bullying and academic performance

Table 1: Test scores and gender distribution/sample descriptives

	M (SD)	N (%)
Age	11 yrs 7 mths (0.38 yrs)	
Math test score	61.78 (23.9)	-
Block Design	9.36 (3.8)	-
ToM total	19.42 (4.1)	-
Gender (girls)	-	643 (55)

N=Number of participants, M=Mean, SD=Standard Deviation, ToM=Theory-of-Mind

Theory-of-Mind, bullying and academic performance

Table 2: Bivariate associations between any involvement in bullying and Math test score

	Bullying		Analysis		
	No involvement	Any involve- ment	t	p	Cohen's d
Full sample N (%)	1021 (87.3)	149 (12.7)			
Math test score M (SD)	62.75(23.7)	55.14(24.2)	(1168)=3.65	<0.001	0.32
Boys N (%)	459 (87.1)	68 (12.9)			
Math test score M (SD)	62.86(23.7)	57.09(24.1)	(525)=1.86		0.24
Girls N(%)	562 (87.4)	81 (12.6)			
Math test score M (SD)	62.66(23.8)	53.49(24.4)	(641)=3.24	0.01	0.38

N=Number of participants, M=Mean, SD=Standard Deviation

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Table 3: Bivariate associations between type of involvement in Bullying, and Math test score

	Type of involvement				Analysis of variance (ANOVA)		
	None	Victim (only)	Bully (only)	Victim-bully	F(df)	p	Post Hoc pairwise comparisons
Full sample, N (%)	1021(87)	110(9)	24(2)	15 (1)			-
Math test score M (SD)	62.75(23.7)	56.30(24.3)	52.97(24.7)	50.04(23.7)	(3.1166)=4.81	0.003	None>victim
ToM total score M (SD)	19.46(4.03)	19.45(4.4)	17.79(4.2)	20.67(5.5)	(3.1166)=1.95	0.12	-
Boys, N (%)	459(87)	39(7)	19(4)	10(2)			-
Math test score M (SD)	62.86(23.7)	60.82(24.8)	54.79(25.3)	46.97(15.8)	(3.523)=2.15	0.09	-
ToM total score M (SD)	19.58(4.1)	19.82(3.8)	18.00(4.6)	18.70(4.9)	(3.523)=1.08	0.36	
Girls, N (%)	562(87)	71(11)	5(1)	5(1)			-
Math test score M (SD)	62.66(23.8)	53.81(23.7)	46.07(23.8)	56.2(36.5)	(3.639)=3.67	0.01	None>victim
ToM total score M (SD)	19.38(3.9)	18.77(4.6)	17.00(2.1)	24.6(4.8)	(3.639)=3.91	0.01	None, victim(only), Bully(only)<Victim-bully

N=Number of participants, M=Mean, SD=Standard Deviation

Theory-of-Mind, bullying and academic performance

Table 4: Associations between Math score and Theory-of-Mind

Math test score		
ToM	r	p
Full sample	0.33	<0.001
Boys	0.29	<0.001
Girls	0.35	<0.001

ToM=Theory-of-Mind

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Table 5: Backward Elimination linear regression analyses of the effect of Gender, Block Design, Bullying and Theory-of-Mind on Math Test score

	Math test score		
	B	SE	p
MODEL I^a			
Block Design	2.38	0.17	<0.001
ToM	1.28	0.16	<0.001
Bully-any	-5.81	1.83	0.002
MODEL II^{ab}			
Block Design	2.39	0.17	<0.001
ToM	1.29	0.15	<0.001
Victim (only)	-5.11	2.1	0.02
Victim-bully	-14.18	5.4	0.01

^aGender removed due to non-significance, ^bBully (only) removed due to non-significance.

ToM=Theory-of-Mind. SE=Standard Error.