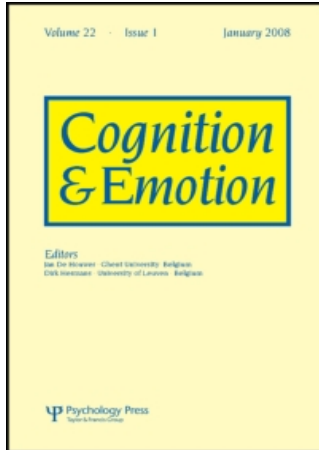


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Theory of Mind and conduct problems in children: Deficits in reading the “emotions of the eyes”

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A significant clinical feature of disorders of antisocial behaviour involves difficulties in social functioning. It has been suggested that deficits in “theory of mind” (ToM) reasoning—the ability to decode others’ emotions and thoughts—may underlie social difficulties in these populations. Success in demonstrating ToM impairment associated with antisocial behaviour and psychopathy in adults and children have been limited. In the current study, parent-reported conduct problems were concurrently measured with performance on an advanced test of ToM developed for children, the Child Eyes Test (*Journal of Developmental and Learning Disorders*, 5, 47–78). Preadolescent and young adolescent children ($n = 79$) drawn from a community sample were required to identify emotions from photographic stimuli depicting the eye region of the face only. Findings suggested a generalised impairment in ToM in children with conduct problems, as indicated by a significant relationship between poor Eyes Test performance and conduct problems, even when IQ, sex and age were controlled for. The findings are discussed in the context of the amygdala theory of psychopathy, and the neural systems suggested to mediate performance on the Eyes Test.

Theory of Mind (ToM, also referred to as mentalising; Fonagy, 1991; Frith & Frith, 2006) was coined by primatologists, Premack and Woodruff (1978) and adapted in developmental psychology to refer to the capacity to interpret the behaviour of others within a mentalistic framework—that is, the child’s ability to ascribe thoughts, feelings, ideas and intentions to others and to employ this ability to anticipate and influence the behaviour of others. Over the last 15 years, evidence in support of a circumscribed neural circuitry underlying this capacity has been accumulating (Adolphs, 2001, 2003a,b; Brothers, 1990; Frith & Wolpert, 2004). This framework has been

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successfully utilised to explain the social deficits associated with autism spectrum disorders in children (e.g., Baron-Cohen, 1997).

Another class of child psychopathology, which is by its very nature associated with social impairment, is antisocial behaviour. Impaired ToM has been suggested to be an important contributor to the development of antisocial behaviour and conduct problems (Happé & Frith, 1996; Sharp, 2000, 2006; Sharp, Croudace, & Goodyer, 2007) as well as psychopathy (Blair, 2001, 2005a, 2005b; Richell et al., 2003). It is argued that ToM is a prerequisite to empathic responding, which facilitates the inhibition of antisocial behaviour. Success in demonstrating impairment on ToM tasks in antisocial children has, however, been limited.

Hughes, Dunn, and White (1998) showed that, compared to controls, hard-to-manage preschoolers performed worse on age-appropriate ToM tasks. Despite these group differences, ToM and affective perspective taking performance did not correlate with symptoms of disruptive behaviour disorder (Hughes, White, Sharpen, & Dunn, 2000). Similarly, Happé and Frith (1996) investigated false-belief understanding in 6- to 12-year-old children. Although children were reported by their teachers to be impaired in their everyday use of social insight, they were as adept at passing false-belief tasks as was expected for their age. Similar negative findings were reported for conduct-disordered children (Buitelaar, Van der Wees, Swabb Barneveld, & Van der Gaag, 1999; Sutton, Reeves, & Keogh, 2000) and adult psychopaths (Blair et al., 1996).

Richell et al. (2003) suggested that the failure to find group differences may reflect the ease of most traditional ToM measures. They therefore used an advanced ToM test (the "Reading the Mind in the Eyes" Test; Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) to investigate ToM performance in adult psychopaths. As with other ToM tasks, the "mentalising circuitry" (Frith & Frith, 2006) has been shown to be activated during performance on the Eyes Test using functional neuroimaging (Baron-Cohen et al., 1999). Activated areas in this study included the dorsolateral prefrontal and left medial frontal cortices, the superior temporal gyrus, and, most notably, the left amygdala. Given the considerable neuropsychological and neuroimaging data in support of the amygdala theory of violent behaviour (Blair, 2005a, 2005b; Blair, Peschardt, Budhani, Mitchell, & Pine, 2006), Richell et al. (2003) predicted that adult psychopaths would perform poorly on the Eyes Test. Contrary to expectations, adult psychopaths performed no worse than controls. The authors suggested that cortical regions may compensate during development for early reduced (but not absent) amygdala functioning.

Developmentally speaking, it remains unclear when exactly such compensation begins to take place in individuals who display antisocial behaviour. Clues from normative data on brain development suggest the following. The capacity for ToM or mentalisation emerges from

developmental changes in the physical structure of the brain (Giedd, 2003). Moreover, adolescence is associated with significant changes in brain regions that underlie social behaviour (Spear, 2000). For instance, the prefrontal cortex and limbic regions like the anterior cingulate cortex and extended amygdala undergo notable ontogenetic alterations during adolescence. Most importantly for the argument advanced here, the prefrontal cortex is prominently remodelled during adolescence across a variety of species. In pre-adolescent and early-adolescent children this development may be limited. Thus, in pre-adolescent and early-adolescent children with psychopathic traits, an overcompensation by cortical regions for reduced amygdala functioning may not yet be established.

Against this background, the aim of the current study was to test the hypothesis that poor performance on an adaptation of the Eyes Test for children (the Child Eyes Test; Baron-Cohen, Wheelwright, Scahill, Lawson, & Spong, 2001) will correlate with concurrent conduct problems (antisocial behaviour) in a sample of pre-adolescent and young-adolescent children. Conduct problems have been shown to be an early marker for the development of psychopathy (Lynam, 1998; Lynam & Gudonis, 2005). Indeed, according to the DSM-IV-TR (American Psychiatric Association, 2000), a diagnosis of adult antisocial personality disorder necessitates a diagnosis of conduct disorder in childhood.

It is further hypothesised that this correlation will not be accounted for by variability in other child characteristics. First, since children with conduct problems have been shown to have lower IQs compared to typically developing children (Loeber & Coie, 2001), it has to be demonstrated that poor performance on the Eyes Test is not due to general cognitive impairment vs. selective impairment in the social-cognitive domain. Second, ToM capacity increases with age (Perner & Lang, 1999), and younger children are often rated as being harder to manage than older children (Hughes et al., 2000). It is therefore necessary to demonstrate that the correlation between conduct problems and Eyes Test performance is not accounted for by age. Finally, there is evidence that girls, on the whole, are better mind readers than boys (see Baron-Cohen, 2003, for a review). It is also well known that boys show significantly more conduct problems compared with girls (Hill, 2002). It is therefore necessary to control for sex when investigating the relationship between conduct problems and Eyes Test performance.

METHOD

Participants

The sample for the current study was drawn from a follow-up phase of a larger community study (the Child Behaviour Study). Details of the

larger-scale study are presented elsewhere (Sharp, Croudace, Goodyer, & Amtmann, 2005; Sharp, Goodyer, & Croudace, 2006; Sharp, van Goozen, & Goodyer, 2006). Children were recruited through schools in the county of Cambridgeshire in the United Kingdom. The follow-up sample for the current study consisted of 79 children (35 boys and 44 girls). The mean age of the sample was 11 years old ($SD = 11$ months) with the youngest age 9 and the oldest age 13.

The study was approved by the local ethics board. Written parental consent was obtained from each parent and child assent from children. All participants were informed that they could withdraw from the study at any time without providing a reason. Table 1 summarises the participant characteristics both for the full sample and separately by sex, including means, SD s, and minimum and maximum scores on all measures.

Measures

Conduct problems. Parents completed the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997, 2001; Goodman, Ford, Simmons, Gatward, & Meltzer, 2000b). The SDQ was specifically designed to screen for psychiatric disorders in community samples and was shown to identify individuals with psychiatric diagnosis with a specificity of 94.6% (95% CI 94.1–95.1%) and a sensitivity of 63.3% (59.7–66.9%; Goodman, Ford, Richards, Gatward, & Meltzer, 2000a). The SDQ consists of five subscales, of which four are indicative of psychopathology. These include: emotionality, conduct problems, peer problems and hyperactivity. To index parent-reported conduct problems, the conduct-problem subscale of the SDQ was used. Sensitivity for the SDQ has been demonstrated to be especially good (70–90%) for identification of conduct-oppositional disorders. Internal consistency has been reported (Cronbach's $\alpha = .73$; Goodman, 2001). For the purposes of this study dimensional scores on the conduct-problems

TABLE 1
Participant characteristics and descriptive statistics on main study variables (SD s in parentheses)

	<i>Full sample</i> ($n = 79$)				<i>Boys</i> ($n = 35$)		<i>Girls</i> ($n = 44$)	
	<i>Min.</i>	<i>Max.</i>	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)	<i>M</i>	(<i>SD</i>)
Age	9 yr	13 yr	11 yr	(11 mth)	11 yr	(12 mth)	11 yr	(10 mth)
IQ	71	144	101.88	(14.48)	102.01	(16.76)	101.74	(11.97)
CP	0	10	2.06	(1.83)	2.66	(2.22)	1.58	(1.27)
Eyes Test	8	25	17.96	(3.55)	17	(3.81)	18	(3.15)

Notes: CP = Conduct problems; yr = years; mth = months.

subscale was used. High scores reflected high conduct problems and low scores reflect low conduct problems.

Child Eyes Test. The Child Eyes Test (Baron-Cohen et al., 2001) was adapted from the adult "Reading the Mind in the Eyes Test" developed by Baron-Cohen et al. (1997). The test comprises 28 photographs of the eye region of the face. The participant is asked to pick which of four words best describes what the person in the photo is thinking or feeling. Three of the four words are foil mental state terms, while the fourth is deemed "correct". The position of the four words is randomised for each item.

IQ. A shortened version (Vocabulary and Block Design) of the Wechsler Intelligence Scale for Children (Wechsler, 1992) was individually administered and scored according to Sattler's (1988) guidelines.

Procedure

Participants completed the Eyes Test individually in private in a quiet room. Parent ratings of conduct problems were obtained at the same time. Written instructions were given to each participant prior to commencing the test. Standardised Wechsler scores were obtained through individual administration during the baseline assessment phase of the study.

RESULTS

Table 2 summarises the results of bivariate analyses (Pearson correlations) to determine the relationships between variables. Table 2 shows that performance on the Eyes Test was significantly correlated with parent-reported conduct problems ($r = -.34$; $p \leq .001$). In addition, younger children were more likely to be scored by their parents as having conduct problems ($r = -.35$; $p \leq .001$).

Analyses of the sex differences between means (independent sample t -tests) for the main variables (Table 1) suggested that parents rated boys as having significantly more conduct problems compared to girls ($t = 2.68$; $df = 76$; $p \leq .01$). No other significant sex differences were found.

Next, the relationship between Eyes Test performance and conduct problems was investigated while taking into account the effects of IQ, age and sex. A multiple linear regression analysis was conducted. Predictor variables included traditional characteristics usually associated with conduct problems (IQ, age and sex), and Eyes Test performance, which were entered into a simultaneous regression equation with parent-reported conduct problems as outcome. Eyes Test performance retained significance as an independent predictor ($B = -.17$; $\beta = -.33$; $p < .01$), with stronger

TABLE 2
Intercorrelations between main study variables

	<i>Age</i>	<i>IQ</i>	<i>Conduct problems</i>	<i>Eyes test</i>
Age	—			
IQ	.03	—		
Conduct problems	-.35**	-.08	—	
Eyes Test	.11	.03	-.34**	—

Note: ** $p \leq .001$.

predictive power than IQ ($B = -.03$; $\beta = -.25$; $p < .01$) and age ($B = -.03$; $\beta = -.19$; $p < .05$). Sex was not a significant predictor of conduct problems.

DISCUSSION

The amygdala theory of violent behaviour (Blair, 1995, 2005a, 2005b; Fisher & Blair, 1998; Richell et al., 2003) suggests that a deficient understanding of other people's emotions and thoughts (an impaired ToM) might lead to antisocial and aggressive behaviour as well as psychopathy by impeding the individual's capacity to respond to distress cues in others. The model is based on ethological findings suggesting that most social animals possess mechanisms for the control of aggression. We control our aggressive impulses by responding to submission (distress) cues from others in the same way a dog will cease fighting if its opponent bares its throat (Blair, 1995). Through empathy, immediate, proximal feedback is provided that discourages both physical and relational aggression by making the perpetrator of the aggression aware of the pain suffered by the victim. Since the amygdala is specifically involved in the processing of facial expressions of distress, it is suggested that the amygdala is the primary locus of dysfunction in psychopathic individuals (Blair & Frith, 2000; Blair, Morris, Frith, Perrett, & Dolan, 1999).

ToM (which also involves the amygdala; Baron-Cohen et al., 1999) is seen as a crucial prerequisite for responding to distress cues from others (Blair, 2005a, 2005b). If an individual is unable to read the mind or eyes of another, s/he will be limited in the cognitive ability to discriminate affective cues in others, and unable to take the perspective or role of another person. Indeed, a recent study has shown that, similar to patients with amygdala damage, deficits in recognising fear in others in children with psychopathic traits could be temporarily corrected by simply asking them to focus on the eyes of other people (Dadds et al., 2006).

However, previous attempts have failed to demonstrate poor performance in an advanced test of ToM (the "Reading the Mind in the Eyes" Test) in

adult psychopaths (Blair et al., 1996; Richell et al., 2003), thus mitigating against the amygdala theory of aggression. An explanation for the negative finding was provided by Richell et al. (2003), who suggested that cortical regions may compensate in later development for childhood reduced (but not absent) amygdala functioning. It follows that in younger children this compensation may not yet have taken place.

The current study makes a contribution to the above literature by being the first to provide evidence in support of the above. Against the background of data suggesting childhood conduct problems to be an early marker for the development of psychopathy (Lynam, 1998; Lynam & Gudonis, 2005), the current study aimed to investigate the concurrent relationship between conduct problems and performance on the child version of the Eyes Test in pre-adolescent and young-adolescent children. The fact that a relationship was found between poor Eyes Test performance and conduct problems suggests that the compensation described above may not yet have taken place in pre-adolescent and young-adolescent children. The relationship between poor Eyes Test performance and concurrent conduct problems was shown to be robust even when taking into account other predictor variables of conduct problems in children.

There are several limitations to the current study that deserve mention. First, although the findings of this study are relevant to the literature on the development of psychopathy, the latter was not directly measured. Neither did this study make use of a clinic or forensic sample of conduct-disordered or psychopathic children. Many concerns exist regarding the validity of the construct of psychopathy in children (Edens, Skeem, Cruise, & Cauffman, 2001; Sharp & Kine, *in press*). In addition, symptoms of psychiatric disorder are seen to be fluid, changeable and not yet fully crystallised in pre-adolescent and young-adolescent children, especially where personality disorders are concerned (Sharp & Bleiberg, 2007). Nevertheless, many recent studies have made use of psychopathy self-report scales or interview-based measures of juvenile psychopathy to investigate the validity of the construct. A next step would be to investigate the performance on the Eyes Test in relation to psychopathy scores, or indeed, a diagnosis of psychopathy in either a community or clinic/forensic sample.

Second, although the current study refers to amygdala functioning, neural correlates of the Eyes Test performance were not ascertained. Given the behavioural findings reported here, future research should use fMRI to investigate performance on the Eyes Test in children with psychopathic traits. Such studies may provide further evidence for the hypothesis that amygdala functioning may be reduced in antisocial children, while compensated for by cortical regions in antisocial adults.

Finally, the current study focused exclusively on Eyes Test performance in children with antisocial behaviour. Eyes Test performance has been shown to

be affected in adults with psychiatric disorders other than psychopathy or autism. For instance, Harkness, Sabbagh, Jacobson, Chowdrey, and Chen (2005) showed in a sample of college students that dysphoria was significantly positively associated with greater accuracy on the Eyes Test, suggesting that an increased sensitivity to the subtle social cues required to make ToM judgements may be related to depression. The Eyes Test and similar tasks provide the opportunity for research investigating how cognition and emotion interact in the development of psychiatric disorders in children and adolescents.

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