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Disruptive behaviours at school: Information processing differentiators of callous-unemotional traits, conduct problems and ADHD

Essi Viding[1,2], Chloe Booth[1], John S.C. Rogers[2], Jonna Kuntsi[2] & Francesca Happé[2]

[1] Research Department of Clinical, Educational and Health Psychology, Division of Psychology and Language Sciences, University College London
[2] Institute of Psychiatry, King's College London

Background. Interventions for disruptive behaviours form an important part of the special educational needs agenda. Such efforts can capitalise on studies that pick apart specific information processing styles in different types of children with disruptive behaviours.
Aims. In this paper we describe two studies probing distinct information processing difficulties in children with disruptive behaviours.
Samples. Study 1 included participants from a mainstream setting. Teacher ratings and ability assessment were used to select children with callous-unemotional and non-callous conduct problems (CP/CU+ [*N*=20] vs. CP/CU– [*N*=18]), as well as ability matched comparison children (*N*=28). Study 2 included children from special school and mainstream settings. Teacher ratings and ability assessment were used to select children with CP symptoms (*N*=18), ADHD symptoms (*N*=12) and ability matched comparison children (*N*=18).
Method. Study 1 used vignette-based tasks to investigate moral emotions of guilt and shame in children with CP/CU+, CP/CU–, and comparison children. Study 2 used computerised experimental tasks to investigate cognitive underpinnings for impulsive behaviour in children with CP, ADHD, and comparison children.
Results. Findings from Study 1 suggest that children with CP/CU+ have a distinct impairment in processing guilt, not found for CP/CU–. Findings from Study 2 suggest that children with CP and ADHD have difficulties in different cognitive domains thought to underlie impulsive behaviour.
Conclusions. Disruptive and impulsive behaviours that may look similar on the surface can result from very different information processing vulnerabilities in different groups of children.

Correspondence concerning this article should be addressed to Essi Viding, Research Department of Clinical, Educational and Health Psychology, UCL Division of Psychology and Language Sciences, 26 Bedford Way, London, WC1H 0AP. Email: e.viding@ucl.ac.uk

Children with disruptive behaviours are at risk of developing chronic life-course persistent anti-social behaviour, as well as several other psychiatric and physical health problems (Kim-Cohen et al., 2003; Odgers et al., 2007). Disruptive behaviours represent a substantial cost burden to society, in terms of costs to victims of these behaviours and the costs associated with intervening with or detaining individuals in an effort to protect potential future victims (Frick & Viding, 2009; Krug, Dahlberg, Mercy, Zwi & Lozano, 2002; Loeber & Farrington, 2001). Disruptive behaviours are also extremely problematic in a school setting, often indexing increased risk for problematic outcomes such as low academic achievement and bullying (e.g. Moffitt, 2003; Smith, Pepler & Rigby, 2004; Viding, Simmonds, Petrides & Frederickson, 2009).

Prevention of disruptive behaviours during childhood features strongly in several government initiatives (see, for example, http://www.homeoffice.gov.uk/crime/anti-social-behaviour/) and schools can and often do have a unique role in providing front line intervention. Relevant interventions can involve school wide initiatives, but in the case of very disruptive children often involve individualised approaches as well. In order to better inform child specific approaches it is important to understand the cognitive and emotion processing biases that may underlie different subtypes of disruptive behaviours. Although we may think that two children manifest very similar disruptive behaviours, these behaviours could be driven by different underlying vulnerabilities. For example, aggressive acts, such as hitting someone can be used to obtain property or favours and may stem from profound lack of empathy and guilt (as seen in children with callous-unemotional [CU] traits) (Blair & Viding, 2008). Alternatively, aggression could stem from emotional over-reactivity to a perceived threat or challenge, whether real or imagined (Frick & Viding, 2009). Similarly, impulsive behaviours are characteristic of disruptive behaviour disorders, such as conduct disorder or attention deficit hyperactivity disorder (ADHD), yet the cognitive underpinnings of impulsive behaviours may differ for children with conduct problem (CP) or ADHD symptoms. Because many of the intervention approaches involve behaviour modification and cognitive restructuring it matters, for example, to know whether aggressive behaviour is driven by poor capacity to empathise or over-reactivity to threat.

To illustrate the point of similar behaviours being accompanied by potentially very distinct information processing profiles, we describe two studies probing distinct information processing correlates of different groups of children with disruptive behaviours. In the first study we investigated moral emotions of guilt and shame in children with callous-unemotional and non-callous conduct problems (CP/CU+ vs. CP/CU–). In the second study we investigated distinct cognitive underpinnings for impulsive behaviour in children with CP symptoms and children with ADHD symptoms.

Study 1: Conduct problems and disturbances in moral development

As we have already alluded to above, children with CP are a heterogeneous group and development of disruptive behaviours can involve several causal pathways that will require different interventions (Frick & Viding, 2009). CU traits are one of the best researched markers of different causal pathways to antisocial behaviour (Frick & Viding, 2009) and can be used to distinguish between children who are capable of pre-meditated antisocial behaviour (CP/CU+) and children whose antisocial behaviour is more impulsive and threat reactive (CP/CU–). A growing evidence base indicates that children with CP/CU+ are more genetically vulnerable to disruptive behaviours (e.g. Viding, Blair, Moffitt & Plomin, 2005) and have more severe conduct problems and more long-term difficulties than their CP/CU– counterparts (Frick & Viding, 2009; Rowe, Maughan, Moran et al., 2010). Children with CP/CU+ appear to lack sensitivity to others' distress (fear and sadness), as probed by vocal stimuli and visual facial stimuli (Blair & Viding, 2008). Their behavioural profile also indicates that they rarely feel guilt or remorse. In contrast, children with CP/CU– show normal reactivity to others' distress emotions and are capable of feeling guilt. However, they can be hypersensitive to perceived threat and may even encode neutral faces as angry (Dadds, Perry, Hawes et al., 2006). It is thought that the disruptive behaviours in the CP/CU– group stem from difficulty in regulating response to threat, whether such threat is real or imagined.

Prominent researchers have argued that emotional processes are fundamental in discriminating right from wrong, motivating reparative actions, and moral development (Eisenberg, 2000). Guilt, in particular, is believed to be critical for moral actions and for the development of conscience. Those individuals who are less able to empathise with others and to feel guilt may not follow the normal course of moral development and could be at increased risk for antisocial behaviour (Blair & Viding, 2008). Moral competence (as indicated by performance on moral reasoning tasks) is negatively associated with antisocial behaviour in children (e.g. Cimbora & McIntosh, 2003; Stams, Brugman, Dekovic, van Rosmalen, van der Laan & Gibbs, 2006). Research has also shown that children with CP/CU+ have difficulty in distinguishing between moral (victim-based) and conventional (norm-based) transgressions as compared with their ability matched peers (Blair, 1995; Blair, Monsen & Frederickson, 2001).

Another emotion that has received attention in relation to moral development is shame. Studies investigating shame responding have found positive correlations between shame and antisocial behaviour (Tangney, Wagner & Gramzow, 1992). Eisenberg (2000) has suggested that excessively shamed people find it difficult to cope with this emotion. This may in turn motivate avoidance and lead to difficulty in rectifying transgressions.

It is possible to hypothesise two routes to antisocial behaviour following differences in processing guilt and shame. The definition of guilt as the motivator of a reparative response suggests that individuals who lack guilt are able to callously commit antisocial acts without the need to engage in compensatory actions (Eisenberg, 2000). In contrast, those individuals with high levels of shame may avoid addressing their transgression in order to avoid experiencing further shame and this could deter them from performing reparative actions (Eisenberg, 2000). Studies using various measures of moral responding have yet to investigate differences between children with different types of conduct problems, such as those with and without CU (Frick, 2006). As reduced guilt and empathy are central to CP/CU+ categorisation, one might expect CP/CU+ to show little guilt in situations that typically provoke a guilt response in others. Previous studies have reported associations between high levels of shame and high levels of impulsive aggressive behaviour (Tangney, 1998). Impulsive aggression is particularly characteristic of CP/CU– (Blair, Peschardt, Budhani, Mitchell & Pine, 2006) and it might be expected that this group of children could be characterised by excessive shame. However, there is less data to support this prediction and previous research on shame has not focused on subtyping individuals with CP.

Study 1 examined guilt and shame responding in a community sample of adolescents where children were grouped according to their level of CP and CU. Two vignette-based measures were used. We predicted that the CP/CU+ group would show lower levels of guilt responding and that that the CP/CU– group would show higher levels of shame responding as compared with ability matched comparison children.

Participants

A sample of 107 adolescents (64 male and 43 female) was recruited from a mainstream comprehensive secondary school in Essex using opportunity sampling. Participants were aged between 11 to 13 years. Study groups were screened from this sample based on questionnaire and ability data (final N=66). Those children designated to the CP group scored in the top tertile of the sample for CP (as indexed by a combination score on the Conduct Disorder and Oppositional Defiant Disorder Scales of the *Adolescent Symptom Inventory*, Gadow & Sprafkin, 1997) and were further divided into CU+ (N=20) and CU– (N=18) groups using a median split on *Inventory of Callous Unemotional Traits* (ICU; Frick, 2003). A comparison group with matching sex, age and ability (FSIQ of *Wechsler Abbreviated Scales of Intelligence*; Wechsler, 1999) was also selected from this screening sample (N=28).

Measures

Adolescent Symptom Inventory, 4th Edition: Conduct Disorder and Oppositional Defiant Disorder Scales (Gadow & Sprafkin, 1997)

Teacher ratings employing the Adolescent Symptom Inventory Conduct Disorder and Oppositional Defiant Disorder scales were used to screen for presence of CP in this sample. These scales measure aggressive, antisocial behaviour, and the violation of others' rights/welfare, as well as argumentative, hostile and defiant behaviour towards authority. The Adolescent Symptom Inventory is a well validated screening instrument for emotional and behavioural symptoms in adolescence, based on the diagnostic criteria specified in the DSM-IV. Teachers are asked to read a list of statements regarding the child's behaviour (e.g. 'Bullies, threatens or intimidates', 'Has stolen things when no-one is looking') and decide how well each statement describes the child's behaviour in school. Each statement is rated on a Likert scale from '0' ('Never') to '3' ('Very Often').

Inventory of Callous-Unemotional Traits (ICU; Frick, 2003)

Teacher ratings were collected on the 24 items of ICU. This questionnaire is designed to characterise poor empathy and flat affect. The instrument has 12 positively and 12 negatively worded items, such as 'I am concerned about the feelings of others', 'Does not care who he/she hurts to get what he/she wants.' Each item is rated on a Likert scale from '0' ('Not at all true') to '3' ('Definitely true'). This instrument is a well validated screen for CU traits and we used median split on CU traits to characterise children as CU+ or CU–.

Test of Self-Conscious Affect, 3rd Edition (TOSCA-III; Tangney, Dearing, Wagner & Gramzow, 2000)

The Test of Self-Conscious Affect is a 16-item self-report measure with scenarios suitable for children and adolescents designed to examine shame- and guilt-proneness, blame externalisation, and detachment/unconcern. For example:

> 'You walk out of an exam thinking you did extremely well. Then you find out that you did poorly.'

For each scenario, several possible responses are presented:

> 'You would think, 'Well, it's just a test.' (Detachment)
> 'The instructor doesn't like me.' (Blame Externalising)
> 'I should have studied harder.' (Guilt)
> 'I feel stupid.' (Shame).

Participants were required to rate the likelihood of responding in a specified way to each scenario on a five-point Likert scale, from '1' ('Not Likely') to '5' ('Very Likely').

Questionnaire of Subjective Emotions (QSE; Burnett, 2006)

Questionnaire of Subjective Emotions is a self-report measure with short scenarios suitable for children and adolescents. We used eight scenarios designed to examine guilt and shame from this measure. For example:

> 'Your mother was sad when you forgot about Mother's Day.'
> 'How guilty would you feel?'
> 'How ashamed would you feel?'

Participants were required to rate the intensity of the specified emotion on a four-point Likert scale from '1' ('I would not feel the emotion at all') to '4' ('I would feel the emotion a lot').

Results and discussion

Descriptive information about the groups is detailed in Table 1. There were no significant group differences on sex, age or IQ. However the groups naturally differed in their levels of CP and CU. The CP/CU+ group had significantly higher ICU scores than both the CP/CU– group ($p<0.001$) and comparison group ($p<0.001$), and significantly higher ASI scores than the CP/CU– group ($p<0.001$) and the comparison group ($p<0.001$). The CP/CU– group had significantly higher ASI scores than the comparison group ($p<0.001$) and also significantly higher ICU scores than the comparison group ($p<0.001$).

The TOSCA data was first inspected for outliers. Five participants who had an extreme score of ±3 standard deviations from their group mean were removed from the analysis, leaving 19 participants in the CP/CU+ group, 16 participants in CP/CU– group, and 26 participants in the comparison group. A mixed model ANOVA was conducted on the TOSCA measure. There was a significant main effect of group ($F_{(2,58)}=4.98$, $p<0.01$), a significant main effect of emotion ($F_{(3,174)}=83.32$, $p<0.001$), and a significant group x emotion interaction ($F_{(6,174)}=7.33$, $p<0.001$). These results are displayed in Figure 1. Planned comparisons were also run using independent samples *t*-tests corrected for multiple comparisons. The CP/CU+ group showed less guilt than the comparison group ($t(45)=-3.95$, $p<0.001$; $d'=1.13$), but the CP/CU– group did not significantly differ from the comparison group ($p=.52$). For shame, the CP/CU+ group did not significantly differ from the comparison group ($p=.16$), but the CP/CU– group showed more shame than the comparison group ($t(41)=2.47$, $p<0.02$; $d'=0.75$). Although not the focus of this study as they did not cover moral emotions, we conducted post-hoc analysis (corrected for family-wise error) for the detachment and blame externalisation responses collected as part of this task. The analyses revealed that both CP/CU+ and CP/CU– groups were more 'detached' and externalised more blame than the comparison group. These findings will not be discussed further, but are in line with previous reports of this task in children with CP and are reported for the sake of completeness.

Table 1. Descriptive statistics for age, IQ, ICU and ASI scores for each group.

	Groups		
	CP/CU+ (*N*=20; 25% Female)	CP/CU– (*N*=18; 38.9% Female)	Comparison (*N*=28; 35.7% Female)
Age	**12.32** (0.60)	**12.20** (0.60)	**12.11** (0.59)
IQ	**93.70** (8.50)	**95.28** (8.30)	**99.00** (9.42)
ICU scores[a]	**41.52** (8.72)	**24.23** (5.37)	**13.56** (4.67)
ASI scores[b]	**17.03** (7.48)	**9.74** 2.82	**0.00** (0.00)

Note. Mean scores in bold, SDs in brackets.
CP/CU+=Conduct Problems with Callous-Unemotional traits.
CP/CU–=Conduct Problems without Callous-Unemotional Traits.
[a]=Total score on Inventory of Callous-Unemotional Traits.
[b]=ASI score assessed using the Conduct Disorder and Oppositional Defiant Disorder Scales.
* Group differences on sex, age and IQ all non-significant.

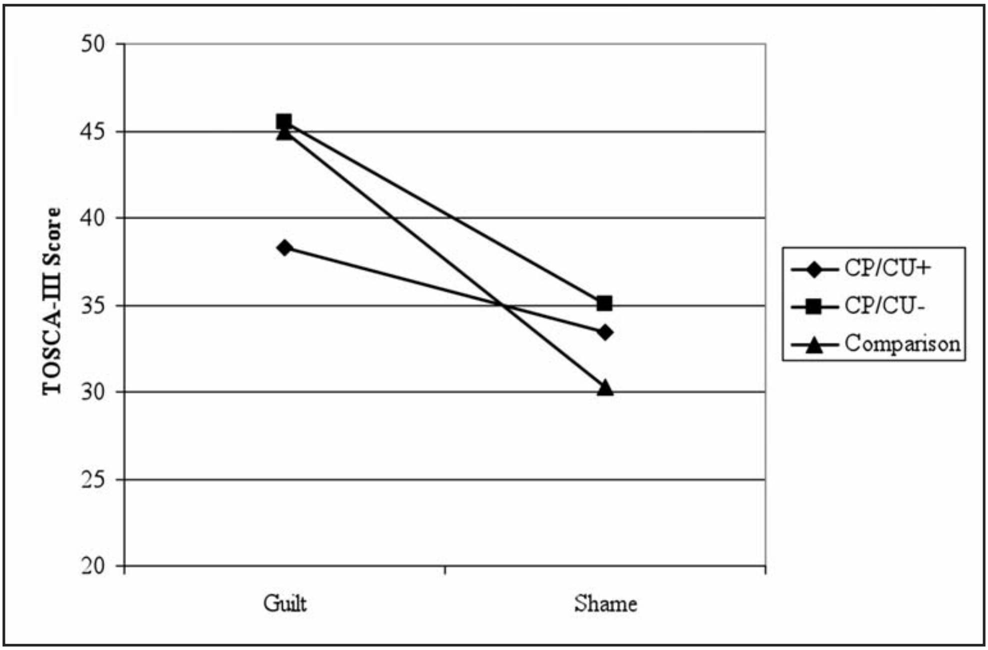

Figure 1.

Outlier inspection of the QSE data revealed two participants who had an extreme score of ±3 standard deviations from their group mean. These individuals were removed from the analysis, leaving 20 participants in the CP/CU+ group, 17 participants in the CP/CU– group, and 27 participants in the comparison group. For the QSE measure, there was a significant main effect of group ($F_{(2,61)}=4.34$ $p<0.05$) and a significant main effect of emotion ($F_{(1,61)}=12.15$ $p<0.001$). However, there was no statistically significant group x emotion interaction ($F_{(2,61)}=0.25$ $p=0.78$). Planned comparisons, corrected for multiple comparisons, revealed that the CP/CU+ group scored less than the comparison group for guilt ($t(45)=-2.96, p<0.01; d'=0.84$), however, CP/CU– individuals did not score significantly differently on guilt items than the comparison group ($p=.76$). For shame items, there were no significant differences between the CP/CU+ group and the comparison group ($p=.11$) or between the CP/CU– group and the comparison group ($p=.68$). These results are displayed in Figure 2. The presence of significant between-group differences for the guilt items but not the shame items is surprising, given the near parallel lines in Figure 2. The lack of statistically significant between-group differences on shame items is most probably due to higher within-group variance for the shame items.

This study examined guilt and shame responding in a community sample of adolescents with differing levels of CP and CU. Researchers have suggested that two developmental pathways to disruptive/antisocial behaviour may exist, one involving low levels of guilt and empathy and another involving heightened shame (Eisenberg, 2000; Frick & Viding, 2009). Whereas guilt is known to promote moral and reparative behaviour, high levels of shame appear to act in an opposite way (e.g. Tangney, 1998). In line with this it was predicted that although both children with CP/CU+ and CP/CU– display elevated levels of disruptive/antisocial behaviour as compared with comparison children, their pattern of guilt and shame responding would be distinct: the CP/CU+ individuals would show less guilt responding than the comparison children and the CP/CU– individuals would show higher levels of shame than the comparison children.

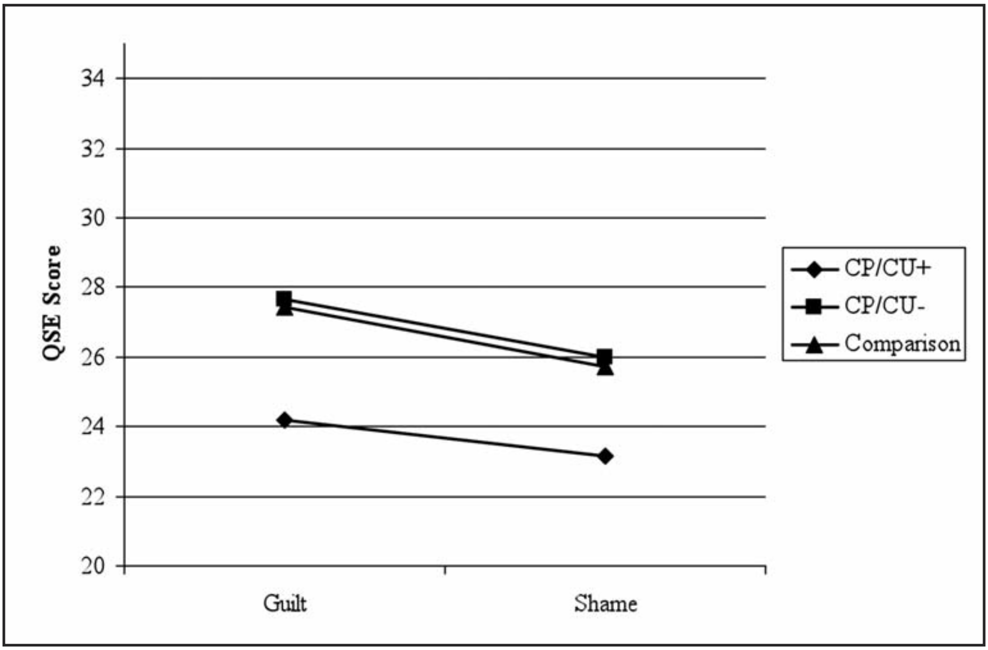

Figure 2.

The findings were broadly in line with the predictions[1]. In the TOSCA task the CP/CU+ individuals displayed less guilt than the comparison children, but the CP/CU– individuals did not significantly differ from the comparison group. For shame, the CP/CU+ individuals did not significantly differ from the comparison group, but the CP/CU– individuals showed more shame responding than the comparison group. Large effect sizes were observed for these group differences, supporting the hypothesis that CP/CU+ and CP/CU– children would show differential guilt and shame responding when compared to the comparison group. Similar to the TOSCA findings, the CP/CU+ individuals showed less guilt responding than the comparison group, and a large effect size was observed for this comparison. Furthermore, the CP/CU– individuals did not differ significantly from the comparison group on the QSE measure. For shame items, there were no significant differences between any of the groups on the QSE measure. It is unclear what drives the discrepant finding for shame in the CP/CU– group in the two tasks. It could be that the TOSCA task is more sensitive in measuring excessive shame attributions because it does not directly ask about feeling ashamed. It may be harder for children to conceptualise feelings of shame than feelings of guilt and thus an indirect probe of shame may be more successful in capturing true individual differences. However, this explanation is purely speculative and more fine grained experiments would be required to examine this issue.

This study suggests that some disruptive behaviours performed by the CP/CU+ individuals may be attributable to low guilt, which make it easier for these children to, for example, continue

[1] It should be noted that we cannot rule out that some of the differences between the CP/CU+ and CP/CU– groups may be driven by differences in the severity of conduct problems (as measured by ASI) rather than CU. This is an unlikely explanation for group differences found in shame proneness (as measured by TOSCA), because the group differences were found between CP/CU– and comparison children, not between CP/CU+ and comparison children. Furthermore, the boys with CP/CU– did not differ from comparison children on either of the guilt measures presented in this study, despite differing significantly from them with respect to their levels of conduct problem symptoms. However, this does not eliminate the possibility of a difference in guilt processing emerging only at high levels of conduct problem severity.

aggressing against other people. Lack of guilt may also prevent children with CP/CU+ from performing reparative actions after transgressions and may thus lead to continued behavioural problems. These findings in children are in line with research on adults with psychopathy. While no one would suggest that children have psychopathic personality disorder, vulnerability to personality disorders is likely to be present from an early age and there are longitudinal data that suggest that some children with CP/CU+ predisposition continue on to become adult psychopaths (e.g. Lynam, Caspi, Moffitt, Loeber & Stouthamer-Loeber, 2007). This study also suggests, albeit in a less clear-cut fashion, that CP/CU– may be associated with excessive shame, which could result in avoidance of addressing one's disruptive behaviours.

These results have implications for the school setting as schools can play a key role in early intervention of disruptive behaviours. Problem behaviours are more malleable during early school years and this is where intervention may be most effective. As children with CP are a heterogeneous group with different pathways leading to disruptive behaviours, the most successful types of intervention will be those that are individualised for the particular risky behaviour that the child is displaying, targeting specific information and affective processing styles. For example, CP/CU+ children are often bullies and their behaviour can be difficult to change (Frick & Viding, 2009; Viding, Simmonds, Petrides & Frederickson, 2009). This may be because traditional anti-bullying strategies tend to rely on encouraging individuals to feel empathy for their victims and guilt for their bullying, but such strategies may not work for CP/CU+ individuals who display reduced empathy and guilt. Therefore, alternative strategies may need to be developed for these children that, for example, capitalise on socially acceptable rewards and seek to boost the weak ability to empathise. Conversely, CP/CU– children may benefit from school programmes that teach about controlling emotions (including shame) and managing aggression (Blair & Viding, 2008).

Different moral emotion processing profiles may help us to understand why different subgroups of children with disruptive/antisocial behaviours may find it difficult to perform reparative actions and engage in a society in a morally acceptable way. Behaving in an impulsive manner is another common hallmark of children with disruptive behaviours and the second study we report here focused on picking apart different information processing correlates of impulsive behaviour in children with CP and ADHD symptoms.

Study 2: Different correlates for impulsive behaviours in children with CD and children with ADHD symptoms

The concept of impulsivity covers a wide range of actions that are prematurely expressed, carry a disproportionate risk, are ill-thought out, or inappropriate to the situation at hand, and typically result in less than optimal outcomes. Impulsive behaviours range from blurting things out inappropriately to reactive aggression and are a characteristic of both children with conduct problem symptoms (CP) and Attention Deficit Hyperactivity Disorder symptoms (ADHD). Findings from neuropsychological and cognitive studies suggest that the impulsive behaviours in CP and ADHD may have different cognitive origins (e.g. Frick & Morris, 2004; Kuntsi, McLoughlin & Asherson, 2006; Nigg, 2003; Shallice et al., 2002). This is in line with research indicating that several independent cognitive/biological mechanisms underlie impulsive behaviour (Evenden, 1999; Winstanley, Dalley, Theobald & Robbins, 2004). It has been argued that as impulsivity constructs become more refined, it should be possible to distinguish among persons who have impulse control deficiencies as a result of dysfunction within different information processing systems (Kindlon, Mezzacappa & Earls, 1995). The aim of Study 2 was to probe such a distinction for CP and ADHD.

There is now substantial amount of data suggesting that individuals with CP show compromised performance in tasks where reward and punishment outcomes must be anticipated and monitored (see e.g. Blair, 2007; Frick & Viding, 2009). We call this cognitive operation 'valence monitoring' and propose that a deficit in this domain may explain various impulsive antisocial/aggressive behaviours associated with CP. For example, we would expect that individuals with a deficit in on-line monitoring the consequence of their antisocial activities may engage in such activities even when the chance of discovery is high, that is they may fail to anticipate negative consequences of their actions. It is also possible that individuals with CP could focus on the potential rewards (rather than punishment consequences) of aggression, again resulting in ill thought out behaviour. Some theorists have proposed that the impulsive behaviours seen in children with ADHD are the result of a different, 'conflict monitoring' deficit at the cognitive level (Berger & Posner, 2000; Swanson et al., 1998). Existing data in children with ADHD indicates difficulties in tasks that involve 'conflict monitoring' for competing responses (e.g. Nigg, 2001; Pennington & Ozonoff, 1996; Sergeant, Geurts & Oosterlaan, 2002; Shallice et al., 2002; but see Huang-Pollock, Nigg & Carr, 2005 for an exception). Poor 'conflict monitoring' could lead children with ADHD to blurt out answers or to make impulsive choices.

Study 2 was set up to investigate a tentative proposal where impulsive behaviours in children with CP and ADHD symptoms are seen to result from deficits in 'valence monitoring' and 'conflict monitoring' respectively. A perfectly clear-cut relationship is not necessarily expected, since the proposed cognitive processes are unlikely to act in isolation from each other. Most response selection requires some form of valence processing, in that presumably an organism tries to avoid errors (negative in valence) in their goal-directed activity. The distinction made here relates to the role of reinforcing properties of a stimulus in goal-directed action, as opposed to the role of initial task instructions in goal-directed action. In the case of stimuli with different reinforcing properties we might require 'valence monitoring' to modulate behaviour according to changes in reinforcement contingencies that relate to specific stimuli. In the case of initial task instructions we might require 'conflict monitoring' to recruit cognitive support for response selection in the face of response options that compete for selection against the task instructions.

Finally, a point of clarification is required here for both CP and ADHD. We acknowledge that both disorders are likely to be heterogeneous and comprise sub-groups of children that may differ on certain cognitive factors. Some CP children are highly reactive to threatening stimuli (i.e. have a hostile attribution bias) and are reactively aggressive (Dodge & Pettit, 2003; Frick & Viding, 2009; Pardini et al., 2003). Other CP children are callous and focus on the rewarding aspects of aggression (Frick & Viding, 2009; Pardini et al., 2003). We propose that 'valence monitoring' dysfunction can account for impulsive behaviour in both subtypes of CP, but that these differ on other cognitive factors, such as differential reactivity to emotional cues in others. We also do not expect predominantly inattentive children with ADHD to suffer from 'conflict monitoring' deficit. We expect this deficit to manifest primarily in children who have both hyperactive-impulsive and inattentive symptoms (combined type) and hence did not include 'inattentive only' children in our analyses.

This study focused on two novel tasks proposed to tap valence monitoring and 'conflict monitoring', and assess how children with CP or ADHD symptoms perform on these tasks as compared with age- and IQ-matched comparison children. We predicted that children with CP symptoms would show dysfunction as compared with comparison children on a task assessing 'valence monitoring', but not on a task assessing 'conflict monitoring'. Children with ADHD symptoms were predicted to show the opposite pattern of performance.

Method

Participants

Participants in this study ranged from 9 to 16 in age. Only males were recruited due to the prevalence of males in special school setting. Participants for the CP and ADHD groups were screened from a sample of 82 children attending special schools for children with Emotional and Behavioural Difficulties (EBD). The group selection for the CP and ADHD groups was performed as follows. All children with CP had attended an EBD school for disruptive behaviour from primary school age onwards, providing a strong indication of early problems. All of the CP children selected in this way had minimum Strengths and Difficulties Questionnaire Conduct Problems score of 5 (4 being the SDQ recommended cut-off for abnormal score). In addition, children in the CP group were required to score minimum 6 out of 10 on the CD symptom scale (see Appendix A). The score was equivalent to endorsing all DSM-IV CD symptoms as occurring sometimes plus one symptom occurring all the time, or three or more (the official diagnostic requirement for CD) symptoms occurring all the time. Children scoring above the age appropriate 90th percentile cut-off for the total and hyperactivity-impulsivity scale score on the DuPaul ADHD Rating Scale – IV were assigned to the ADHD group. This screening was done to ensure that the children in this group would have high levels of ADHD symptoms overall, but also score at the extreme for the hyperactivity-impulsivity domain.

Eighteen boys were assigned to the CP symptoms group and 12 boys to the ADHD symptoms group[2]. These groups do not represent clinical diagnoses and were created for research purposes only, using the rating scales given (see above for more information on group selection and below for the rating scales used in this study). Therefore, when CP or ADHD labels are used, these refer to children exhibiting high numbers of behaviours in CD or ADHD domains. It is important to note that the CP group had elevated levels of ADHD symptoms compared with comparison children. The same was also true with ADHD children with respect to CP symptoms. The comparison children ($N=18$) were selected from a large mainstream sample ($N=121$; all from a single school in a low SES catchment area in Oxfordshire) taking part in a separate study of individual differences across development. They were group-wise ability matched (on verbal and working memory ability) to the CP and ADHD groups.

Apparatus

A laptop computer with a 15-inch colour monitor was used to present all experimental tasks. The Catch the Frog Game was programmed using Java programming language. The Response Switch task was programmed using SuperLab Pro 2.0 experimental software.

Measures

British Picture Vocabulary Scale, 2nd Edition (Dunn, Dunn, Whetton & Burley, 1994)
Every child was individually administered the British Picture Vocabulary Scale (BPVS-II) in order to obtain an estimate of verbal ability.

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[2] Two boys in the ADHD group were on medication (fast release methylphenidate administered two times a day). It was not possible to take children off medication for the purposes of this study. Children were, therefore, seen prior to their second medication of the day, four to five hours after the administration of their morning medication (fast release methylphenidate has duration of action of one to four hours; Kimko, Cross & Abernethy, 1999). Although not equivalent to seeing children off medication, it was thought that this would give the best estimate of their non-medicated performance. Furthermore, given that methylphenidate improves performance on cognitive tasks (e.g. Kramer, Cepeda & Cepeda, 2001), it was thought that retaining these children in the sample would not introduce an unfair bias in the predicted direction. Examination of the task performance of these children confirmed that they were performing in line with the rest of the children in their group.

Digit Span Backwards (Wechsler, 1991)
The backward digit span from Wechsler Intelligence Scales for Children – Third Edition (WISC-III) was used to assess working memory (WM) quotient of the participants to control for its possible contribution to task performance. This WM test is likely to employ the central executive component of WM, and thus assess the kind of 'on-line' manipulation capabilities assumed to contribute to efficient performance on the experimental tasks.

Strengths and Difficulties Questionnaire (Goodman, 1997)
The Strengths and Difficulties Questionnaire (SDQ) is a brief behavioural screening questionnaire that asks about 25 attributes, some positive and others negative. All items are rated on a three-point scale. The SDQ has scales for conduct problems, and hyperactivity, which were the focus of the current investigation. The current investigation also assessed emotional problems (anxiety and depression symptoms) to ascertain that CP and ADHD groups did not differ from each other on emotional symptoms, which are a known moderator of cognitive and affective performance. The SDQ has been shown to have both good reliability and validity, in the United Kingdom and other countries (Goodman, 1997, 2001, 2003).

CD symptom scale
This screening measure contained items characterising DSM-IV CD behaviours, particularly aggressive ones, and supplemented the SDQ conduct problem scale. The items on this scale are listed in Appendix A.

ADHD Rating Scale-IV (DuPaul, Power, Anastopoulos & Reid, 1998)
The ADHD Rating Scale-IV consists of 18 items that are closely related to the DSM-IV criteria for ADHD. This instrument is designed to measure the two diagnostic components of ADHD: hyperactivity-impulsivity and inattention. Each item on the questionnaire can be rated on a four-point scale. The ADHD rating scale has been shown to have both good reliability and validity (DuPaul et al., 1998). The ADHD Rating Scale-IV manual provides norms tables to indicate the extent of deviance on all scales and total questionnaire score.

Catch the Frog Game
The Catch the Frog Game (CFG) was designed to assess the 'valence monitoring', and specifically the ability to evaluate choices against possible reward or punishment outcomes that changed from trial to trial. This task was adapted from Rogers' 'Risk Task' (Rogers et al., 1999) to be more appropriate for children by simplifying the instructions and adding the idea of a hunt for a cartoon frog.

The participants were told to catch the frog that would be hiding behind one of the six shields displayed on the top section of the computer screen. It was made explicit to the participants that at each trial the frog was equally likely to be behind any of the six shields. The six shields were of two different colours, orange and blue, in the ratios of 5:1, 4:2, and 3:3. The participants had two cannon buttons that matched the colours of the shields. Either cannon could be used to blow away the shields of corresponding colour to find the frog. The participants were told to take their time in making their decision about which cannon to use.

For a single trial each cannon had a number of points associated with it (displayed on the cannon) and these would be added to their total if the participants found the frog or subtracted from their total if they did not. The points associated with each cannon varied in the ratios 10:90, 20:80, 70:30, 40:60 and 50:50. Each probability – point combination appeared 12 times giving a total of 180 trials.

On all trials where the number of shields was unequal, the greater share of the points was always associated with the smaller number of shields and hence the least likely response to find the frog. This presents a valence conflict and makes successful response selection dependent on integration of the possible reward and punishment outcomes and their changing nature throughout the task (i.e. valence monitoring). The 'safe' colour was counterbalanced across participants as was the side on which it appeared.

After response selection the matching shields were immediately removed to reveal if the frog was behind them. Feedback was presented in the form of a message in red (negative) or green (positive) lettering stating how many points had been lost or won. The participants' total score was always displayed in the centre of the screen. No monetary significance or other concrete reward value was attached to the points accumulated by the end of the task.

No practice was given for the CFG as this would have compromised the assessment of valence monitoring in this experimental paradigm. Before commencing the task the participant could ask questions, and if required, the instructions were repeated. At the start of the game the participants were given 100 points and instructed to make whatever choices they thought necessary to increase this score as much as possible. The instructions emphasised that the cannon button associated with more shields would be the less risky choice. The task took approximately seven minutes to complete. The number of safe choices was recorded for analyses. It was predicted that children in the CP group would make more choices to shoot the 'risky' cannon button (i.e. associated with higher probability of loss) than the control children. The ADHD group was hypothesised not to differ from control children. It was predicted that the tendency for 'risky' choices might particularly manifest on the high possible point gain trials (10 vs. 90), where it was predicted that the lure of the reward would interfere with the ability to compute the cost of the possible punishment, thus demonstrating the 'valence monitoring' deficit 'in action'. Reaction times (RTs) were not analysed as the task instructions emphasised that children could take their time in making the decision regarding the gamble and thus it was unclear what latent variable the RTs may have indexed in this experimental task.

The Response Switch (RS) task

The Response Switch (RS) task, adapted from a task by Rushworth and colleagues (Rushworth, Paus & Sipila, 2001), involves an element of response conflict at the response selection (for motor output) level. Successful execution of manual responses in the RS task depends on resolving that conflict. The participants were presented with a series of coloured squares and alternated between two response selection rules, either 'yellow and blue square – right hand' 'and 'pink and turquoise – left hand' or vice versa. They had to press the appropriate button (either left or right hand button of a two button mouse) as soon as the colour appeared. The participants were instructed that when the computer showed the word 'stay' they should stay on the current response mapping, but when the computer showed the word 'change' they should change their hand-colour mapping. The 'stay' trials were presented to control for possible RT increase associated with reading a word.

Both words appeared for 500ms. Each square appeared on the screen for 2500ms, followed by an inter stimulus interval of 800ms. An error feedback of a red cross and a ringing tone was given for 500ms after an incorrect response. In total there were 260 trials and four changes, a change occurred after 60, 120, 180 and 240 trials. Six 'stay' commands were dispersed in between the 'change' commands. The number of 'stay' commands was greater than 'change' commands to avoid direct alternation of these commands, which would have made the changes predictable. Only the trials after the first four 'stay' commands were entered into the analyses for comparability with the 'change' trials. Most trials in this task did not begin with a command.

The number of correct responses, errors and nonresponses after 'change' and 'stay' trials were recorded along with RTs. Responses with RT of 100ms or less were eliminated from the analyses because they are too fast to have been triggered by processing the target stimulus after 'change'/'stay' and it is impossible to determine whether they represent random errors, or impulsive responses initiated before the stimulus onset.

Before proceeding with the task the participants read aloud the words 'change' and 'stay' from a sheet of paper to ascertain that they did not have problems in reading these words. A 20-trial practice was completed by all participants to familiarise them with responding to particular colours with a particular hand. The practise was repeated if required, until the participant had firmly established the response set. After the practice a brief repeat of the instructions was displayed on the computer screen and this was read to the participants before they commenced the task. The participants used a two button mouse to execute their responses, with the left thumb placed on top of the left hand button of the mouse and the right thumb placed on top of the right hand button of the mouse. The initial mapping of the colours to left-hand vs. right-hand button was counter-balanced across participants. The task took approximately 10 minutes to complete.

A measure of cognitive conflict can be computed as an RT difference between 'change' and 'stay' trials. It was predicted that children with ADHD would show a larger RT difference than comparison children, indicating a greater cost in processing the conflict created when the target-response mapping changes. The error and non-response differences were also thought to show a conflict effect in the same direction, although it was questionable whether all groups would have adequate amounts of such data to allow analyses to be performed on these variables. It was predicted that children in the CP group would not differ from control children.

Procedure

All teachers and parents/guardians received an ethics committee approved information sheet about the study. The teachers gave personal consent indicating that they understood the purpose of the research project and that they were willing to provide questionnaire information. The parents/guardians were also sent consent forms regarding their children. Active consent was required for the mainstream children. Passive parental consent for the EBD children was agreed upon with the ethics committee as it was thought that the likely low active parental consent level in an EBD setting would compromise the scientific quality of the data (through exclusion of the majority of representative cases). As a safeguard, an 'in-loco-parentis' consent was also required from the child's form teacher before approaching the child for the study. A separate 'in-loco-parentis' information sheet explained this procedure to the teachers. Finally, personal informed consent was required from the children before proceeding with the testing.

All children were seen in a quiet room on the school premises. At the beginning of a testing session each child was given an information sheet about the study. The child kept the information sheet, but the experimenter (EV) read it out, to make sure that even those children with reading difficulties were adequately informed about the study. The child then signed a consent form or opted out of the study (two children chose to opt out). The consent form emphasised to the child that he did not have to take part and was entitled to finish the session when he wanted (two children finished early).

The left-right distinction ability was tested prior to commencing the task and the task was commenced only if the child was able to reliably tell the difference between left and right. The two tasks (CFG and RS) were presented in a counterbalanced order across the participants to avoid possible order effects. The BPVS and digit-span backwards were administered in between the tasks. If the child got tired on the computer, he was told that he could take a break between tasks. The average testing session lasted 35 to 40 minutes.

Task analyses

As there were *a priori* comparisons based on the hypotheses outlined previously and because the group sizes were limited, we conducted the following analyses for these data. ANOVAs were followed by *t*-tests for both experimental tasks (CP vs. ADHD, CP/ADHD vs. comparison children for each task, one-tailed). In line with Howell (2002), no correction was made for multiple comparisons for *a priori* predictions (The maximum family wise error rate is approximately 0.14 in the case of the three planned comparisons that were performed for each experimental task analysis in this study ($\alpha = 1-(1-\alpha)^c$; where α represents the error rate for any one comparison and ^{c} represents the number of comparisons). Finally, effect sizes for the findings were noted as these are less influenced by modest sample sizes.

Results and discussion

Table 2 displays the participant characteristics for CP, ADHD, and comparison groups. One-way between subjects ANOVA confirmed that there were no statistically significant group differences in either age or cognitive ability (as ascertained by BPVS and WM).

Naturally, there were significant group differences on all questionnaire data that denoted group membership. It is worth noting that children in the CP group still exhibited elevated levels of ADHD behaviours (Bonferroni corrected comparison: CP>comparison children, $p<.001$) and children with ADHD showed some conduct problems (often oppositional behaviours; Bonferroni corrected comparison: ADHD>comparison children, $p<.001$), as compared with mainstream comparison children (see Table 2; only SDQ data is available for the comparison children). Thus, although the CP and ADHD groups were selected not to be 'co-morbid', they were not entirely symptom free with regard to the other disorder domain (because of this, and to fully investigate performance differences on the tasks, the CP and ADHD groups were also compared against each other, not just to the comparison group, in the analyses). It is additionally noteworthy that while both EBD groups showed statistically higher levels of emotional problems (anxiety and depression symptoms as measured by the SDQ) than comparison children, the level of emotional problems did not differ statistically significantly across the two EBD groups (Bonferroni corrected comparisons: CP>comparison children, $p<.05$; ADHD>comparison children, $p<.01$; CP vs. ADHD,

Table 2. Descriptive statistics for age, verbal ability, working memory and behavioural rating scale information for each group.

	Age	BPVS	WM	SDQ HA	DuPaul Tot	DuPaul Imp/HA	SDQ CP	CD Screen	SDQ Emo
CP	**12.04**	**89.78**	**.14**	**5.50**	**23.17**	**10.33**	**6.72**	**7.44**	**3.67**
(*N*=18)	(2.36)	(9.23)	(1.01)	(2.68)	(10.61)	(4.68)	(1.27)	(1.42)	(2.33)
ADHD	**13.56**	**89.67**	**–.22**	**9.17**	**40.76**	**19.49**	**3.92**	**1.83**	**4.25**
(*N*=12)	(2.14)	(11.29)	(.65)	(.83)	(6.53)	(4.63)	(2.23)	(1.95)	(2.49)
Comparison	**12.54**	**96.38**	**.38**	**1.46**	**–**	**–**	**.54**	**–**	**.31**
(*N*=18)	(3.19)	(9.24)	(.69)	(1.76)			(.78)		(.63)

Note. Mean scores in bold, SDs in brackets. BPVS = British Picture Vocabulary Scale; WM=age standardised WM z-score; SDQ HA=Strengths and Difficulties Questionnaire Hyperactivity scale score; DuPaul Tot=DuPaul ADHD Rating Scale total score; DuPaul ADHD Rating Scale Impulsivity-Hyperactivity scale score; SDQ CP=Strengths and Difficulties Questionnaire Conduct Problems scale score; CD Screen=CD Screening scale; SDQ Emo=Strengths and Difficulties Questionnaire Emotional Problems scale score; CP=conduct problem symptoms group; ADHD=attention deficit hyperactivity disorder symptoms group.

p=1.00). Hence any distinct patterns of group differences in the experimental measures related to CP or ADHD status were not due to differences in the level of emotional problems in these two groups.

Catch the Frog Game (CFG)

There were no outliers in any of the groups. It should be noted that the CFG was only available for 12/18 control participants. One child from the CP group and one child from the ADHD group were excluded from the analyses due to computer problems. One child with CP terminated his participation in the middle of the task. Table 3 shows the average number of safe choices made during the entire task (180 trials), as well as for all 10:90 point trials (36 trials). Children with CP made fewest safe choices both during the entire task, and particularly when faced with the 'lure' of high possible point gain. Children with ADHD resembled the comparison children.

The between groups ANOVA did not reveal a significant main effect of group for total safe choices score ($F_{(2,36)}=1.39$; $p=.13$, one-tailed). Given the specific hypotheses we performed pairwise comparison *t*-tests and effect-size analyses to explore the pattern of results. None of the pairwise comparisons were statistically significant (CP vs. comparison group; $t(25)=1.44$, $p=.08$, one-tailed; $d'=.55$; ADHD vs. comparison group; $t(21)=.17$, $p=.43$, one-tailed; $.d'=.07$; CP vs. ADHD group; $t(26)=1.44$; $p=.08$, one-tailed; $d'=.55$).

Data for the total number of safe choices at 10:90 point trials was examined next. The between groups ANOVA showed a marginally significant main effect of group ($F_{(2,36)}=2.27$; $p=.06$, one-tailed). The group difference between CP group and comparison group was statistically significant and showed a medium effect size ($t(25)=1.72$, $p<.05$, one-tailed; $d'=.55$). The comparison between ADHD children and comparison children showed a negligible difference ($t(21)=.05$, $p=.48$, 1-tailed; $.d'=.02$). The group difference between CP group and ADHD group was of similar magnitude to that between CP group and comparison group ($t(26)=1.82$; $p<.05$; $d'=.55$).

Table 3. Descriptive statistics for Catch the Frog Game, and Response Switch task.

	CP (*N*=18)	ADHD (*N*=12)	Control (*N*=12; CFG) (*N*=18; RS)
CFG TS	**116.81** (12.98)	**125.09** (16.93)	**124.00** (13.29)
CFG 10:90	**22.44** (3.69)	**24.91** (3.65)	**24.83** (3.10)
RS RT difference (change-stay)	**197.01** (226.53)	**360.97** (346.86)	**124.79** (212.80)

Note. Mean scores in bold, SDs in brackets; based on all available data.
CFG=Catch the Frog Game (TS=total score, 10:90=10:90 points ratio trials); RS=Response Switch task; CP=early onset conduct disorder symptoms group; ADHD=attention deficit hyperactivity disorder symptoms group; Control=Comparison group.

Response Switch Task

There were no outliers in any of the groups. Data were missing from one child from the CP group and one child from the ADHD group due to computer problems. Given the low rate of non-responses in all groups (more than 60% of the children in each group did not commit a single nonresponse) and extremely low rate of errors in the comparison group (only two control children committing errors, thus preventing meaningful statistical comparison), non-response and accuracy data are not discussed further.

Table 3 summarises the RT 'change-stay' difference data for each group. The RT difference between change and stay trials (indicating the 'cost' of changing the colour-response mapping) was largest for children with ADHD, indicating possible 'conflict monitoring' difficulty in these children when correctly executing a task switch. It is worth noting that both children in the CP and children in the ADHD groups showed similar RTs to comparison children on stay trials (CP=1205ms; ADHD=1174ms; comparison group=1160ms), hence it was the magnitude of difference between the change and stay trials that really differentiated the ADHD group from the two other groups. In other words, the ADHD group was slower on the change (i.e. conflict) trials.

The between groups ANOVA showed a significant main effect of group on RT cost ($F_{(2,43)}=2.96$; $p<.05$, one-tailed). The group difference between ADHD group and comparison group was statistically significant and showed a large effect size ($t(27)=2.28$, $p<.025$, one-tailed; $d'=.82$). The group difference between CP group and comparison group was not statistically significant ($t(33)=.97$, $p=.17$, one-tailed; $.d'=.33$), but the group difference between CP group and ADHD group approached statistical significance and showed a medium effect size ($t(26)=1.52$; $p=.07$, one-tailed; $d'=.56$).

We had proposed that impulsive behaviours characteristic of CP are related to dysfunction (or difficulties) in 'valence monitoring', whereas impulsive behaviours characteristic of ADHD are related to dysfunction (or difficulties) in 'conflict monitoring'. There was tentative support for these predictions in our preliminary study that suffered from low N. The 'valence monitoring' dysfunction in the CP group was particularly evident under conditions where a potential large reward appeared to distract the children from the low probability of obtaining that reward. Children in the ADHD symptom group performed as well as children in the comparison group on the 'valence monitoring' task. Children in the ADHD group showed most difficulty in 'conflict monitoring', performing worse than children in the CP and comparison groups on conflict trials of the Response Switch (RS) task. Children in the CP group did not differ significantly from children in the comparison group in the 'conflict monitoring' domain. It is important to note that the CP group had elevated levels of ADHD symptoms compared with comparison children. The same was also true with ADHD children with respect to CP symptoms. In light of this lack of complete symptom dissociation and our relatively small N, the differential pattern of performance, even if modest, is all the more interesting.

Our findings fit with previous research into CP. Earlier studies have suggested that, at least under certain circumstances, children with CP may have difficulty in monitoring changes in reinforcement contingencies (e.g. Daugherty & Quay, 1991; O'Brien et al., 1994). Furthermore, Dodge and colleagues have argued that aggression may result from difficulty in appraising or monitoring the outcome of aggression (Dodge & Pettit, 2003), something which may be conceptualised as a valence monitoring deficit. The novel Catch the Frog Game (CFG) presented the children with an experimental condition that is relatively similar to the kind of real life scenarios where valence monitoring is required and in which CP impulsiveness is manifest (i.e. failure to make appropriate 'snap-shot' decisions about affective consequences of one's own actions). Children in the CP group performed poorly under conditions where there was a lure of high reward.

The findings from this study also fit with some previous findings from the ADHD literature. A number of studies have highlighted the possibility of a 'conflict monitoring' deficit in ADHD (see, for example, Kuntsi et al., 2006; Shallice et al., 2002; Pennington & Ozonoff, 1996). Children with ADHD seem to find it difficult to perform cognitive operations that entail processing competing stimulus elements that require effortful control. This seems particularly true when a pre-potent motor response needs to be cancelled in favour of a competing, novel representation (Nigg, 2001). Again, there was initial support for the hypothesis that children with ADHD have a 'conflict monitoring' dysfunction. Their larger RT cost in the Response Switch (RS) task could indicate a weakened ability to recruit additional cognitive resources that are needed to support response conflict resolution. It is particularly interesting to note that children with ADHD were not slower overall in this task, as has been found on some more general conflict tasks such as Stroop (van Mourik, Oosterlaan & Sargeant, 2005), but were particularly poor at overcoming the conflicting motor response in the task-switch situation.

Although these are potentially interesting findings, several limitations apply. Firstly, the results must be considered preliminary until replicated in larger samples, both in the community and in the clinic. The current study population represents CP and ADHD symptoms as they occur in an EBD setting. Secondly, additional tasks should be employed in the future to test the valence and 'conflict monitoring' predictions put forward in this paper. As each task is an indirect and imperfect probe of the cognitive construct it is proposed to measure, a profile of performance across related tasks would strengthen claims about cognitive deficits pertaining to impulsive behaviours in CD and ADHD. However, the current results give direction to the development of future assessment of valence and 'conflict monitoring' difficulties in children with CD and ADHD.

Taken together, the findings from this study encourage further investigations of impulsive behaviours and their cognitive correlates in CP and ADHD. The selective pattern of performance for children with CP and ADHD symptoms also suggests that any difficulties in task performance do not lie within response selection per se. Both groups were able to make appropriate response selections in certain tasks. It is more likely that such selection can be compromised by difficulty in monitoring certain classes of response competition – either affective or cognitive.

Study of the dysfunctional cognitive processes underlying impulsive behaviours in CP and ADHD may be important for designing individualised treatment programmes in the school setting. Our data suggest that children with CP may be lured by large rewards and will possibly ignore information that is relevant for sensible decision making in situations where there is perceived potential for large gains. It may be useful to think whether and how this sensitivity to rewards could be capitalised on by reinforcing those behaviours and activities that are desirable in the school setting. In the GTF game the potential reward was revealed immediately and one consideration in the school setting is whether immediate, tangible rewards for good behaviour and achievement could be introduced for youngsters who have behavioural problems. Currently ADHD is successfully treated with stimulant medication and as such there may be less incentive to search for cognitive treatment options for this disorder than for CP. However, well targeted cognitive approaches that take into account the reality of the cognitive difficulties that limit the child's functioning are still likely to be important. Furthermore, it is likely that many children with ADHD symptoms go undiagnosed and do not receive any treatment (pharmacological or otherwise). It may be possible to devise activities where children with ADHD symptoms do not have competing demands for their attention, where the task at hand is highly motivating and where it can perhaps be performed in short bursts (so as not to overtax these children).

Conclusion

In short, we claim that charting of distinct cognitions associated with disorder risk and how they come about will be informative for prevention and treatment efforts. The tentative findings reported in this paper suggest the possibility of divergent cognitive underpinnings for disruptive behaviours in different kinds of children. Lack of moral behaviours may be motivated by different affective vulnerabilities in subgroups of children with conduct problems. Impulsive behaviours in children with conduct problems and ADHD are likely to reflect different cognitive vulnerabilities. These findings are preliminary, but they illustrate the concept of equifinality; similar behaviours stemming from potentially very different cognitive/affective difficulties. The concepts and data put forward in this paper will hopefully serve as a useful backdrop for professionals in the school system who have the unenviable task of selecting and implementing suitable assessments and interventions for children with disruptive behaviours.

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Appendix A: CD symptoms scale.

1. Often fights with other children or bullies them.
2. Steals from home, school or elsewhere.
3. Has used force to take something from another child.
4. Has hit other people with something that could really hurt them.
5. Often initiates physical fights.