Children with oppositional-defiant disorder display deviant attentional processing independent of ADHD symptoms

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Summary. Objective: To examine neurophysiological correlates of attentional processing in children with oppositional-defiant disorder (ODD) independent of ADHD symptoms. Method: Thirteen children with oppositional-defiant disorder without comorbid ADHD symptoms and 13 healthy control children (all 11 years) performed a cued Continuous Performance Test (CPT-AX). Event-related potentials (ERP) to cue and target stimuli were examined for group differences. Results: Children with ODD showed significantly reduced parietal P3a and P3b amplitudes to cues and to targets, compared with healthy controls. ERP amplitudes correlated with oppositional and aggressive behavior scores. Conclusions: Event-related potentials revealed reduced orienting to cues and reduced executive target processing in children with ODD. These findings indicate that ODD children show neurophysiological deviances independent of ADHD comorbidity.

Keywords: Oppositional-defiant disorder, attention, continuous performance test, event-related potentials, P3, child.

Introduction

Oppositional-defiant disorder (ODD) is associated with compromised social relations with parents and peers and impaired school and academic performance (Greene et al., 2002). Moreover, ODD is a significant risk factor for a wide range of concurrent and future psychiatric disorders, not only for conduct disorder, but also for anxiety and mood disorders, even in adult age (Kim-Cohen et al., 2003).

ODD has been linked to deficits in self-regulatory abilities which are necessary to prevent reactive acting-out of negative emotions (Greene and Doyle, 1999). The self-regulation of emotion and behavior relies on attentional processes: orienting attention to and focusing on a (neutral or positive) object or task reduces affective arousal and limits the experience of negative emotion (Harman et al., 1997).

The evidence for attentional deficits in subjects with disruptive disorders is equivocal. Older studies examined neuropsychological deficits in samples without reliable DSM diagnoses (Moffitt, 1993). Even where there is a diagnosis of a disruptive disorder...
according to DSM, the question of comorbid ADHD symptoms remains an issue of concern. Thus, it is still not clear whether attentional deficits in disruptive youth are specifically related to disruptive pathology or due to co-occurring ADHD symptoms (Nigg, 2003; Oosterlaan et al., 1998). Furthermore, although ODD and CD are highly interrelated in school-age, the two disorders have different symptoms, predictors, age profiles, and patterns of comorbidity, and a substantial proportion of boys with ODD do not develop CD (Loeber et al., 2000; Maughan et al., 2004). The distinction between these two disorders, however, has often been disregarded by using mixed ODD/CD samples.

Using event-related potentials to investigate covert information processing, a significantly reduced P3 amplitude was found in adolescents with conduct problems compared with adolescents without any conduct problems, as they performed the Stroop test (Bauer and Hesselbrock, 1999a) or a visuospatial mental rotation task (Bauer and Hesselbrock, 1999b). Both groups contained a comparable number of subjects with ADHD. Examining adolescents with a visual oddball task, a reduced parietal P3 amplitude was found in “pure” groups with CD and ODD subjects, respectively, compared with healthy adolescents (Iacono et al., 2002). Subjects who fulfilled all, or all but one, of the ADHD criteria, were excluded from these groups but ADHD symptoms below this diagnostic threshold were not controlled for. Additionally, adolescent samples provide some intrinsic methodological problems as adolescents can be affected by either early-onset or late-onset CD, which differ with regard to symptom characteristics and risk factors (Loeber et al., 2000). Those with early-onset CD display more oppositional and aggressive behaviors than adolescents with late-onset CD, and late-onset CD is more related to psychosocial risk factors and less related to biological risk factors than early-onset CD. Thus, examining an adolescent group without differentiating between early-onset and late-onset CD leads to considerable within-sample variety. Furthermore, disruptive adolescents are more likely than healthy adolescents to engage in fights and to suffer cerebral trauma, as well as to abuse alcohol and drugs causing cognitive deficits. By choosing children instead of adolescents, these potentially confounding effects can be minimized.

Another methodological point is that the paradigms used in the studies mentioned above do not allow us to differentiate between different attentional processes which are all reflected in the P3 amplitude. The cued Continuous Performance Test (CPT-AX), however, where the target X is preceded by the cue A makes it possible to distinguish between orienting of attention to cues and target processing. Using the CPT-AX in a mixed ODD/CD group, Banaschewski et al. found a reduced P3a to cues (Banaschewski et al., 2003) but not to targets (Banaschewski et al., 2004), which may reflect reduced attentional orienting to stimuli inducing preparatory processes. Their ODD/CD subjects, however, displayed CBCL attention problem scores indicating subclinical attention problems (mean T score = 65), and some of their subjects suffered from a comorbid emotional disorder so that their findings could be due to comorbid attentional and/or emotional symptoms.

All in all, the question has not yet unequivocally been answered whether youth with oppositional-defiant disorder but without ADHD symptoms show deviances in attentional processing. To avoid the methodological problems explained earlier, we examined thoroughly diagnosed school-age children with ODD (but not CD) without any comorbid ADHD symptoms. We used the CPT-AX paradigm with simultaneous ERP registration, which allows us to examine attentional deviances even if there are no performance differences between groups. Cues and targets – as task-relevant stimuli that must be attended to – evoke a parietal P300, which typically consists of P3a and