



Accuracy of drawing in a dual-task and resistance-to-distraction study: Motor or attention deficit?

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Abstract

To determine whether manual incoordination is caused by attention deficit or not, we used an accuracy drawing task as a primary task in dual-task and resistance-to-distraction studies, and examined if thus measured attention could differentiate inattention (IA) and combined (CO) subtypes of ADHD. The secondary tasks and distractions failed to lower the primary task performance in IA, CO and control groups. We also compared the impairment scores of the accuracy drawing tasks from the Movement Assessment Battery for Children [Henderson, S. E., & Sugden, D. A. (1992). *Movement assessment battery for children*. London: Psychological Corporation.] between the groups with attention deficit hyperactivity disorder (ADHD) and/or developmental coordination disorder-inaccurate drawing type (DCD-ID). There were no group differences in the impairment score between the control and the ADHD groups, and between ADHD and ADHD plus DCD-ID groups. We concluded that inaccurate drawing is not caused by attention deficit, but that it is a manifestation of a motor deficit as a separate entity from attention deficit.

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1. Introduction

Attention deficit hyperactivity disorder (ADHD) hampers children's academic achievement and activity of daily living. Children with ADHD have difficulty in attending to cognitive and motor tasks that demand attention for a length of time to complete them. In a classroom situation, they may have difficulty in sitting still and listening to teachers and other students, and react to any stimuli that trigger their attention. While engaged in academic activities, they may thus not be able to stay on a task until they complete it. At home, children with ADHD may have problems similar to those in the classroom. They may be restless and fidget while eating at the dining table or studying at a desk. As the contemporary diagnostic criteria of DSM-IV (American Psychiatric Association; APA, 1994) indicate, the core attributes that encompass these behavioural symptoms are inattention, impulsivity and hyperactivity.

The DSM-IV (APA, 1994) distinguishes three sub-types of ADHD, the predominantly inattentive subtype (IA), the hyperactive–impulsive subtype (HI), and a combination of these symptoms (CO). Behavioural examples of inattention, impulsivity and hyperactivity are not difficult to describe. In fact, almost all individuals, children and adults alike, behave as such from time to time. To diagnose ADHD, therefore, it is important to judge whether the behavioural problems are in excess or not, compared to the age norms. The comparison of this sort has been left to subjective judgment by teachers, parents and clinicians. A number of questionnaires (e.g., Achenback & Edelbrock, 1983; Conners, 1997; Levy & Hay, 1991) have been developed to standardise the process of the subjective judgment.

The inheritant limitation of questionnaire assessment lies in the subjective nature of rating children's behavioural characteristics. For example, school teachers who have Type A personality (Hunter, Parker, & Williamson, 1985) or mental health problems (Schachar, 1991) seem to rate children's behaviours strictly. Different settings (e.g., mainstream class, segregated special class) also influence the way teachers rate children's behaviours (Miyahara, Möbs, & Doll-Tepper, 2001). On one hand, it is important to tap into phenomenological realities of teachers and parents for holistic understanding of the problems. On the other hand, subjective diagnosis of ADHD can cause over diagnosis, over prescription and potential abuse of stimulant medication.

To supplement subjective ratings of children's behaviours, attempts have been made to measure inattention, impulsivity and hyperactivity objectively. For the objective measurement of sustained attention and motor inhibition, in particular, computerised choice reaction time tasks, such as the Continuous Performance Task (Conners, 1995) and the Stop Signal Test (Gordon, 1983) have been developed and clinically utilised at times. However, reaction time tasks are repetitive and tedious (Lezak, 1995), and attention measures and motor inhibition measures often do not correspond to attention and behaviour inhibition outside the laboratory (cf. Scheres, Oosterlaan, & Sergeant, 2001).

In addition to choice reaction-time tasks, researchers have measured children's attention by applying the dual-task paradigm (Kahneman, 1973; Wickens, 1976) which posits that concurrent execution of two tasks interferes with the performance of one or both tasks as a result of dividing attention. Lawrence et al. (2002) distinguished children with ADHD from those without ADHD in their performance on a commercial videogame (primary task), while they were watching a TV animation program (secondary task). A significant group difference was found in the decreased performance on the primary task in the expected direction in such meaningful tasks for children. Although the tasks were not as

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