Introduction

The findings in motor behaviour of Attention Deficit Hyperactivity Disorder (ADHD) and Developmental Coordination Disorder (DCD) have led some to suggest that they simply reflect a common childhood developmental disorder (Gillberg, 2003; Kaplan et al., 1998). On the other hand, current concepts in ADHD suggest a response inhibition deficit (Burkley, 1997), whereas DCD deficit lies in the inability to produce efference copy for movement corrections (Katschmursky et al., 2001; Wilson et al., 2001). Presence of these deficits was investigated through the amplitude transition function (Becker & Jürgens, 1979) by examining the ability of children with ADHD and/or DCD in movement corrections to superceding stimuli in a crossed double-step tracking task.

Aims of this study are to determine:

- The patterns of movement response to error correction in children with ADHD and/or DCD.
- How is visual-spatial error information updated?
- The nature of the response inhibition and efference copy deficits underlying motor dysfunctions in ADHD and DCD respectively.

Methods

Participants

Children aged between 10 to 12 were recruited from primary schools. The children were divided into: ADHD-PI (Inattentive) (n=6), ADHD-C (Combined) (n=3), ADHD-PI with DCD (n=4), DCD (n=5), and control group (n=8) using the following measures.

Measures

- Australian Twin Disruptive Behaviours Scale (ADBS; Levy & Hay, 2001)
- Conners’ Parent Rating Scale (CPRS-R; Connors, 1997)
- Conners’ Teacher Rating Scale (CTRS-R; Connors, 1997)
- Developmental Coordination Disorder Questionnaire (DCDQ; Wilson et al., 1998)
- McCarron Assessment of Neuromuscular Development (MAND; McCarron, 1982)

Double-step tracking task

- Participants were required to capture a target that jumped to different locations twice in succession.
- The first step served as signal for initiation of a movement response.
- The second step indicated new target location and was viewed as an induced movement error where amendment of the initial movement was required.
- Two step conditions: single- and double-step.
- Four target positions, two on each side of home base (76 cm, 152 cm).
- Six interstimulus intervals of 40, 80, 120, 160, 200 and 240 ms.
- A total of 576 randomised trials.

Amplitude transition function (ATF)

ATF represents the variations of the amplitudes of the initial response as a function of the determinant time interval (D), which reflects the actual processing time available after the onset of the second target step stimulus (Becker & Jürgens, 1979). Depending on the duration of D, three types of amplitude responses could be obtained (see Fig. 1). Deficit in efference copy would affect the ability to produce a corrective response whereas a deficit in response inhibition would affect the ability to cancel the direction of the movement.

Conclusion

The preliminary findings in this study suggest that the amplitude of an initial double-step response varies as a function of D in all groups. The ADHD subtypes were able to inhibit the initial response when a correction is required but this ability is reduced in ADHD-C. Similarly, the DCD group was able to produce a corrective response that is accurate with respect to the final target position but this ability is also diminished compared to the control and ADHD-PI groups. These results suggest that there may be a ADHD subtype difference in response inhibition and that efference copy is operating in DCD but is not as effective. A larger sample size is required for more conclusive findings.

References


Pek Ru Loh, Jan P. Piek and Nicholas C. Barrett
School of Psychology, Curtin University of Technology, Western Australia