Postural control and sensory information integration abilities of boys with two subtypes of attention deficit hyperactivity disorder: a case-control study.


Abstract
BACKGROUND: Attention deficit hyperactivity disorder (ADHD) is one of the most commonly diagnosed psychiatric disorder in childhood. ADHD children with overlapping symptoms and signs of motor problems have more serious prognosis than that of children with ADHD only. However, the motor and sensory processing problems in children with ADHD have not been studied well. Few people adopt the technique of computerized dynamic posturography (CDP) in the study of ADHD, which is applied widely in clinical and laboratory research to objectively evaluate human's balance performance. This study aimed to assess the characteristics of postural control and sensory information processing of boys with two subtypes of ADHD by using CDP, so as to provide the proof for non-drug therapy of ADHD.

METHOD: From June 2003 to September 2004, a total of 73 boys (7-15 years of age) with ADHD and 73 normal developing boys matched by age and intelligence quotient from Peking University Institute of Mental Health were recruited in the study. The Sensory Organization Test was adopted to test the static balance performance under six sensory input conditions by SMART EquiT 8.0 (NeuroCom) instrument. The sensory information from three sensory systems were available under condition 1, the visual inputs were removed or distorted under condition 2 or 3, the somatosensory inputs were in conflict with or without the visual inputs removed under condition 4 or 5, and both the visual and somatosensory inputs were in conflict under condition 6. The indexes of equilibrium score, somatosensory, vestibular, and visual ratios, and strategy scores were analyzed to indicate the subjects' postural control ability.

RESULTS: ADHD boys had significantly lower composite equilibrium score (CES) than the normal group (P < 0.05). Under condition 1 and conditions 3-6, the equilibrium scores (ES) of the ADHD group were significantly lower (all P < 0.05) than those of the control. Significantly lower visual and vestibular ratios and strategy scores under conditions 4-6 were found in boys with ADHD compared with the control group (P < 0.05). Boys of ADHD-predominantly inattentive (ADHD-I) type had a significantly lower CES and ES under conditions 4-6 than the controls (all P < 0.05) while the ESs of ADHD-combined type (ADHD-C) boys under each condition were similar with that of boys with ADHD-I and no significant difference was found between boys with ADHD-C and the control group (all P > 0.05). Compared with the control group, the ADHD-I boys showed significantly lower visual and vestibular ratios and strategy scores under conditions 4-6 whereas the ADHD-C boys showed a trend of lower visual ratio (all P < 0.05).

CONCLUSIONS: ADHD boys had a poorer static postural control ability and impaired function of processing visual and vestibular information compared with the normal control. Boys with ADHD-I showed particularly severe defect of static postural control and vestibular function integrating conflict information than normal boys. These deficits may be an important contributor to the clinical presentation of ADHD children and their cognitive deficits. Assessment and training of postural control function would be suggested during the diagnosis and treatment of ADHD children.