Cognitive Function of Children and Adolescents with Attention Deficit Hyperactivity Disorder and Learning Difficulties: A Developmental Perspective

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Abstract

Background: The cognitive function of children with either attention deficit hyperactivity disorder (ADHD) or learning disabilities (LDs) is known to be impaired. However, little is known about the cognitive function of children with comorbid ADHD and LD. The present study aimed to explore the cognitive function of children and adolescents with ADHD and learning difficulties in comparison with children with ADHD and healthy controls in different age groups in a large Chinese sample.

Methods: Totally, 1043 participants with ADHD and learning difficulties (the ADHD + learning difficulties group), 870 with pure ADHD (the pure ADHD group), and 496 healthy controls were recruited. To investigate the difference in cognitive impairment using a developmental approach, all participants were divided into three age groups (6–8, 9–11, and 12–14 years old). Measurements were the Chinese-Wechsler Intelligence Scale for Children, the Stroop Color-Word Test, the Trail-Making Test, and the Behavior Rating Inventory of Executive Function—Parents (BRIEF). Multivariate analysis of variance was used.

Results: The results showed that after controlling for the effect of ADHD symptoms, the ADHD + learning difficulties group was still significantly worse than the pure ADHD group, which was, in turn, worse than the control group on full intelligence quotient (98.66 ± 13.87 vs. 105.17 ± 14.36 vs. 112.93 ± 13.87, P < 0.001). The same relationship was also evident for shift function (shifting time of the Trail-Making Test, 122.50 [62.00, 194.25] s vs. 122.00 [73.00, 201.50] s vs. 66.00 [45.00, 108.00] s, P < 0.001) and everyday life executive function (BRIEF total score, 145.71 ± 19.35 vs. 138.96 ± 18.00 vs. 122.71 ± 20.45, P < 0.001) after controlling for the effect of the severity of ADHD symptoms, intelligence quotient, age, and gender. As for the age groups, the differences among groups became nonsignificant in the 12–14 years old group for inhibition (meaning interference of the Stroop Color-Word Test, 18.00 [13.00, 25.00] s vs. 17.00 [15.00, 26.00] s vs. 17.00 [10.50, 20.00] s, P = 0.704) and shift function (shifting time of the Trail-Making Test, 62.00 [43.00, 97.00] s vs. 53.00 [38.00, 81.00] s vs. 101.00 [88.00, 114.00] s, P = 0.778).

Conclusions: Children and adolescents with ADHD and learning difficulties have more severe cognitive impairment than pure ADHD patients even after controlling for the effect of ADHD symptoms. However, the differences in impairment in inhibition and shift function are no longer significant when these individuals were 12–14 years old.