Empirical differences in the quality of handwriting between children with and without ADHD

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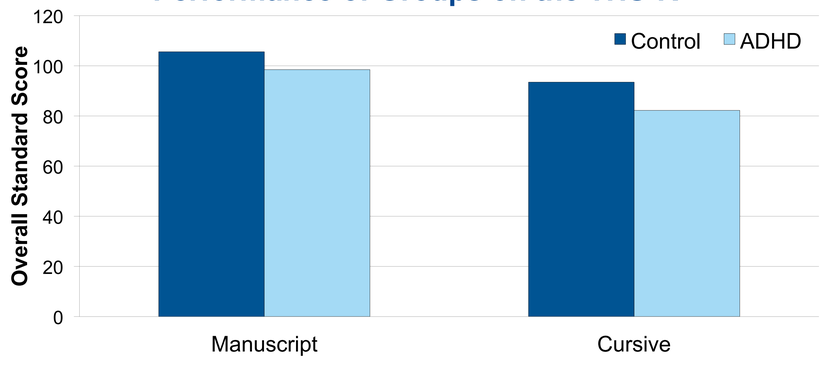
Introduction

- Previous research using subjective ratings of handwriting quality have found that children with ADHD have messy and illegible handwriting (Adi-Japha et al., 2007; Tucha & Lange, 2001, 2004, 2005).
- In clinical practice less attention is paid to motor problems in children with ADHD (Fliers et al., 2010) despite 30-50% of them having these difficulties (Fliers et al., 2008).
- Learning disability of written expression is more common in ADHD than reading or mathematics disabilities (Mayes & Calhoun, 2006, 2007).
- The purpose of this study was to objectively examine the quality of handwriting in children with ADHD as compared to those without.
- To further understand any differences in handwriting quality, groups were also compared on fine motor control and cognitive factors.

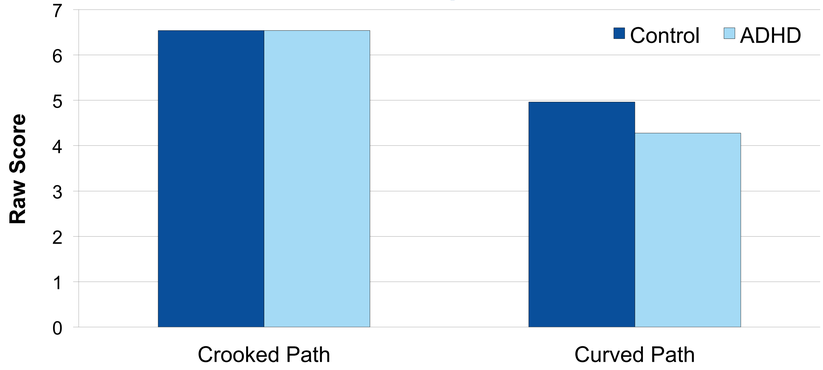
Methods

- 50 children with ADHD (41 males, 9 females) and 50 children without ADHD (30 males, 20 females) in Grades 4-8 were recruited for this study.
- ADHD had been previously diagnosed by a physician, psychiatrist, or psychologist. All ADHD subtypes were included.
- Handwriting quality was measured using the overall standard scores of the manuscript and cursive versions of the Test of Handwriting Skills - Revised (THS-R).
- Fine motor control was measured using the raw scores of the Drawing Lines Through Paths tasks of the Bruininks-Oseretsky Test of Motor Proficiency, 2nd Edition (BOT-2).
- Children were also compared on the Block Design, Similarities, Digit Span, and Coding subtests of the Wechsler Intelligence Scale for Children - 4th Edition (WISC-IV).
- The two groups were compared on each measure using separate MANOVAs. Significant MANOVAs were followed up with discriminant function analysis (DFA).

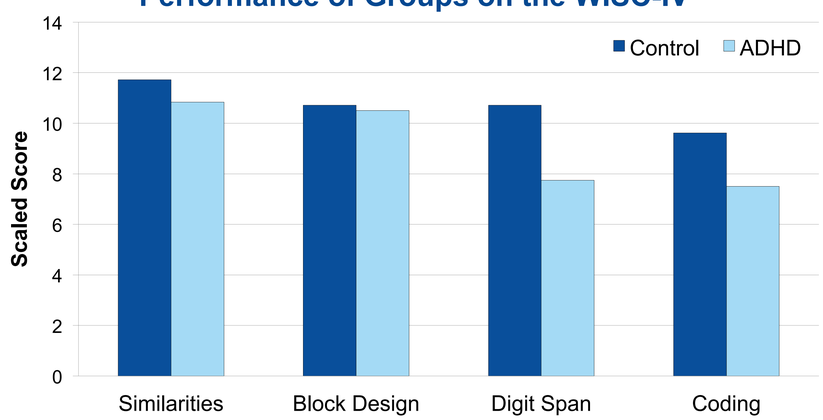
Performance of Groups on the THS-R



Performance of Groups on the BOT-2



Performance of Groups on the WISC-IV



Results

- The mean age of control participants was 11.06 years (SD = 1.55) and ADHD participants was 11.62 years (SD = 1.41).
- There was a significant multivariate effect of group on the THS-R [Wilks' Lambda = 0.842, $F(2,97) = 9.098$, $p = 0.00$]. Follow-up DFA indicated that scores on the cursive version (.848) were more predictive of group membership than scores on the manuscript version (.195).
- There was no significant difference between the groups on the Paths tasks of the BOT-2 [Wilks' Lambda = 0.942, $F(2,97) = 2.97$, $p = 0.056$].
- There was a significant multivariate effect of group on the WISC-IV [Wilks' Lamba = 0.632, $F(4, 95) = 13.802$, $p = 0.00$]. Follow-up DFA indicated that Digit Span (0.820) and Coding (0.628) were better predictors of group membership than Block Design (-0.332) and Similarities (-.087).

Discussion & Conclusions

- These findings suggest that children with ADHD have lower quality cursive and manuscript handwriting as compared to children without ADHD. Furthermore, children with ADHD performed worse on cursive as compared to manuscript handwriting.
- This difference does not appear to be related to fine motor control difficulties as there were no differences on the BOT-2. This difference might be related to differences in working memory and symbol processing as seen in the differences on Digit Span and Coding on the WISC-IV.
- These findings are consistent with clinical observations and previous research that used subjective ratings.
- These results indicate that children with ADHD are at higher risk than their normative peers of experiencing problems with handwriting and printing. Assessment and treatment of these skills should be considered in children with ADHD.

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