

The Role of ADHD in Academic Fluency: A Follow-up Study

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Background

It is well substantiated that children with ADHD often have academic deficits (Hinshaw, SP, 2002). Academic fluency, the ability to perform reading and mathematical tasks quickly and accurately, is crucial for academic success. Reading fluency is an important attribute associated with reading comprehension. Poor reading fluency has been found to compromise silent reading comprehension in children with ADHD (Schuck, 2008). Although a substantial overlap exists with ADHD and problems with fluency, fluency is rarely assessed on rating scales employed to diagnose ADHD. For example, the *Conners' Rating Scales*, and the *Achenbach Child Behavior Checklist* do not have items that specifically address fluency. Given that educational authorities require evidence for fluency deficits in order to grant accommodations to students, it is important that assessment protocols include items that characterize fluency problems in ADHD. Rating scales with an academic fluency item have been found to be an accurate predictor of actual limitations in academic fluency in children with ADHD (Ansari et al., 2008). However, this finding has not been replicated. The present study will examine academic fluency in both ADHD and a community control sample.

Objective

To determine the relationship between academic fluency (reading and math) and symptoms of Attention Deficit Hyperactivity Disorder (ADHD). To examine the correlations between fluency items and symptom ratings among both children with ADHD and normative controls. To demonstrate the sensitivity of these fluency items with an independent measure of reading and math ability.

Bibliography

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Methods

The present study included 116 children, ages 6-12 years, with a diagnosis of ADHD and a normative group composed of 186 students. The Community Control group was drawn from a community sample of students from two public schools and one independent school located in upper middle class communities in Southern Orange County, California. The ADHD sample consisted of children evaluated at a private neuropsychological clinic in Southern Orange County. Families were self-referred, often due to concerns about academic underperformance.

A battery of assessments was completed for each participant: Center for Learning (C4L) Rating Scale (Ansari et al., 2008), SNAP rating scale (Swanson, Nolan and Pelham, 1981), and Woodcock Johnson Tests of Achievement III – Reading and Math Fluency (Woodcock et al., 2001). The items of the C4L are listed in their entirety below. Item number one is considered to be the primary item to determine fluency, while the remaining five items were included largely to rule out potentially confounding learning disabilities.

	Not at All	Just A Little	Quite A Bit	Very Much
1. Takes an inordinately long time to finish homework, regardless of the subject or level of difficulty.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>
2. Becomes overly anxious about taking timed tests.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>
3. Reads slowly even when the material is simple.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>
4. Works slowly on math assignments even when material is simple.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>
5. Has specific trouble with reading.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>
6. Has specific trouble with math.	<u> 0 </u>	<u> 1 </u>	<u> 2 </u>	<u> 3 </u>

A series of one-way ANOVA analyses were conducted to evaluate differences between the ADHD and Community Control groups in *WJ-III* Reading Fluency (RF), *WJ-III* Math Fluency (MF) and each of the *C4L* items. Within the groups, individual items from the *C4L* were correlated with RF and MF. Correlations of *SNAP* subscales Hyperactivity-Impulsivity (HI), Inattention (INA) and Oppositional Defiance Disorder (ODD) with RF, MF and each of the *C4L* items were also performed within the groups.

Conclusions

Between groups analysis revealed that for individuals with ADHD, the *C4L Rating Scale* items were endorsed much more frequently than for the Community Controls. In addition, the key rating item of interest (item #1) was strongly associated with a symptoms of ADHD, (ES = -1.45) the strongest correlation among the *C4L* rating items.

A between groups analysis also established that children in the ADHD group presented with lower math and reading fluency scores than those without. These differences were strong, with large effect sizes for both reading fluency and math fluency (ES= 1.33 and 1.43, respectively).

As expected, the primary *C4L rating scale* item of interest (item 1) was found to have convergent validity with academic fluency, as measured by *WJ-III* Math Fluency. The *WJ-III* Math Fluency subtest is likely more sensitive to generalized fluency problems, particularly in children with ADHD, since it is a more challenging than the Reading Fluency subtest. Specifically, since the Math Fluency subtest requires rapid retrieval of math facts and exact numerical answers, it likely requires more attentional resources than the *WJ-III* Reading Fluency subtest, a task of simple, more automatic discrimination. The correlations found for the other *C4L* items were expected, as children with reading problems presented with impaired RF and children with math problems were found to have weak math fluency. Of note, impaired MF was mildly correlated ($r = -.21733$, $p=.0031$) with *C4L* item 2 (“*Becomes overly anxious about taking timed tests.*”). This association may be explained by the fact that timed math fact tests (addition and subtraction tasks) are typically the first timed tests that children are exposed to in first grade and are therefore a reminder of the child’s fluency limitations.

The fact that *C4L item 1* was found to be correlated with a measure of academic fluency (MF) in children with ADHD, while no such association was found between the *SNAP* subscales and academic fluency, suggests that *C4L item 1* is unique in detecting fluency problems. It is interesting to note how strongly the *C4L* items are associated with the inattentive subtype of ADHD, while having little association with the hyperactive/impulsive type of ADHD. This finding provides support for the notion that symptoms of inattention put these children at great risk of poor academic performance.

These findings provide evidence that children with ADHD are at great risk for impaired academic fluency when compared to their same age, typically developing peers. In addition, the key *C4L* rating item, item #1, has a robust association with academic fluency. These findings provide support for the utility of this fluency rating item in a study that included a community comparison group. This study supports the inclusion of a fluency item in rating scales commonly used to screen for symptoms of ADHD.

Results

Within Group Correlation Coefficients: C4L Rating Items and Fluency Standard Scores

*p<.05	RF Standard Score	MF Standard Score
ADHD		
C4L Item 1	-.12707 (.2981)	-.39717 (.0009)
C4L Item 2	-.13437 (.2710)	-.23799 (.0543)
C4L Item 3	-.46771 (<.0001)*	-.28307 (.0193)
C4L Item 4	-.13280 (.2696)	-.45049 (.0001)
C4L Item 5	-.57272 (<.0001)*	-.19205 (.1195)
C4L Item 6	-.13620 (.2645)	-.33808 (.0055)

Community Control

*p<.05	RF Standard Score	MF Standard Score
ADHD		
C4L Item 1	-.06983 (.3475)	-.08592 (.2475)
C4L Item 2	-.09908 (.1821)	-.21733 (.0031)
C4L Item 3	-.20635 (.0050)*	-.07531 (.3096)
C4L Item 4	.00129 (.9862)	-.27534 (.0002)
C4L Item 5	-.21232 (.0038) *	-.04624 (.5331)
C4L Item 6	.02684 (.7176)	-.24888 (.0007)

In both groups, as predicted, the two math items (items 4 and 6) were significantly correlated with MF, and the reading items (items 3 and 5) was correlated with RF.

Among the Community Control sample, rating of anxiety during timed tests (item 2), was correlated with MF, but not RF. This relationship approached significance among the ADHD sample as well. In the ADHD sample, the key *C4L* rating item of interest (item 1 “*Takes an inordinately long time to finish homework, regardless of the subject or level of difficulty*”) was correlated with trouble with MF but not trouble with RF.

Within Group Correlation Coefficients: SNAP Subscales and Fluency Standard Scores

Within the ADHD sample, no significant correlations were evident between *SNAP* ratings and the fluency measures. Among the Community Control sample, higher INA and HI ratings were associated with decreased MF.

Within Group Correlation Coefficients: C4L Items and SNAP Subscales

Increased INA ratings are associated with higher *C4L* ratings in both groups, and neither group shows a relationship between HI ratings and *C4L* ratings. In the ADHD group, increased ODD ratings were also associated with each *C4L* item, except the two specifically pertaining to reading (items 3 and 5).

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For further information

Information on this and related projects can be obtained at info@C4L.net.