

Extended Time Improves Reading Comprehension Test Scores for Adolescents with ADHD

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Abstract

Objective: To test the hypotheses that reading comprehension difficulties of adolescent students with ADHD: 1) are related not so much to weak verbal abilities or weak basic reading skills, as to impairments of working memory and processing speed characteristic of ADHD; and 2) that extended time on a test of reading comprehension would yield significantly higher reading comprehension scores than would standard time.

Method: Charts of 145 adolescents 13-18 years diagnosed with DSM-IV ADHD and no specific reading disorder after a comprehensive clinical and psycho-educational evaluation, were reviewed to extract 1) word reading and word attack subtest scores from the Woodcock-Johnson Achievement Test or the Wechsler Individual Achievement Test 2) Index scores from the WISC-IV or WAIS-III IQ tests; 3) scores from the Nelson-Denny Reading Test.

Results: Mean index scores for verbal comprehension abilities not including reading were in the high average range, but working memory and processing speed index scores were significantly weaker, Under standard time limits 53% were unable to complete the reading comprehension test and only 42.8% were able to score within 1 SD of their IQ verbal comprehension index (VCI). When allowed extended time, 77.9% were able to score within 1 SD of their VCI. T-test comparisons between standard time and extended time were significant at <0.001.

Conclusions: Allowing extended time for adolescents with ADHD to complete tests involving reading may help to compensate for their impairments of working memory and processing speed, allowing them to score closer to their actual verbal abilities.

Introduction

Among adolescents with ADHD are some who report chronic difficulties in reading that significantly impair their ability to complete test and assignments within usual time allotments. Although most demonstrate no significant impairment in phonological processing, the usual hallmark of dyslexia, these students complain of a chronic slowness in assigned reading, due usually to a need to re-read passages several times in order to fully grasp the meaning. They also report that, though they may understand the content at the time of reading a passage, they have chronic difficulty in recalling what they have read just a few minutes earlier. It appears that re-reading is needed to engage their focus sufficiently to encode the information in memory. One student with ADHD described this: “Most of the time when I’m reading assignments in my textbooks, I’m just licking the words rather than chewing them. That’s why I have to keep going back to read it all over again.”

Interestingly, many of these students report that such impairments often are not present when reading self-chosen rather than assigned texts. This clinical observation suggests that such reading impairments may be the result of impairments in executive functions (EF), which tend to be situationally specific, rather than consistent impairment in verbal abilities or basic reading skills. Pennington [1] and Brown [2,3] have described the situational variability of executive functions impaired in ADHD, how individuals with ADHD often demonstrate little impairment in their ability to deploy executive functions when doing tasks which hold strong personal interest or anxiety for them, though they show much EF impairment in most other situations. This is consistent with findings by Anmarkrud and Braten [4] that students’ motivation for reading content of a personal interest to them, the value they place on reading a specific text, plays an important role in their reading comprehension.

In this study, we hypothesized that adolescents with ADHD who are slow in reading comprehension tasks and do not have a specific learning disability in reading would demonstrate relative weaknesses in working memory and processing speed, aspects of executive function often impaired in ADHD. Further, we hypothesized that extended time on a test of reading vocabulary and reading

comprehension would help these students to compensate for their ADHD-related reading impairments, yielding higher reading comprehension scores more consistent with the individual's verbal comprehension abilities as shown on an IQ measure not involving reading.

There is considerable evidence that executive functions often impaired in ADHD, especially processing speed and working memory, play an important role in reading, particularly in reading fluency and comprehension (see Willcutt [5], Shanahan [6], Laasonen [7], McGrath [8], Arnell [9], and Swanson [10]). This is true not only in those with a reading disorder, but also in those who are not impaired in phonological processing (see: Sesma [11], Locasio [12], Samuelson [13], Jacobson [14], Bental [15] and Leong [16]).

One specific executive function impairment in reading comprehension is processing speed. Willcutt et al. [17] demonstrated that impairment in processing speed is found much more in children with reading disability (dyslexia), in children with ADHD, and in those with both disorders than in controls. In a sample of children and adolescents Shanahan et al. [6] demonstrated that processing speed, measured in multiple ways, is a shared cognitive risk factor across reading disorder and ADHD with a correlation of 0.7 between the two disorders. The authors suggested that participants with each disorder may be slowed down because they are engaging in a speed-accuracy trade-off, buying increased accuracy with a slower rate.

Both processing speed and working memory have been identified as important aspects of the complex cognitive processes involved in reading comprehension. Cain and Oakhill [18] reviewed multiple studies which demonstrate that for skilled readers as well as for those with poor reading skills or very limited reading comprehension, working memory plays a critical role in integrating information to facilitate comprehension of text. This is likely to be because comprehension depends upon recalling what has been read in preceding sentences and paragraphs so that the reader can develop and modify an adequate working understanding of the message of each section of the text and of how those components are related to one another.

Sesma, Mahone and colleagues [11] [performed a study in 2009]. Results indicated that executive skills differentially support reading comprehension, but are less necessary for single word reading. They explained their findings as follows: "Reading comprehension is inherently more complex than single

word reading, with demands that go beyond phonological decoding and word identification and include higher order cognitive processing of meaning conveyed through sentences and paragraphs... executive control skills such as planning and working memory become more necessary as the length and complexity of written text increases” (p. 8).

Similar findings about the role of executive function impairments in reading comprehension of individuals with ADHD were reported by Samuelsson, Lundberg and Herkner [13]. In their study of male adults they found a significant correlation between poor reading comprehension and ADHD while there was no significant association between word decoding and ADHD. They explained this by arguing that word decoding “is determined by a smoothly operating, encapsulated... phonological model largely unrelated to higher cognitive functions such as executive controls” while “reading comprehension involves many of the higher cognitive control functions assumed to be impaired in ADHD” (p. 165).

Recent research clearly indicates that adequate reading comprehension depends not only on ability to recognize and decode words. It also depends upon 1) adequate attention, 2) adequate working memory, and 3) adequate processing speed. Typically, individuals with ADHD are significantly impaired in all 3 of these critical executive functions.

We tested several predictions about cognitive functions related to reading comprehension difficulties in these adolescent students diagnosed with ADHD. We also tested the effects of one specific compensatory strategy that may be helpful to many of these students... extended time for a reading comprehension test.

Walczyk and colleagues [20] have reported research testing a variety of compensatory strategies that have been demonstrated helpful for readers at various skill levels who are struggling for efficient comprehension of a text. These compensatory strategies include slowing down the reading rate; pausing to allow more time for processing; looking back in the text to clarify confusion; jumping over text segments that are confusing, but not essential; and rereading of the text to enhance understanding. Regression analyses in their study revealed that restriction of time to read a text tends to reduce comprehension because it does not allow sufficient opportunity for the reader to clarify information to be processed in working memory. This is consistent with clinical reports of many

students with ADHD who are unable to complete exams within standard time allocation. Extended time is one useful way to help students whose reading comprehension is compromised by impaired working memory and processing speed.

Measures

To assess basic reading skills, we used standardized measures of word reading and pseudoword reading (word attack) from the woodcock-Johnson Achievement Test or the Wechsler Individual Achievement Test. These were compared with the student's overall verbal abilities as measured by the Verbal Comprehension Index of the student's WISC or WAIS IQ tests. To assess processing speed and working memory, we used two index scores from the student's WISC or WAIS: Working Memory Index and Processing Speed Index. To assess the impact of extended time for reading comprehension, we used the Nelson-Denny Reading Test [29].

Results

Overall verbal skills of these students on tests not involving reading were relatively strong. These scores indicate that basic reading skills of this sample were somewhat lower than their VCI, but still solidly in the average range. As predicted, scores of these ADHD students improved significantly when they were allowed the extended time on the reading comprehension section.

Discussion

While many of these 145 adolescents with ADHD were able to complete the NDRT within standard time constraints, 48% were unable even to attempt all the vocabulary questions and 53% were unable to attempt all of the reading comprehension questions without extended time. This is consistent with our clinical experience that many, but not all students with ADHD report chronic difficulty in completing tests, particularly tests involving substantial reading, within standard time limits.

These data provide evidence that on tests involving reading longer, more complex texts under time constraints, allowing a modest extension of time can provide individuals with ADHD opportunity to demonstrate reading comprehension abilities more consistent with their actual verbal abilities. This accommodation can help these students to compensate for the chronic problems with working

memory and processing speed that, for such tasks, burden many, though not all, adolescents with ADHD.

Our study indicated that many, but not all of our participants with ADHD were unable to complete one or both sections of the NDRT within standard time allotments. This suggests that some diagnosed with ADHD do not need extended time on tests such as the NDRT, though many do need extended time to have a fair chance to show what they know and can do.

These findings suggest that clinicians screening individuals for ADHD should include in their evaluation specific inquiries about reading comprehension, speed of reading, memory for what has been read, and whether the individual can usually finish tests and exams within usual time constraints. In making such inquiries, it is important that the clinician ask about assigned reading as distinguished from reading of self-chosen materials in which the person has a strong personal interest.

Current regulations on most high-stakes testing require clinical diagnostic interviews and a battery of psycho-educational testing for persons requesting extended time for such exams based on diagnosis of ADHD or a specific learning disorder. Such an assessment seems appropriate to establish need for extended time, but this requirement is problematic for students who cannot afford the high costs of such testing which often is not covered by insurance. The requirement is also problematic for those who do not have access to psychological evaluators who have the appropriate expertise.

Conclusions

Given the findings of this study, it would seem advisable for clinicians assessing individuals with ADHD to inquire directly about whether they are able to complete tests involving reading comprehension within the time usually allowed. If the student reports frequent inability to complete such tests, the student should be referred for a full psycho-educational evaluation, including the NDRT or a comparable measure, to establish whether accommodations including extended time for tests and examination are appropriate and should be provided.