From Theory to Practice

ADHD Symptoms and Benefit From Extended Time Testing Accommodations

Benjamin J. Lovett$^1$ and Ashley M. Leja$^2$

Abstract

Objective: To investigate the relationship between ADHD symptoms, executive functioning problems, and benefit from extended time testing accommodations. Method: College students completed a battery of measures assessing processing speed and reading fluency, reading comprehension (under two different time limits), symptoms of ADHD, executive functioning deficits, and perceptions of need for extended time. Results: Students reporting more symptoms of ADHD and executive functioning deficits actually benefited less from extended time, and students’ perceptions of their timing needs did not predict benefit. Conclusion: Students with more ADHD symptoms are less likely to use extended time effectively, possibly because of their associated executive functioning problems. These results suggest there may be little justification for examining a student’s ADHD symptoms when making extended time accommodation decisions. (J. of Att. Dis. 2015; 19(2) 167-172)

Keywords

reading fluency, test accommodations, ADHD

Treatments for ADHD are well understood by researchers and well known to the general public. Medications, especially stimulants, are commonly prescribed, and are generally acknowledged to be effective in attenuating ADHD symptoms (Connor, 2006). A variety of psychosocial treatments are also available, including behavior modification, cognitive-behavioral therapy, and working memory training (Mezzacappa & Buckner, 2010; Young & Amarasinghe, 2010). In addition to treatments, management strategies for ADHD often include accommodations in education and employment settings (Latham & Latham, 2011). Testing accommodations are especially common; these accommodations serve to change the administration format of a test and remove the barriers (such as limited time or small print) that may keep students with disabilities from demonstrating what they know (Bolt & Thurlow, 2004). Extended testing time is one of the most commonly given testing accommodations, and it is frequently provided for students with ADHD (Ranseen & Parks, 2005; Stretch & Osborne, 2005). In this research brief, we report a study of the relationships between ADHD symptoms, executive functioning problems, and benefit from extended time.

Past research has shown repeatedly that students with ADHD benefit from extended time. For instance, in a recent study, Brown, Reichel, and Quinlan (2011) examined students’ scores on the Nelson-Denny Reading Test (NDRT) under standard and extended time. All the students (aged 13-18) met Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM-IV; American Psychiatric Association, 1994) diagnostic criteria for ADHD, and did not have a specific learning disability in reading. The students achieved a mean standard score of 101 on the standard-time administration of the NDRT comprehension task (composed of 38 multiple choice comprehension questions concerning 7 passages), but this mean score rose to 113 under the extended time condition (60% additional time). Moreover, 53% of the students were unable to complete the task without extended time.

Although extended time accommodations have a clear logic behind them, they are also controversial, in part, because some critics have noted that their benefits are not specific to students with disabilities (for review, see Lovett, 2010). For example, Mandinach, Bridgeman, Cahalan-Laitusis, and Trapani (2005) examined the benefit of extended time on the SAT for students with and without disabilities (learning disabilities and ADHD). Although 75% of students with disabilities reported needing additional time to finish the test, so did 50% of the nondisabled students.

Lewandowski, Lovett, Parolin, Gordon, and Codding (2007) also examined the issue of extended time’s specificity; these investigators gave middle school students with

$^1$Elmira College, Elmira, NY, USA
$^2$Illinois State University, Normal, IL, USA

Corresponding Author:
Benjamin J. Lovett, Elmira College, 1 Park Place, Elmira, NY 14901, USA.
Email: blovett@elmira.edu
and without ADHD a highly speeded mathematics calculation test, which was scored at the end of 12 min (standard time condition) and the end of 18 min (50% extended time condition). Students with ADHD certainly benefited from the additional time; their mean raw score rose from 65 to 98. However, the comparison group of nondisabled students benefited significantly more, with their mean score rising from 89 to 132.

Through their study, Lewandowski et al. (2007) showed that nondisabled students can actually benefit more from extended time than students with ADHD, but that study involved scores on an unusually speeded mathematics test, one made specifically for that study. In the present study, we sought to test the specificity of benefit of extended time using a more typical reading comprehension test. We also assessed a nonclinical sample and used a continuous measure of ADHD symptoms, given work showing that these symptoms have a dimensional structure (Haslam et al., 2006). Although cutoffs are needed for a clinical diagnosis, we were more interested in the effect of various symptom levels on benefit from extended time, and so dichotomizing the ADHD symptoms variable (even using DSM-IV cutoffs) would be statistically suboptimal (see Cohen, 1983).

In addition to measuring ADHD symptoms, we measured related cognitive skills that might affect extended time needs, such as executive functioning. In his seminal work, Barkley (e.g., 1997) has argued for a model of ADHD characterized by a deficit in behavioral inhibition linked to different aspects of executive functioning, such as working memory and emotion regulation. Certainly, individuals with ADHD show lower mean scores on executive functioning tasks. Willcutt, Doyle, Nigg, Faraone, and Pennington (2005) conducted a meta-analysis of 83 studies in which participants with and without ADHD were given executive functioning measures. The results showed that there were significant differences between groups with and without ADHD, with a weighted mean effect size of .54 across all the comparisons. Although these authors argue that these deficits are not large enough to explain ADHD symptoms by themselves, the moderate effect sizes found throughout the examined studies nonetheless show that deficits in executive functioning are a common problem in individuals with ADHD.

Processing speed and reading fluency, two skills more theoretically related to extended time accommodations than executive functioning, have also been found to be deficient in individuals with ADHD. For instance, recently, Jacobson et al. (2011) compared 41 children with ADHD with 21 comparison peers (all aged between 9 and 14 years). Children with ADHD had significantly slower processing speed and reading fluency on multiple measures of each skill. These researchers hypothesized that deficits in working memory (which are typically found in ADHD) may, in turn, cause deficits in speeded task performance in individuals with ADHD. Therefore, in addition to ADHD symptoms, we measured processing speed, reading fluency, and executive functioning to determine whether these characteristics predicted which students would benefit from extended time accommodations.

Method

Participants

Students taking courses at a small liberal arts college in the Northeastern United States (N = 159) participated in the study. The data from 18 students was not used, either because the students reported diagnoses of ADHD or they did not complete the entire assessment packet. (We did not use data from students reporting ADHD diagnoses to eliminate the confounding effect of the diagnosis, as opposed to the individual symptoms themselves, on performance.) Of the remaining 141 students (58.9% females), 70 were first-year students, 35 were sophomores, 23 were juniors, and 13 were seniors; the sample had a mean age of 19.38 years (SD = 2.5). Finally, 92.8% of the participants identified themselves as White/Caucasian (n = 131), while the rest of the participants self-identified as African Americans, Hispanic, and Multiracial or “Other.”

Measures

Processing speed measures. The two processing speed subtests from the Wechsler Adult Intelligence Scale, Third Edition (WAIS-III; Wechsler, 1997) were used to assess participants’ speed of information processing. (Although the fourth edition of the WAIS is available, these subtests have not changed substantially.) The first subtest given, Digit-Symbol Coding, requires copying symbols that are paired with numbers for 133 digit stimuli. Symbol Search, the second subtest given, requires that the participants search rows of symbols (60 rows are present on the test) to determine whether the row contains either of two symbols, and indicate “yes” or “no” for each row. These tests are highly speeded with a time limit of 2 min each. Furthermore, according to the WAIS-III manual, Digit-Symbol Coding and Symbol Search have adequate test–retest reliability (r_{xx} = .81 and .74, respectively, with a median test–retest interval of approximately 1 month).

Reading Fluency Test. The Reading Fluency subtest from the Woodcock-Johnson Tests of Achievement, Third Edition (WJ-III; Woodcock, McGrew, & Mather, 2001) was used to assess participants’ reading rate. In this task, students have 3 min to indicate whether each of 98 brief sentences (e.g., “A dog has five legs.”) is true or false. The WJ-III manual reports good test–retest reliability with an extended test–retest interval of 1 year (r_{xx} = .88).
Reading comprehension test. The comprehension subtest from the Nelson-Denny Reading Test (NDRT; Brown, Fishco, & Hanna, 1993), Form H, was used to represent a timed academic test. The test contains 18 multiple-choice items pertaining to seven passages; the format is similar to the reading comprehension sections on high-stakes tests such as the SAT and GRE. The NDRT manual reports good alternate-form reliability ($r_{xx} = .81$). Students were given 10 min to work on the test, then were stopped and asked to indicate their place in the test. Then, 5 additional minutes were provided for the students to continue working. We then calculated the number of items answered correctly at each of the time limits. The altered time limits were based on pilot testing with 4-year college students suggesting that the typical time limits for NDRT administration were too long for many students to show any benefit from extended time (leading to ceiling effects in research studies). Because we altered the time limits, only raw NDRT scores were used in statistical analyses.

ADHD Current Symptoms Scale. Participants were given the ADHD Current Symptoms Scale (Barkley & Murphy, 2006) to assess students’ levels of 18 DSM symptoms of ADHD. Participants responded to each of the items on a scale from 0 to 3 (0 indicating never or rarely, 1 indicating sometimes, 2 indicating often, and 3 indicating very often).

Behavior Rating Inventory of Executive Functioning. The adult version of the Behavior Rating Inventory of Executive Functioning (BRIEF-A; Roth, Isquith, & Gioia, 2005) was given to participants to assess their perceptions of their executive functioning problems. For each of the 75 items, students indicated how often each of the behaviors has been a problem (“N” indicating never, “S” indicating sometimes, and “O” indicating often). The BRIEF-A manual reports excellent reliability (the general executive composite, GEC; $r = .96$) and extensive validity evidence as well.

Perceptions of time needs. Participants were given the nine-item Self-Evaluation of Performance on Timed Academic Reading (SEPTAR; Kleinmann, 2005), a questionnaire used to assess students’ perceptions of their need for extra time when reading and taking exams. Initial psychometric analyses found good reliability ($\alpha = .89$), an exploratory factor analysis found the scale to be unidimensional, and correlations with speeded cognitive measures showed evidence of construct validity.

Demographic questionnaire. Finally, participants completed a brief demographic questionnaire asking them to report their gender, age, ethnicity, year in school (e.g., freshman), and whether they had ever received any relevant diagnoses (e.g., learning disabilities, attention problems).

Table 1. Task and Rating Scale Intercorrelations.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WAIS Coding</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. WAIS Symbol Search</td>
<td>0.45**</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. WJ Reading Fluency</td>
<td>0.45**</td>
<td>-0.92**</td>
<td>0.52**</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. NDRT at 15 min</td>
<td>-0.34**</td>
<td>-0.49**</td>
<td>-0.59**</td>
<td>-0.34**</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. NDRT Gain (benefit)</td>
<td>0.13</td>
<td>-0.13</td>
<td>-0.26**</td>
<td>-0.15</td>
<td>-0.19*</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>6. ADHD symptoms</td>
<td>-0.01</td>
<td>0.01</td>
<td>-0.01</td>
<td>-0.15</td>
<td>-0.19*</td>
<td>-0.20**</td>
<td>-0.75**</td>
</tr>
<tr>
<td>7. BRIEF-A GEC</td>
<td>-0.16*</td>
<td>-0.12</td>
<td>-0.13</td>
<td>-0.26**</td>
<td>-0.20**</td>
<td>-0.75**</td>
<td>—</td>
</tr>
<tr>
<td>8. SEPTAR</td>
<td>-0.22**</td>
<td>-0.37**</td>
<td>-0.38**</td>
<td>-0.47**</td>
<td>-0.75**</td>
<td>-0.20*</td>
<td>-0.28**</td>
</tr>
</tbody>
</table>

Note. WAIS = Wechsler Adult Intelligence Scale; WJ = Woodcock-Johnson; NDRT = Nelson-Denny Reading Test; BRIEF-A GEC = Behavior Rating Inventory of Executive Functioning General Executive Composite; SEPTAR = self-evaluation of performance on timed academic reading.

*p < .05. **p < .01.

Procedure

Participants completed the battery of measures in small groups (10 or fewer) in quiet classrooms, with the entire session time lasting approximately 45 min. Before receiving instructions for the tests, participants completed an informed consent form. Then, they were given a packet containing each of the measures described above and received directions for each measure before completing it. Participants began and stopped at the same time for each measure, according to the timing instructions from the proctor. The measures were completed in the following order: Coding, Symbol Search, Reading Fluency, NDRT Comprehension, ADHD Symptoms, BRIEF-A, SEPTAR, and Demographic Questionnaire. On completing the demographic questionnaire, students gave their packets to the proctor and were thanked for their participation in the study.

Results

We first plotted the data to ensure expected distributions of each variable. We also calculated gender differences, finding that female participants were significantly higher than male participants on the cognitive/academic variables: NDRT correct score at 15 min ($p < .01, d = .57$), WAIS-III Digit-Symbol Coding ($p < .01, d = .54$), WAIS-III Symbol Search ($p < .01, d = .56$), and WJ-III Reading Fluency ($p < .05, d = .35$). No significant gender differences were found in total ADHD symptoms or executive functioning problems.

Table 1 displays the correlation matrix for the entire group of participants. (We also computed the correlations separately by gender but did not find substantial differences in the separate correlation matrices.) First, we found many expected relationships between measures of similar constructs. For example, the general executive functioning composite score on the BRIEF-A was strongly correlated with reported ADHD symptoms ($r = .75, p < .01$). In addition, the
WAIS-III processing speed tasks had moderate positive correlations with WJ-III Reading Fluency. Furthermore, the WAIS-III tasks and the WJ-III Reading Fluency all positively correlated with the number of questions students had answered correctly on the NDRT at 15 min.

Second, we found that students with more ADHD symptoms or more executive functioning problems did not benefit more from extended time. Indeed, ADHD symptoms showed a modest negative correlation with benefit from extended time ($r = -0.19$, $p < .05$), showing that the presence of more ADHD symptoms actually predicted less benefit from extended time. The findings for the BRIEF were similar; more perceived executive functioning deficits predicted slightly less benefit from extended time ($r = -0.20$, $p < .05$).

Finally, students’ perceptions of their timing needs showed several interesting relationships. SEPTAR scores correlated modestly but significantly with students’ total ADHD symptoms and composite score on the BRIEF-A ($r = 0.20$ and $0.28$, respectively; both $p < .05$). Therefore, students who rated themselves as having more ADHD symptoms or executive functioning problems also had a modestly higher perceived need for extended time on tests (as might be expected). However, students’ perceptions of their need for extended time did not predict their actual gain in correct items; SEPTAR scores showed no relationship with benefit from extended time ($r = 0.03$, n.s.).

Discussion

This study builds on Lewandowski et al.’s (2007) work in providing evidence that extended time is not only beneficial to impaired populations. Just as Lewandowski et al. found that nondisabled middle school students benefited more from extended time than their peers with ADHD, we found that higher levels of self-reported ADHD symptoms (even in a nondisabled sample) predicted less benefit from extended time. The findings for the BRIEF-A were similar; more perceived executive functioning problems also predicted slightly less benefit from extended time. We should note that even if Bonferroni corrections are applied to control for Type-I error (given that we computed 36 correlation coefficients), our results still show that higher levels of self-reported ADHD symptoms and executive functioning problems do not lead to greater benefit from extended time testing accommodations, at least on the NDRT with the time limits used in this study.

These results may seem surprising, given the (typical) restriction of testing accommodations to students with disabilities. However, students with more ADHD symptoms may be less likely to use their extended time effectively because of their executive functioning problems; the deficits that lead some students to take longer to finish a test could actually cause them to make poor use of additional time. This hypothesis is supported, indirectly, by a study by Pariseau, Fabiano, Massetti, Hart, and Pelham (2010), who found that students with ADHD simply slowed their work pace when they were given longer time allotments to complete assignments.

Our results have implications for educational practice. The results do not suggest that extended time accommodations are inappropriate per se, but there appears to be little justification for making decisions about extended time symptoms by examining ADHD symptom levels. Research showing that accommodations also benefit students without disabilities (as discussed in the introduction) can make denying this population the same accommodations controversial. Thus, time limits placed on tests should be set generously, if speed/fluency is not being measured intentionally, as outlined by the principles of universal design (Thompson, Johnstone, Anderson, & Miller, 2005). Moreover, we found that students’ perceptions of their timing needs do not predict their actual benefit from additional time, suggesting that students’ self-perceptions should be confirmed with objective demonstrations of benefit before extended time accommodations are proffered. (This does not mean that students’ perceptions of accommodations are without value, only that they must be supplemented by other data when making decisions; see Lovett & Leja, 2013, for further discussion).

Some features of this study may limit the conclusions that can be drawn. First, we did not use any clinical samples, although our results may nonetheless generalize to clinical samples, given research showing relationships between continuous measures of ADHD symptoms and life impairment in nonclinical samples (e.g., Allan, 2009). Similarly, although we believe that these results are likely to generalize to students in Grades K-12, the sample consisted only of college students. Third, in this study, our main dependent variable was a reading comprehension test where the actual stakes for participants were low, whereas accommodations are typically for exams with real implications for students’ lives. Because students’ results on the NDRT had no effect on any grades, it is possible that students did not put forth their best effort. Finally, we administered the NDRT in a highly speeded fashion (i.e., with a very short time limit), and it is likely that this affected our results, because many participants were unable to finish the test under our “standard” 10-min time limit.

Future studies should address these potential limitations in an effort to generalize findings regarding the relationship between ADHD, similar constructs, and extended time accommodations. We recommend that investigators replicate the present study with students with ADHD diagnoses, and to students of different ages, to determine whether our findings apply to a clinical population and to other age groups. In addition, the study should be replicated with less speeded dependent measures to determine the degree to which ADHD symptoms predict benefit from extended
time on less speeded tests. Finally, it would be ideal to conduct a similar study during an actual high-stakes exam, such as a timed admissions test, or even a timed classroom test at a school or university, to ensure that participant motivation (especially motivation to finish the exam quickly) is high. Hopefully, with studies such as these conducted, we will continue to better understand which ADHD symptoms and associated cognitive skills relate to time use during exams.

Acknowledgments

The authors thank Iiona Scully, for her assistance with data collection.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References


Lovett, B. J. (2010). Extended time testing accommodations for students with disabilities: Answers to five fundamental questions. Review of Educational Research, 80, 611-638.


Author Biographies

Benjamin J. Lovett, PhD, is an associate professor of psychology at Elmira College, where his research focuses on the assessment of students with learning and attention problems. He received his doctorate in school psychology from Syracuse University.

Ashley M. Leja, BA, is a doctoral student in school psychology at Illinois State University, where her research interests include relational aggression and middle-school-aged girls’ behavioral responses to ostracism from peers. She received her bachelor’s degree in psychology from Elmira College.