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Academic Testing Accommodations for ADHD: Do They Help?

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Abstract

This study investigated the effectiveness of five commonly administered academic testing accommodations on reading and math performance in children with attention deficit hyperactivity disorder (ADHD). A total of 96 parents of 3rd–8th grade students with ADHD participated. More than half of the sample also had parent-reported learning difficulties in reading and/or math. Individually administered cognitive and achievement test scores, types of testing accommodations received, and Maryland School Assessment (MSA) reading and math scores were obtained from these students' school records. Taking into account grade level and co-occurring learning difficulties, none of the five accommodations investigated were associated with better MSA scores among students with ADHD who received the accommodations versus comparable students who did not. Additionally, individual variation in processing speed performance did not moderate the association between receipt of accommodations and reading or math performance. Common testing accommodations, as presently administered, may offer little benefit for students with ADHD, regardless of co-occurring learning difficulties.

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Keywords

ADHD; learning disabilities; accommodations

Introduction

Why ADHD?

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by behavioral symptoms that include difficulties with attention, focus, impulsivity, hyperactivity, memory, and organization. Youth with ADHD often demonstrate difficulties in executive functions, which refer to a complex set of cognitive process that are involved in planning, initiating, and maintaining goal-directed behavior (i.e., "getting your act together" per Denckla, 2011). In addition to being the most commonly diagnosed psychiatric condition of childhood, with recent research estimating that more than 1 in 11 American youth aged 4 to 17 years is affected (Pastor et al., 2015), ADHD confers considerable academic risk for students. Children with ADHD are more likely to earn lower GPAs and face greater risk of retention and school dropout relative to their typically developing peers (Barkley, 2006; Fletcher & Wolfe, 2008). Estimates of the co-occurrence of ADHD and reading disability range from 25% to 40% (Dykman & Ackerman, 1991; Semrud-Clikeman et al., 1992; Willcutt et al., 2010), with ADHD and *any* learning disability co-occurring at 30% to 45% (DuPaul et al., 2013; Smith & Adams, 2006). Robb and colleagues (2011) estimate that the average student with ADHD costs $4,700 more to educate per year than the average student without the disorder, resulting in, at minimum, an extra $30 billion spent annually on the education of students with ADHD in the United States.

The Use of Accommodations in the Educational Management of ADHD

In addition to pharmacologic and behavioral interventions, accommodations are commonly provided in the academic setting in an effort to more effectively educate and assess students with ADHD. *Accommodations* represent adjustments to standardized instructional practices or assessment conditions that are designed to reduce the effects of a child's disability by allowing him/her to participate more fully in instruction and to better demonstrate their knowledge and skills (Fuchs et al., 2000). The assumption is that an effective accommodation should minimize the functional impairment associated with a student's disability but should *not* affect the performance of a nondisabled student (Tindal & Fuchs, 1999). The empirical support for academic accommodations for students with ADHD is meager, despite the frequency with which they are administered (Schnoes, Reid, Wagner, & Marder, 2006).

Extended time, the most commonly administered accommodation for students with ADHD (Schnoes et al., 2006), has received the most empirical attention; however, findings regarding the *effectiveness* of extended time for these students are mixed. Brown, Reichel, and Quinlan (2011), for instance, demonstrated that receipt of extended time was associated with better scores on a passage comprehension measure among adolescents with ADHD; however, this study provided no comparison group of typically developing peers to evaluate whether the students with ADHD received a "differential boost" in performance (Tindal & Fuchs, 1999) from this accommodation. Several studies that have compared students with ADHD to their typically developing peers have suggested that extended time may *not* differentially benefit these students with disabilities. Lewandowski and colleagues (2007) evaluated the effect of extended time on middle school students' performance on a math fluency test. Results indicated that typically developing students outperformed students with ADHD under both standard administration and extended time conditions, and typically developing students benefitted *more* than teens with ADHD from extended time. Even more concerning, Pariseau and colleagues (2010) found that elementary school-aged children with ADHD actually completed significantly *fewer* reading, math, and writing problems under extended time conditions than under standard time. Further, Lovett and Leja (2015) examined the effects of extended time on performance in college students. They found that college students reporting more severe ADHD symptomatology benefitted less from extended time on a reading comprehension task than those reporting fewer ADHD symptoms.

Other academic testing accommodations for students with ADHD that have received empirical attention include paced item presentation and small group testing. Among college students with ADHD, paced item presentation offered no performance benefits on computer-based testing (Lee, Osborne, Hayes, & Simoes, 2008). Hart and colleagues (2011) found that while small group *instruction* increased on-task behavior in the classroom among children with ADHD, small group *testing* actually reduced productivity for these children.

Still other accommodations, such as oral presentation of written information, have been examined among mixed groups of children with disabilities, including some with ADHD and learning disabilities; however, these testing accommodations have not been evaluated with respect to students with ADHD specifically. Among students with learning disabilities, several studies point to possible, though limited, effectiveness of the oral presentation of written information, or read-aloud accommodation, in improving performance. Fuchs and colleagues (2000) found that students with disabilities did not benefit from the read-aloud accommodation on measures of math application but did benefit on measures of math problem-solving. Further, Tindal and colleagues (1998) demonstrated that students with disabilities benefitted from having math assessments read aloud to them by their teacher, whereas students without disabilities did not benefit from this accommodation.

The literature regarding the effectiveness of setting accommodations, such as a reduced distraction or reduced noise environment, on performance offers mixed findings. Vaughan and colleagues (2014) found that although 5- to 12-year-olds with ADHD were more likely than typically developing peers to give invalid responses on memory and reaction time measures in a group setting, performance validity between groups was comparable when measures were administered individually. Smith and Riccomini (2013) reported that students with learning disabilities in grades 3 to 5 demonstrated greater improvement in reading comprehension relative to their typically developing peers when wearing noise-reducing headphones. In contrast, Lin and Lin (2013) found that students with learning disabilities did not benefit from a reduced noise environment when tested on number sense and numeration skills.

Similarly mixed findings are evident regarding the accommodation permitting the use of a calculator. Studies of middle schoolers have shown that students with and without disabilities benefitted equally from the opportunity to use a calculator on measures of math problem-solving (Bouck & Bouck, 2008). In contrast, Fuchs and colleagues (2000) found that calculator use offered a differential boost to fourth and fifth graders with disabilities on measures of math problem-solving but not math concepts and applications.

Thus, even the existing literature regarding the effectiveness of academic accommodations for learning disabled youth offers mixed findings, and still less is known about the impact that these accommodations might have for students with ADHD. The goal of the present study was to investigate the association between five of the most commonly recommended academic testing accommodations and performance on standardized, group-administered reading and math tests among elementary and middle school-aged students with ADHD.

Methods

Procedure

Participants were recruited from a large outpatient psychological assessment clinic and from the local community via flyers and newspaper advertisements. Participants included children in grades 3 through 8 in Maryland public schools who had been previously diagnosed with ADHD, as well as their caregivers. Potential participants were screened by a trained research assistant using the ADHD Rating Scale-IV (DuPaul, Power, Anastopoulos, & Reid, 1998) to assess parent report of current symptoms of ADHD. Caregivers whose children did not currently meet symptom count criteria for ADHD diagnosis via the ADHD Rating Scale-IV, but whose children had a documented diagnosis of ADHD from available educational, medical, or research records were also included in the study ($n = 11$).

After informed consent was obtained from parents and assent from children, parents provided basic demographic and history-related information and completed the Colorado Learning Difficulties Questionnaire (CLDQ; Willcutt et al., 2011), as well as an educational records release. A member of the study team then requested the following items from the child's school record: (1) Maryland School Assessments (MSA) scores for reading and math for the prior academic year, (2) Individual Education Program (IEP) or 504 Plan for the prior academic year (if applicable), and (3) reports of psychological or educational testing for the child completed within the past three years (if applicable).

Participants

Participants in this study included 96 caregivers of children diagnosed with ADHD. The majority of caregivers providing ratings (85%) were mothers, 70% of whom had completed at least some college. Students in the sample were 68% male, consistent with the sex distribution in the population of American children with ADHD (Pastor et al., 2015). Students were evenly distributed across grades 3 through 8 in schools across 14 of the 24 school districts in the state of Maryland. They were primarily Caucasian (52%) and African American (34%). Eighty-three percent of these students were prescribed medication for symptoms of ADHD at the time of the study, with 73% of those on medication taking stimulants. The distribution of ADHD subtypes in the sample was similar to that found in other samples of students with ADHD (Merikangas et al., 2010), with the largest proportion (53%) falling in the Predominantly Inattentive subtype, followed by 34% falling in the Combined subtype. The majority of students in the sample had significant co-occurring parent-reported learning difficulties (CLDQ mean scores above clinical cut points as published in Patrick et al., 2013) in reading (52%) or math (67%). The mean MSA Reading and Math scores for the present sample were 413 (range: 344–514) and 417 (range: 337–504), respectively. At the time of the 2012 MSA tests, 63% of the sample was receiving special education services allowing for test accommodations via an IEP ($n = 30$) or 504 Plan ($n = 30$).

Measures

ADHD Rating Scale-IV (ADHD-RS-IV; DuPaul et al., 1998)—The ADHD-RS-IV is an 18-item measure of ADHD symptomatology that adheres closely to *DSM-IV* diagnostic criteria (American Psychiatric Association, 2000). Nine inattentive (IA) symptoms and nine hyperactive/impulsive (HI) symptoms are rated on a 0 (“Never”) to 3 (“Very Often”) Likert scale. For diagnostic symptom count purposes, a rating of 2 (“Often”) or 3 indicates an endorsed symptom. Consistent with *DSM-IV* criteria for ADHD, parents who endorsed six or more inattentive symptoms and/or six or more hyperactive/impulsive symptoms for their child were enrolled in the study.

Colorado Learning Difficulties Questionnaire (CLDQ; Willcutt et al., 2011)—The CLDQ is a brief caregiver rating of learning problems in children and adolescents and was used in the present study to screen for co-occurring learning difficulties. The measure consists of 6-item reading and 5-item math subscale, along with three other subscales that were not used in the present study. Parents are asked to rate how often their child has difficulty with a particular skill on a Likert scale from 1 (“never/not at all”) to 5 (“always/a great deal”), with higher scores indicating greater learning difficulty. The CLDQ reading and math subscales have demonstrated strong convergent validity and sensitivity with respect to performance-based measures of reading and math achievement (Patrick et al., 2013; Willcutt et al., 2011).

Maryland School Assessments (MSA; Maryland State Department of Education, 2003)—The MSAs are standardized measures of reading and math achievement administered annually to students in grades 3 through 8 in Maryland public schools through the 2012–2013 school year. Each child earned a standardized MSA score for reading and math ranging from a minimum of 240 to a maximum score of 650. Cut scores were developed for each grade level to offer categorical descriptors (basic, proficient, advanced) of performance as well, with achievement of the proficient level analogous to performing at grade level in a given domain.

All students on the diploma track in Maryland public schools prior to the 2014–2015 academic year were required to take the MSAs by the Maryland State Department of Education. Some students were administered a modified version of the test, based on extent of special education needs; however, these individuals were excluded from the present study.

Statewide results for the MSAs are available online on the Maryland Report Card (http://reportcard.msde.maryland.gov/MsaOverview.aspx?PV=1:3:99:AAAA:1:N:0:13:1:1:0:1:1:1:3). For reading, across the state of Maryland, 29% of students scored within the basic range, 39% in the proficient range, and 32% in the advanced range. For math, 23% of Maryland students scored within the basic range, 48% in the proficient range, and 29% in the advanced range.

Standardized Measures of IQ and Processing Speed

Scores from standardized, performance-based measures of IQ were extracted from educational, medical, and research records. Such assessment records were available for 47% of the present sample. Measures of intellectual ability from which scores were extracted included the Wechsler Intelligence Scales for Children, Fourth Edition (WISC-IV; Wechsler, 2003), the Wechsler Abbreviated Scales of Intelligence, 2nd Edition (WASI-II; Wechsler, 2011), the Stanford Binet, 5th Edition (SB-V; Roid, 2003), and the Differential Abilities Scales, 2nd Edition (DAS-II; Elliott, 2007). The majority (n = 41) of the individuals for whom performance-based IQ measures were available completed the WISC-IV. For these individuals, the WISC-IV Processing Speed Index score was utilized in supplementary analyses.

Data Analysis Plan

Descriptive statistics were used to evaluate the frequency with which the five accommodations under review were offered, as well as basic sample characteristics. Pearson correlation and logistic regression were used to evaluate associations between ADHD symptom severity, extent of learning difficulties, and accommodations received. Equivalence of the group of students offered testing accommodations (ACCOMS+ group) and the group of students *not* offered testing accommodations (ACCOMS− group) was evaluated using independent groups t-tests, analyses of variance (ANOVAs) and chi-squared tests of independence. Multiple hierarchical linear regression was used to assess the relationship between receipt of individual accommodations and MSA reading and math scores, controlling for learning difficulties. Separate regressions were run for elementary (third to fifth grade) and middle (six to eighth grade) school students in order to evaluate whether accommodations impact performance differentially for students at different grade levels. Finally, the potential moderating effect of processing speed on the association between receipt of the extended time accommodation and MSA performance was considered via multiple linear regression.

Results

Frequency of Receipt of Accommodations

Per students' IEP and 504 Plan records, extended time was the most frequently offered accommodation (present on 88% of IEP/504 Plans), followed by a reduced distraction environment (present on 77%), use of a calculator (present on 47%), more frequent breaks (present on 45%), and oral presentation of written information (present on 32%). Among those students with an IEP or 504 Plan, the average number of accommodations offered was 5, with a range from 0 to 13.

Associations between the number of accommodations offered and academic performance (MSA reading and math scores), between number of accommodations offered and ADHD symptom severity (ADHD-RS-IV scores), and between ADHD symptom severity and academic performance were not statistically significant; therefore number of accommodations offered and ADHD symptom severity were not included as variables in the regression models that follow.

ACCOMS+ and ACCOMS− Group Differences

As shown in Table 1, independent groups *t*-tests indicated that the group of students with ADHD who were offered one or more accommodations (ACCOMS+) and the group of students with ADHD who were not offered accommodations (ACCOMS−) were not significantly different in terms of grade of child, maternal education level, ADHD symptom severity, parent-reported math difficulties, and visually-based reasoning skills (PIQ); however, the ACCOMS+ group demonstrated significantly more parent-reported reading difficulties, as well as significantly lower language-based reasoning skills (VIQ) and Full Scale IQ (FSIQ). Distribution of sex ($\chi^2(1, 96) = 0.079$, $p = .778$, $\varphi_c = .029$) and ADHD subtype ($\chi^2(3, 96) = 0.141$, $p = .987$, $\varphi_c = .038$) also did not vary significantly across groups.

No significant group differences were observed on MSA reading or math scores (see Table 1), even after controlling for language-based reasoning scores. Further, the distribution of students across performance levels (basic, proficient, advanced) was equivalent in the two groups for both reading ($\chi^2(2, 95) = 1.050$, $p = .592$, $\varphi_c = .105$) and math scores ($\chi^2(2, 95) = 1.943$, $p = .379$, $\varphi_c = .143$).

Elementary school-aged participants did not differ significantly from middle school-aged participants in terms of VIQ ($t(43) = 0.101$, $p = .920$, Cohen's $d = 0.030$), MSA reading scores ($t(93) = 0.532$, $p = .596$, Cohen's $d = 0.110$), or MSA math scores ($t(93) = 0.542$, $p = .589$, Cohen's $d = 0.110$) .

Association between Accommodations and MSA Performance

Table 2 shows the results of the multiple linear regressions of receipt of individual accommodations on MSA reading and math scores, performed separately for elementary and middle school students. The unstandardized estimate associated with the constant represents the average MSA score for the sample, controlling for all of the accommodations variables entered into the model. Thus, the average MSA Reading score in the elementary model is 421 and the average MSA Math score is 433, while the average MSA Reading score in the middle school model is 414 and the average MSA Math score in that model is 417. Among elementary school-aged students with ADHD, none of the accommodations were significantly associated with MSA reading scores and only the calculator use accommodation was associated with a statistically significant MSA math score difference. Elementary school students with ADHD who received the calculator use accommodation earned MSA math scores more than 58 points *lower* than those who were not allowed to use a calculator. Among middle school-aged students with ADHD only oral presentation of written information was significantly associated with MSA scores, and only on the math portion of the test. Middle school students with ADHD who received the oral presentation accommodation performed, on average, 36 points *worse* than their peers with ADHD who did not receive the accommodation.

Impact of Learning Difficulties on Accommodations and MSA Performance for Students with ADHD

Parent-reported learning difficulties (CLDQ) were, as expected, significantly correlated with MSA reading and math scores, with greater learning difficulties associated with worse performance in both cases (reading $r = -.535$, $p < .001$; math $r = -.403$, $p < .001$). Two hierarchical multiple regressions (one using only elementary school students, the other only middle school students) in which CLDQ scores were entered in the first block, followed by the five accommodations in the second block, indicate that parent-reported learning difficulties account for a significant proportion of the variance in MSA math scores but are only marginally associated with reading scores at both grade levels (Table 3). These regressions also indicate that, controlling for parent-rated reading difficulties, neither elementary nor middle school students with ADHD benefitted significantly from any of the accommodations on the MSA reading test. In math, elementary school students with ADHD who receive the calculator use accommodation continue to perform significantly more poorly (38 points worse) than their peers who were not allowed to use a calculator, even when parent-rated math learning difficulties were controlled in the model. No such association was found among middle schoolers.

In order to further investigate the impact of learning difficulties on the relationship between receipt of accommodations and reading/math performance, we created two groups for each academic domain based on parent-reported learning difficulties. Students whose parents endorsed reading difficulties on the CLDQ reading subscale that fell above the clinical cutoff score of 2.67 identified by previous research (Patrick et al., 2013) were assigned to the "students *with* reading difficulties" group, while those whose parents endorsed reading difficulties falling below the clinical cutoff were assigned to the "students *without* reading difficulties" group. Similarly, students whose parents endorsed math difficulties on the CLDQ math subscale falling above the clinical cutoff score of 2.60 (Patrick et al., 2013) were assigned to the "students *with* math difficulties" group, while those whose parents endorsed math difficulties falling below the clinical cutoff were assigned to the "students *without* math difficulties" group. These two groups are not mutually exclusive; some of the students with reading difficulties also were rated as having math difficulties and vice versa. Using these groups, students with ADHD who also have learning difficulties, per their parents' ratings, were compared to students with ADHD without learning difficulties in terms of the relationship between receipt of accommodations and reading/math performance. Given the impact of grade level on our previous findings, grade was included as a continuous covariate in these regressions, which are presented in Tables 4 and 5. Findings of these regressions indicate that, controlling for grade, students with ADHD did not benefit from any of the accommodations, regardless of whether they had co-occurring reading or math difficulties.

Moderating Effect of Processing Speed on Extended Time–MSA Performance Association

To test for a possible moderating effect of processing speed on the association between receipt of the extended time accommodation and MSA performance, a processing speed-by-extended time interaction variable was regressed, along with the individual processing speed and extended time accommodation variables, on MSA scores, within the subsample ($n = 41$) for whom WISC-IV Processing Speed Index scores were available. For both reading and math, the interaction term ($\beta = -0.780$, $SE = 0.992$, $p = .437$ and $\beta = -0.465$, $SE = 1.117$, $p = .680$, respectively) did *not* indicate a significant moderating effect of processing speed.

Discussion

The aim of the present study was to offer a preliminary evaluation of the effectiveness of five of the most commonly administered academic testing accommodations for students with ADHD. Among our sample of students with ADHD in grades 3 through 8, more than half received at least one accommodation. Similar to Schnoes and colleagues' (2006) findings, extended time was, by far, the most commonly offered accommodation in our sample. Thus, a majority of students with ADHD are being offered accommodations, five on average, and these most commonly include extended time. Those students with ADHD who were offered accommodations appeared to be similar to those who were not, in terms of both demographic variables and the severity of ADHD symptoms; however, parent-reported reading difficulties tended to be greater and language-based reasoning skills tended to be poorer among the group of students who did receive accommodations.

Our data further suggest that the severity of a student's ADHD was not associated with the number or the specific type of accommodations offered, or with the student's reading and math performance, and number of accommodations offered was also not associated with MSA scores. Our comparison of the group of students who received no accommodations to the group of students who received one or more accommodations suggests that, cumulatively, accommodation receipt is not associated with better reading or math MSA performance.

When each accommodation is evaluated with greater specificity, taking into account both grade level and co-occurring parent-rated learning difficulties, a consistent pattern emerges. When these covariates are taken into account, none of the accommodations under study here were associated with significantly better performance on reading or math testing.

This absence of significant associations point to three possibilities. The first is that students with ADHD, including those with co-occurring learning difficulties, do not benefit from accommodations such as extended time, more frequent breaks, oral presentation of information, a reduced distraction environment, or the use of a calculator, because these accommodations do not mediate the core neurocognitive deficits that these students manifest. Alternately, perhaps no significant benefit of receiving these accommodations was observed because students with ADHD have not been taught to use them effectively. This hypothesis raises the possibility that the types of accommodations investigated here may still hold value *if* students with ADHD are *taught to use them strategically* and are *provided with ample time for practicing them*. For example, extended time is often intended to support students who are easily distracted and frequently require extra time in order to complete classroom assignments; however, under testing conditions, students are not usually provided with the same types of scaffolded supports they typically receive within the instructional condition. In the testing conditions, students are required to regulate their own behavior, utilizing their extended time strategically, in order to benefit. Given the nature of their disability, which includes weaknesses in self-managed inhibitory control, planning, and organization, students with ADHD are especially *unlikely* to be able to use such an accommodation effectively, unless they receive specific training and practice in its strategic use. For instance, impulsive students may be less likely to use extended testing time to go back and check their work for errors *unless* they are specifically trained and prompted to do so. The final possibility is that the present study is underpowered to detect significant effects of accommodations due to its relatively small sample. It is worth noting, however, that the findings of analyses employing the full sample ($n = 96$), which effectively double the sample size of analyses run separately for elementary and middle school students, thereby increasing power to detect significant effects, also indicate no significant benefit of any of the accommodations under investigation. In addition, effect size estimates presented in the tables for all nonsignificant associations between accommodations and reading/math performance were small (all $\eta^2 < .10$). This further suggests that the study was adequately powered to detect meaningful effects and that the nonsignificant findings represent an actual absence of or very small association between the variables.

While prior research points to the effectiveness of some accommodations for students with learning disabilities (Elliott & Marquart, 2004; Lewandowski, Cohen, & Lovett, 2013; Lewandowski, Lovett, & Rogers, 2008), our findings suggest that, *when ADHD is also present* students with parent-reported learning difficulties do not seem to benefit from the accommodations that they are offered. The characteristic symptoms of ADHD may make it especially difficult for students with learning difficulties to make appropriate use of accommodations which might otherwise be helpful to them.

It is worth noting that the calculator use accommodation remains significantly associated with poorer math scores for elementary school students with ADHD, even after parent-rated math difficulties are controlled. It may be the case that elementary school students are not yet well trained in the effective use of a calculator, given the emphasis in elementary school on mastering calculation itself, and as a result use of a calculator does not improve their test performance. Additionally, access to a calculator could increase distractibility, particularly for younger students who have less experience with such tools and who are already at risk for difficulty with sustained attention as a result of their ADHD.

The present study also allowed us to consider the extent to which a student's speed, rather than his/her attention (though the two constructs are clearly associated), may relate to the effectiveness of the extended time accommodation. It stands to reason that students who work especially slowly, but who may not necessarily be off-task, might be better able to benefit from receipt of extended testing time than their off-task or impulsive peers. Our preliminary findings among the subsample of students for whom we have processing speed data do not support this hypothesis, as processing speed does not moderate the (nonsignificant) association between receipt of extended time and reading or math performance.

Limitations

These results should be interpreted in light of several limitations of the present study. Primary among these limitations is the fact that we do not have access to data regarding the fidelity of implementation of the accommodations investigated in this study. We do not know how, or whether, the testing accommodations listed on a student's IEP were actually administered for that student during the MSAs. It is worth noting, however, that the Maryland State Department of Education completes unannounced fidelity checks during standardized testing, with a particular focus on special education. Failure to offer accommodations specified as part of an IEP or 504 Plan is in direct violation of state and federal law, thus presenting significant risk to both teachers and administrators. Even when offered, however, students may decline to use accommodations.

An additional limitation of the present study is the size of the sample. In particular, the subsample of students for whom we have individually-administered IQ testing scores is too small to allow for use of language-based reasoning scores as a covariate in our central multivariate regression analyses, despite this variable's significant association with receipt of accommodations. Thus, the possibility remains that, since the ACCOMS+ group has poorer language-based reasoning skills than the ACCOMS− group, the ACCOMS+ group would have performed more poorly on the MSAs if they had not received accommodations.

Learning difficulties in the present study were parent-reported and cannot be equated with a diagnosed learning disability. It is, however, notable, that the measure of parent-reported learning difficulties used in the present study demonstrates strong sensitivity in the prediction of learning disabilities as defined by performance-based measures.

The naturalistic nature of this study does not allow us to evaluate the issue of "differential boost" in performance for students with ADHD relative to their typically developing peers; however, given that the students with ADHD in this study who did receive accommodations do not appear to be receiving any sort of "boost" from the accommodations examined here, relative to the students with ADHD who did not receive them, this limitation seems less pertinent. Future research in this area would benefit from the use of experimental designs to more rigorously evaluate the effectiveness of individual types of academic testing accommodations for students with ADHD and learning disabilities. Such designs will also further our understanding of whether certain combinations of individual accommodations might offer benefits for students such students.

Finally, the processing speed scores that were used to evaluate the moderating effect of sluggishness on the lack of association between extended time and reading/math performance offer an imperfect measure of cognitive sluggishness or slowed response speed. These scores are likely confounded with inattention, thus reducing the chance of detecting a moderating effect of pure slowness.

Due to these limitations, the findings of this study must be considered preliminary and should be used to help guide future research in this area, rather than to recommend or deny specific accommodations for particular types of students or direct educational policy decision-making.

Conclusions

Results of the present study offer no support for the effectiveness of commonly administered academic testing accommodations for students in elementary and middle school who have ADHD. Being offered extended time, more frequent breaks, a reduced distraction environment, oral presentation of written information, and/or the opportunity to use a calculator was not associated with better performance on reading or math testing for students, regardless of grade level or co-occurring learning difficulties. Further study of academic accommodations for ADHD is warranted, particularly in terms of whether instruction and in and practice with strategic use increases their effectiveness.

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Table 1

ACCOMS+ vs. ACCOMS− Group Differences: Independent Groups T-tests

	Group							
	ACCOMS+ (n = 60)		**ACCOMS− (n = 36)**					
	M	***SD***	***M***	***SD***	***df***	***t***	***p***	**Cohen's *d***
Grade	5.717	0.214	5.639	0.271	94	−0.224	.823	0.046
Maternal education	5.000	0.177	5.286	0.190	90	1.055	.294	0.222
CLDQ reading mean	2.901	1.106	2.364	0.877	94	−2.414	.015	0.512
CLDQ math mean	3.161	1.156	2.921	1.281	94	−0.945	.347	0.195
FSIQ	88.552	2.733	101.143	2.163	41	2.979	.005	0.930
VIQ	94.133	2.353	104.467	2.195	43	2.807	.008	0.856
PIQ	95.967	3.002	101.667	2.386	43	1.243	.221	0.379
ADHD IA item sum	21.133	0.540	20.528	0.674	94	−0.695	.489	0.143
ADHD H/I item sum	13.533	0.837	15.000	1.006	94	1.101	.274	0.227
MSA reading score	410.153	5.435	416.389	6.423	93	0.727	.469	0.151
MSA math score	412.644	4.989	424.944	6.392	93	1.517	.133	0.315

Note. FSIQ = Full Scale IQ from an individually-administered IQ test, VIQ = language-based IQ score from an individually administered PIQ = visually based IQ score from an individually administered IQ test, ADHD IA item sum = sum of scores on inattentive items IV, ADHD H/I sum = sum of scores on hyperactive/impulsive items from ADHD-RS-IV, MSA = Maryland School Assessment

Table 2

Individual Accommodations Regressed on MSA Reading and Math Scores

	Elementary School Students									
	MSA Reading Scores					**MSA Math Scores**				
(*n* = 43)	**β**	***SE***	***t***	***p***	η^2	**β**	***SE***	***t***	***p***	η^2
constant	420.880	9.235	45.57	**.000**		433.490	8.984	48.25	**.000**	
Extended time	19.919	18.375	1.08	.285	.030	−1.798	17.998	−0.10	.921	.000
Frequent breaks	−6.088	16.993	−0.36	.722	.003	4.352	16.514	0.26	.794	.002
Reduced distraction	−35.139	18.023	−1.95	.059	.091	6.865	21.905	0.31	.756	.003
Oral presentation	6.336	17.281	0.37	.716	.004	3.023	16.844	0.18	.859	.001
Use of calculator	---	---	---	---	---	−58.285	18.598	−3.13	**.003**	.210

	Middle School Students									
	MSA Reading Scores					**MSA Math Scores**				
(*n* = 52)	**β**	***SE***	***t***	***p***	η^2	**β**	***SE***	***t***	***p***	η^2
constant	413.660	8.616	48.01	**.000**		416.617	7.057	59.04	**.000**	
Extended time	6.299	16.221	0.39	.700	.003	−6.361	14.322	−0.44	.659	.004
Frequent breaks	−6.208	14.297	−0.43	.666	.004	−2.627	12.380	−0.21	.833	.001
Reduced distraction	2.011	17.385	0.12	.908	.000	15.639	14.355	1.09	.282	.025
Oral presentation	−29.794	17.142	−1.74	.089	.060	−36.209	16.401	−2.21	**.032**	.096
Use of calculator	---	---	---	---	---	9.396	15.208	0.62	.540	.008

Note. The ‘use of calculator’ accommodation was not included in regressions on MSA reading scores because this accommodation is not provided for reading tests.

Table 3

Individual Accommodations Regressed on MSA Reading and Math Scores, Accounting for Parent-Reported Learning Difficulties

	Elementary School Students									
	MSA Reading Scores					MSA Math Scores				
(n = 43)	**β**	***SE***	***t***	***p***	η^2	**β**	***SE***	***t***	***p***	η^2
constant	459.960	20.545	22.39	**.000**		482.237	16.754	28.78	**.000**	
CLDQ mean score	−14.634	7.290	−2.01	.052	.125	−16.092	4.644	−3.46	**.001**	.210
Extended time	16.963	14.298	1.19	.243	.025	−4.030	13.609	−0.30	.769	.002
Frequent breaks	−6.233	18.981	−0.33	.744	.004	−7.346	14.314	−0.51	.611	.006
Reduced distraction	−26.258	16.349	−1.61	.117	.057	8.475	17.190	0.49	.625	.005
Oral presentation	16.024	17.929	0.89	.377	.024	−3.042	13.704	−0.22	.826	.001
Use of calculator	−--	---	---	---	---	−38.031	18.104	−2.10	**.043**	.110

	Middle School Students									
	MSA Reading Scores					MSA Math Scores				
(n = 52)	**β**	***SE***	***t***	***p***	η^2	**β**	***SE***	***t***	***p***	η^2
constant	435.245	15.682	27.75	**.000**		445.653	13.616	32.73	**.000**	
CLDQ mean score	−10.264	5.858	−1.75	.086	.061	−9.958	3.183	−3.13	**.003**	.125
Extended time	9.256	16.119	0.57	.569	.007	0.376	10.948	0.03	.973	.000
Frequent breaks	−9.320	13.482	−0.69	.493	.009	−7.508	12.676	−0.59	.557	.009
Reduced distraction	4.933	20.009	0.25	.806	.002	6.827	10.043	0.68	.500	.005
Oral presentation	−21.909	14.481	−1.51	.137	.033	−25.419	15.095	−1.68	.099	.053
Use of calculator	---	---	---	---	---	12.193	14.832	0.82	.415	.016

Note. The “CLDQ mean score” referred to here represents the CLDQ reading subscale score for the analyses with MSA reading as the dependent variable and the CLDQ math subscale score for the analyses with MSA math as the dependent variable.

Table 4

Individual Accommodations Regressed on MSA Reading Scores, for Students with and without Parent-Reported Reading Difficulties

	Students With Reading Difficulties					**Students Without Reading Difficulties**				
	β	*SE*	*t*	*p*	η^2	β	*SE*	*t*	*p*	η^2
Constant	419.521	18.080	23.20	**.000**		435.782	28.616	15.23	**.000**	
Grade	−3.301	3.127	−1.06	.297	.025	−1.205	4.402	−0.27	.786	.002
Extended time	23.969	16.148	1.48	.145	.049	3.977	18.070	0.22	.827	.001
Frequent breaks	−15.597	14.344	−1.09	.283	.027	−3.813	16.631	−0.23	.820	.001
Reduced distraction	−18.384	16.444	−1.12	.270	.028	−11.138	18.549	−0.60	.552	.009
Oral presentation	5.864	13.730	0.43	.671	.004	−42.286	24.967	−1.69	.098	.067

Note. Students **with** reading difficulties ($n = 49$) are those students whose parent-rated reading difficulties fell above the CLDQ reading mean cut score of 2.67; students **without** reading difficulties ($n = 46$) are those students whose parent-rated reading difficulties fell below the CLDQ reading mean cut score.

Table 5

Individual Accommodations Regressed on MSA Math Scores, for Students with and without Parent-Reported Math Difficulties

	Students With Math Difficulties					**Students Without Math Difficulties**				
	β	*SE*	*t*	*p*	η^2	β	*SE*	*t*	*p*	η^2
Constant	409.832	18.124	22.61	**.000**		490.281	24.937	19.66	**.000**	
Grade	1.111	2.935	0.38	.706	.003	−9.738	4.048	−2.41	**.024**	.188
Extended time	19.816	14.027	1.41	.163	.034	−19.970	19.067	−1.05	.305	.042
Frequent breaks	−20.285	13.442	−1.51	.137	.039	3.291	16.308	0.20	.842	.002
Reduced distraction	−11.252	16.122	−0.70	.488	.009	23.947	18.661	1.28	.211	.062
Oral presentation	−6.056	13.761	−0.44	.662	.003	−14.445	21.110	−0.68	.500	.018
Use of calculator	−19.055	13.967	−1.36	.178	.032	−29.829	21.235	−1.40	.172	.073

Note. Students **with** math difficulties ($n = 63$) are those students whose parent-rated math difficulties fell above the CLDQ math mean cut score of 2.60; students **without** math difficulties ($n = 32$) are those students whose parent-rated math difficulties fell below the CLDQ math mean cut score.