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# Testing Performance as it Relates to Academic Self-Concept and Test Anxiety in Students with and without ADHD

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**Testing Performance as it Relates to Academic Self-Concept and Test  
Anxiety in Students with and without ADHD**

A Thesis  
Presented to  
The Faculty of the Department of Psychology  
Murray State University  
Murray, Kentucky

In Partial Fulfillment  
of the Requirements for the Degree  
of Masters of Arts in Clinical Psychology

by Kyrstin Sutton-Davis

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## Abstract

Students who are diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) comprise 25% of students with disabilities who receive educational accommodations in post-secondary settings, and represent roughly 2 - 4% of college students (Weyandt et al., 2013). However, there are mixed results regarding the efficacy of testing accommodations, specifically extended time, and whether these accommodations may offer an advantage to students with ADHD (Gregg & Nelson, 2012). In addition to extended test time, students with ADHD commonly use minimal disturbance rooms. However, there is little research regarding the efficacy of the accommodation. The relationship among academic self-concept, test anxiety, test performance, and testing environment (testing alone vs. in a group) among students with and without ADHD was examined. Test performance of 67 college students with and without ADHD was compared at three time intervals: 10, 15, and 20 minutes. Participants also completed the Academic Self-Concept Scale, the Test Anxiety Inventory, and the ACT English test. Overall, students with ADHD obtained lower scores across all time conditions; however, the number of completed test questions did not differ based on disorder. There was no significant effect or interaction for testing environment. Based on the findings, extended time accommodations may offer an advantage to students with ADHD by allowing them to answer more test questions. The efficacy of minimal disturbance rooms needs to continue to be explored in future studies.

## Chapter I: Literature Review

According to Section 504 of the Rehabilitation Act of 1973, individuals must be granted access to major life activities, despite any limitations due to their disability (Byrnes, 2008). One life activity that is covered under this statute is educational opportunity. As such, educational accommodations aim to remove barriers of performance that are due to an individual's disability so individuals are able to demonstrate their ability or knowledge (Byrnes, 2008; "Disability Employment," n.d.). The National Center on Educational Outcomes defines accommodations as adjustments in test materials or procedures that allow students to participate in assessments so that their abilities are being measured, rather than their disabilities ("Accommodations for students", n.d.). Academic accommodations may include dictated response, which may mean writing down what the student says for an exam, or having someone else take notes for the student (Byrnes, 2008). Large print materials or Braille materials may also be academic accommodations for students. Byrnes (2008) mentions preferential seating as an academic accommodation, in which students may be allowed to sit in a particular area of the classroom in order to better facilitate their learning. Accommodations of test materials may include having the test items read to the student (Harrison, Bunford, Evans, & Owens, 2013), extended time on tests, or taking a test in a minimal disturbance room (Ofiesh, Moniz, & Bisagno, 2015), among other options. For the purpose of this study, the author will focus on extended time and minimal disturbance room accommodations.

Students who are diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) comprise 25% of students with disabilities who receive educational accommodations in post-secondary settings, and represent roughly 2 - 4% of college students (Weyandt et al., 2013). ADHD is a neuropsychological disorder that is characterized by inattention and/or hyperactivity-impulsivity that begins in childhood and interferes with an individual's daily functioning (American Psychiatric Association, 2013). Although ADHD begins during childhood, a significant proportion of individuals with ADHD continue to experience impairment well into adulthood (American Psychiatric Association, 2013). For instance, students with ADHD in post-secondary settings are more likely to be on academic probation, have lower grade point averages, have lower levels of self-esteem (Lee, Osborne, & Carpenter, 2010; Weyandt & DuPaul, 2006) and have more difficulty managing time compared to their peers without ADHD (Weyandt et al., 2013). Compared to students with ADHD who do not use university services for students with disabilities, students who do utilize these services perform better academically (Lee et al., 2010). Of these services, testing accommodations are used the most consistently for individuals who have ADHD and learning disabilities (Tagayuna, Stodden, Chang, Zeleznik, & Whelley, 2005). These testing accommodations most often include extended time and testing in a minimal disturbance room (Lee et al., 2010).

### **Extended Time**

In a focus group of college students with ADHD, students reported using extended time to relieve symptoms of ADHD. Specifically, students with ADHD reported using extended time to take a break due to difficulties with distractibility and

maintaining attention, to move around, to self-monitor time, or a combination of these (Ofiesh et al., 2015). Despite the common use of this testing accommodation, there is much debate regarding whether extended test time is appropriately compensating for the disability or providing an advantage to individuals with disabilities (Gregg & Nelson, 2012). Alster (1997) found that students with learning disabilities (LD) performed significantly better on an algebra test under extended-time conditions than under regular-timed conditions. He also found that the test scores from the extended-time conditions of students with learning disabilities did not differ significantly from the scores of students without learning disabilities in either time condition. These findings suggest that extended time is effective in improving test scores for individuals with LDs, but it does not result in an advantage for students with LDs over students without LDs. However, Alster (1997) used an elementary algebra test for this study; therefore, the results may not be representative of students performance on more difficult tasks they would experience in the college setting.

Extended time is also a popular accommodation for students with ADHD (Miller, Lewandowski, & Antshel, 2015; Ofiesh et al., 2015). Specifically, Wadley and Liljequist (2013) found that extended time did not result in significantly better test scores on a college math placement test for individuals with ADHD compared to their counterparts without ADHD; however, compared to peers without ADHD, students with ADHD took more time to complete the test, had lower state self-esteem, and attained lower test scores. These results suggest that extended time may not be providing a benefit to students with ADHD regarding their academic performance. Wadley and Liljequist (2013) noted that the math test they used included difficult items and was not a “high



stakes” test; therefore, it is possible students may not have been as motivated to put in the same amount of effort they would engage in for a university exam. However, there are still clear differences between students with and without ADHD outside of academic performance. It may be that the non-academic difficulties that students with ADHD experience negatively affect their academic performance in ways that extended time accommodations are not addressing. For example, self-esteem has been found to be correlated with school performance, albeit weakly, so that individuals with higher self-esteem usually perform better than individuals with lower self-esteem (Baumeister, Campbell, Krueger, & Vohs, 2003).

Conversely, a study conducted by Miller and colleagues (2015) found that students with ADHD performed similarly to students without ADHD on tests when allowed standard time, time and one half, and double time. However, the authors found that extended time gave an advantage to students with ADHD, in that students with ADHD who received extended time were able to answer significantly more test items than their peers without ADHD who received standard test time. Another study found that extended time, specifically double time, benefited students with LDs when given only to LD students (Lewandowski, Cohen, & Lovett, 2013). However, students without LDs benefited more from extended time than students with LDs when both groups were offered extra time (Lewandowski et al., 2013). Based on the results of these studies, extended time seems to level the playing field for students with LDs and ADHD, up to a certain point; once students with LDs and ADHD are offered double time, the extended test time accommodation may then offer an advantage over their non-disabled peers.

Both of the aforementioned studies used the Nelson-Denny reading test for high school and college adults.

The discrepancy in the literature that extended time seems to sometimes help and other times not help students with ADHD perform better academically may be due to differences in performance on mathematical tests versus reading tests for individuals with an LD and/or ADHD diagnosis. It is possible that students with an LD and/or ADHD diagnosis perform better on reading-based tests than they do on mathematical tests, in general.

The discrepancy may also be due to the level of difficulty of the tests (i.e., an elementary-level test versus a college-level test). It is possible that students with ADHD may not experience difficulties related to their symptomology on non-challenging academic tasks, such as a test that is intended for a lower grade level than the student's current academic placement. On the other hand, as noted by Wadley and Liljequist (2013), students may not put forth the same amount of effort on difficult tests that are not "high stakes" tests, which may lead to inaccurate results. If students with ADHD did not put forth the amount of effort they would have for a "high stakes" exam, it is possible their scores may have been artificially lowered in the study. It is also possible that the same is true for the students without ADHD. It may be the case that students without ADHD would normally perform significantly better than students with ADHD, when they put forth the optimal amount of effort on academic exams.

Similarly, students' perceived competence of the test material or their level of academic self-concept may impact their performance. Research has found that individuals' levels of academic self-concept are related to whether they attribute success

to internal or external factors (Tabassam & Grainger, 2002). It has been suggested that individuals who have higher academic self-concept are more likely to attribute their success to internal factors, therefore gaining more satisfaction with their academic performance and leading them to put forth more effort on academic tasks (Tabassam & Grainger, 2002). Therefore, it is possible that students who do not believe they will perform well on a test do not put forth the same amount of effort as someone who believes they will perform well. This lack of effort then negatively affects their test score.

### **Minimal Disturbance Rooms**

In addition to extended test time, students with ADHD commonly use minimal disturbance rooms, which help relieve symptoms similar to those alleviated by extended test time. Some of these symptoms include distractibility, inattention, the need for movement, and lack of focus (Ofiesh et al., 2015). In one study, after students completed a reading test, students reported preferring a quiet, isolated environment for testing (Lee, Osborne, Hayes, & Simoes, 2008). One student stated that any background noises distract him/her because he/she “gives equal attention to everything around [him/her]” (p. 135). Another student reported he/she liked how quiet the room was and that no one else was in the room.

Although minimal disturbance rooms are a popular testing accommodation, there is little research regarding the efficacy of the accommodation. It is possible that the benefits of this accommodation may be at least partially explained by the social facilitation effect. According to Guerin (1983), social facilitation occurs when an animal increases or decreases its behavior in the presence of another animal that it does not otherwise interact with. Furthermore, Zajonc (1965) proposed that social presence either

improves or impairs performance. Specifically, the performance of simple tasks is improved by social presence, while the performance of complex tasks is impaired by social presence. One of the theories that explains why performance is improved or impaired by social performance is the Distraction-Conflict theory (Baron, 1986; Baron, Moor, & Sanders, 1978; Groff, Baron, & Moore, 1983; Sanders & Baron, 1975). The theory explains that social presence acts as a distractor and creates a conflict with the individual's attention between the task and the social presence. For instance, the individual's desire to complete the task competes with factors of social presence such as social comparison or the need to monitor for threats. This attentional conflict then results in a cognitive overload or an increased drive, either of which results in the impaired performance of complex tasks. Because individuals with ADHD are prone to attentional difficulties, these individuals may experience more impaired performance in a group testing environment, compared to individuals without ADHD. The benefit of minimal disturbance rooms may then be the lack of social presence, preventing an individual from experiencing cognitive overload and resulting in impaired test performance.

### **Test Anxiety**

In addition to causing impairments in academic functioning, ADHD is commonly comorbid with anxiety disorders, with prevalence rates of comorbid anxiety disorders ranging from 15% to 35% (Kessler et al., 2006; Klassen, Katzman, & Chokka 2010; Schatz & Rostain, 2006). Researchers have also found that adults with ADHD are more likely to perceive test-taking problems (Ofiesh et al., 2015). Specifically, they typically report feeling that they did not perform well on standardized tests and report difficulty finishing timed tests.

Dan and Raz (2012) found an association between test anxiety and ADHD. Test anxiety occurs when an individual is being evaluated by an examination and he/she has a specific reaction to the examination situation, such as an emotional, cognitive, behavioral, or physiological reaction (Dan & Raz, 2012). These reactions to the examination situation may also be present while students are preparing for the test (Cohen, Ben-Zur, & Rosenfeld, 2008). Research has repeatedly found negative associations between test anxiety and overall test performance, academic achievement, and intellectual aptitude tests (Chapell et al., 2005; Zeidner, 1998). Specifically, research indicates that students who have test anxiety do not perform to their full potential, resulting in test scores that do not accurately represent their knowledge and understanding of the test material (Shobe, Brewin, & Carmak, 2005). Test anxiety can also manifest itself through worry and self-denigrating thoughts (Damer & Melendres, 2011). In conjunction with self-denigrating thoughts, test anxiety has been found to have an inverse relationship with self-esteem (Dan & Raz, 2012; Thomas & Gadbois, 2007).

### **Academic Self-Concept**

Another common area of impairment for individuals with ADHD is self-esteem (Dan & Raz 2012; Biederman, 2005). Studies have also found that students with an LD and/or ADHD tend to have lower academic self-concept, which is a specific domain of self-esteem, compared to their non-disabled peers (Tabassam & Grainger, 2002).

Academic self-concept can be defined as a combination of feelings and beliefs regarding one's general academic functioning (Choi, 2005). A study of college students found that academic self-concept significantly predicted academic achievement measured by students' grades, which were based on several tests and quizzes in the course (Choi,

2005). Based on their findings, the authors suggested that college students who have a higher degree of academic self-concept tend to perform better academically than students who have a lower degree of academic self-concept. However, it is possible that students who perform well academically have higher academic self-concept due to their academic success. Although the direction of the association between academic self-concept and academic performance is unclear, it is possible that lower levels of academic self-concept experienced by students with ADHD could be a contributing factor to the academic difficulties these individuals experience.

The focus of the present study was on the relationship among academic self-concept, test anxiety, and test performance among college students with and without ADHD. Because self-reports of students with ADHD indicate a preference for testing in minimal disturbance rooms, students' test performance was examined in relation to the testing environment. Specifically, whether the test performance of students with ADHD differs when they test alone, as in a minimal disturbance room, versus taking the test among a group of other students, as in a traditional classroom setting, was examined.

It was hypothesized that:

1. Students with ADHD who took the test alone would complete more test questions and obtain higher scores than students with ADHD who tested in a group.
2. Students without ADHD would complete more test questions and obtain higher scores than students with ADHD in the group testing situation.
3. Students with ADHD would report higher levels of test anxiety than students without ADHD (Dan & Raz, 2012); students with ADHD would also report lower

levels of academic self-concept than students without ADHD (Tabassam & Grainger, 2002).

4. Students who endorsed higher levels of test anxiety would obtain lower scores than students who endorsed lower levels of test anxiety (Shobe, Brewin, & Carmak, 2005).
5. Students who endorsed lower levels of academic self-concept would obtain lower scores than students who endorsed higher levels of academic self-concept (Choi, 2005).

## Chapter II: Methods

### Participants

235 participants completed the online portion of the study; however, 144 participants did not complete the in person portion of the study and were therefore excluded from the study. Of the remaining 91 participants who completed both portions of the study, 24 participants did not provide the information needed to collect all of their data and were excluded from the study. The final sample consisted of 67 undergraduate and graduate students from Murray State University; 11 participants were recruited through the Murray State University office of Student Disability Services (SDS), and 52 participants were recruited through an online research recruiting system and via psychology courses. All participants were eligible to win one of four \$10 Visa gift cards, regardless of recruitment method. Participants were required to sign up for the study online and be present on the day the study was scheduled.

Of the participants, 73% were female and 27% were male. The majority were Caucasian (89.55%), followed by biracial (5.97%), Hispanic (2.98%), and African American (1.49%). The average age of participants was 20.58 years ( $SD = 4.73$ ), ranging from 18 to 51 years. Participants ( $N = 22$ ) reported they had previously received a diagnosis of ADHD and 10 of the 22 participants reported they were taking ADHD medication at the time of the study. Five participants reported they were receiving testing



accommodations through SDS at the time of the study and three participants reported they had previously received testing accommodations.

## **Materials**

*Test Anxiety Inventory (TAI)*. The Test Anxiety Inventory (Spielberger et al., 1980; see Appendix B) is a 20-item self-report inventory that is intended to measure individual differences in test anxiety, which is seen as a situation-specific personality trait (Taylor & Deane, 2002). Using a 4-point Likert scale, individuals indicate how often they experience certain symptoms of anxiety before, during, and after tests, with higher scores indicating higher levels of test anxiety. A total score is calculated that measures susceptibility to anxiety related to test situations. Two subscales are included in the inventory: the TAI/E (emotionality,  $\alpha = .91$ ) and the TAI/W (worry,  $\alpha = .91$ ). Studies have shown that the TAI has good concurrent and construct validity, as well as test-retest and internal-consistency reliability ( $\alpha = .93$ ; Taylor & Deane, 2002).

*Academic Self-Concept Scale (ASCS)*. The Academic Self-Concept Scale (Reynolds, 1988; see Appendix C) is a 40-item self-report inventory for use with college students to assess for an academic aspect of self-concept. The ASCS uses a 4-point Likert scale, ranging from *strongly disagree* (1) to *strongly agree* (4), with higher scores indicating higher levels of academic self-concept. Previous research has indicated a strong internal consistency reliability of  $\alpha = .91$  (Reynolds, Ramirez, Magriña, & Allen, 1980). The validity of the scale was assessed through correlations of the ASCS and GPA (.40) and the Rosenberg Self-esteem Scale (.45). A multiple regression analysis of the ASCS with GPA and scores on the Rosenberg scale resulted in a multiple correlation of

.64, which increased to .67 when SAT scores were added to the regression equation (Reynolds et al., 1980).

*Practice American College Testing (ACT) English Test.* The American College Testing (ACT) is a standardized test that assesses students' academic achievement and readiness for college. It consists of four tests of educational development that are curriculum-based, one of which is English (Allen & Sconing, 2005). The ACT English Test is a 45-minute test that consists of 75 questions that measures individuals' understanding of standard English conventions, such as sentence structure, punctuation, and word usage. The test also measures knowledge of language, such as tone, word choice, and style, as well as production of writing, which includes topic development, unity, organization, and cohesion. The test is comprised of multiple-choice questions that accompany five essays, or passages ("About the ACT", n.d.). This particular ACT English Test came from the 2005-2006 version of the ACT and was retrieved from an open access online ACT practice test site.

A 1995 study of a nationally representative sample of twelfth-grade students produced a reliability of  $\alpha = .92$  for the ACT English Test (ACT, 2014). The ACT Technical Manual (2014) reports the ACT has good content-related validity in predicting students' success in college by measuring their problem-solving skills and knowledge in particular subject areas.

*Demographic Information Form.* The demographic information form consisted of 9 questions, as well as age, gender, grade level, race, GPA, and SAT/ACT score (Appendix D). The form has yes or no questions regarding ADHD diagnosis and medication, treatment for anxiety and related medication, as well as learning disability

diagnosis and testing accommodations. There are 2 open-ended questions allowing participants to describe any testing accommodation they currently or have previously received.

### **Procedure**

Participants completed the first portion of the study online. Before beginning the study, participants read the informed consent form and gave their consent, then they completed the ASCS (see Appendix C). Participants were asked to enter a three- or four-digit identification code or their SONA ID, after which they were randomly directed to one of two websites to schedule the in person portion of the study. One website offered times and dates for the individual testing condition and the other website offered times and dates for the group testing condition, regardless of diagnosis.

During the in person portion, participants provided their SONA ID or their three- or four -digit identification number to the experimenter the day of the study and were offered the opportunity to enter into the gift card drawing. Once participants entered the drawing, the experimenter handed participants the same informed consent form they signed online. Once all participants arrived, the experimenter allowed participants to ask questions concerning the informed consent, then provided directions. Participants were given 20 minutes to complete as much of the ACT English test as they could and were asked to mark their progress at 10 and 15 minutes. At the end of the 20-minute duration, participants completed the TAI (Spielberger et al., 1980), followed by the demographic information form (see Appendix D).

### Chapter III: Results

All analyses were conducted at the 0.05 level of significance. To test the first part of hypothesis one (students with ADHD who test alone will complete more test questions than students with ADHD who tested in a group), a 2 (ADHD vs. non-ADHD) x 2 (alone vs. group) x 3 (number of completed questions at 10, 15, and 20 minutes) mixed-model analysis of variance (ANOVA) was used. Results indicated there was no significant interaction ( $F(2, 67) = 1.98, p = 0.14$ ). To test the second part of hypothesis one (students with ADHD who test alone will obtain higher scores than students with ADHD who test in a group), a 2 (ADHD vs. non-ADHD) x 2 (alone vs. group) x 3 (performance at 10, 15, and 20 minutes) mixed-model ANOVA was used. Results indicated there was no significant interaction ( $F(2, 67) = 0.14, p = 0.15$ ). The same analyses were used to test the first part of hypothesis two (students without ADHD who test in a group will complete more test questions than students with ADHD who test in a group) and the second part of hypothesis two (students without ADHD will obtain higher scores than students with ADHD who test in a group). No interaction was found for the first or second part of hypothesis two ( $F(2, 67) = 0.02, p = 0.98; F(1, 67) = 1.01, p = 0.32$ ). These results indicate diagnosis and testing condition, combined did not impact performance in this study. However, students with ADHD had lower scores than students without ADHD,

regardless of testing condition ( $F(1, 63) = 7.22, p = 0.009$ ), suggesting diagnosis has a greater impact on test performance than testing environment. This pattern held (i.e. the only significant difference was test score based on disorder) when analyses were run as a series of 2 x 2 ANOVAs. Means and standard deviations appear in Table 1.

Contrary to hypothesis three, students with ADHD did not report higher levels of test anxiety ( $t(62) = -0.36, p = 0.72$ ) or lower levels of academic self-concept ( $t(62) = 1.17, p = 0.24$ ) than students without ADHD. These results indicate students with and without ADHD may experience similar levels of test anxiety and ADHD may not have as much of an impact on academic self-concept as previously believed. Although Hypothesis five was supported (students who endorse lower levels of academic self-concept will obtain lower scores than students who endorse higher levels of academic self-concept), the results were not statistically significant ( $r = 0.25, p = 0.05$ ).

However, hypothesis four (students who endorse higher levels of test anxiety will obtain lower scores than students who endorse lower levels of test anxiety) was supported ( $r = -0.35, p < 0.001$ ), meaning higher levels of test anxiety were positively correlated with lower overall test scores. Correlations appear in Table 2.

Table 1.

*Means and Standard Deviations of scores participants.*

Variables	ADHD		Non-ADHD	
	Alone	Group	Alone	Group
	n = 8	n = 14	n = 18	n = 27
	M(SD)	M(SD)	M(SD)	M(SD)
ACT Score	24.00(3.05)	23.08(3.37)	26.20(3.78)	23.64(3.61)
GPA	3.10(7.90)	3.18(5.87)	3.35(5.99)	3.33(5.26)
TAI Score	45.37(11.03)	50.00(12.01)	45.31(11.94)	48.19(14.49)
ASCS Score	102.62(5.34)	106.85(7.29)	107.00(5.70)	107.22(5.81)
Correct at 10 <sup>a</sup>	68.87(15.79)	65.93(16.59)	75.89(12.77)	80.22(13.18)
Correct at 15 <sup>a</sup>	67.37(15.17)	63.36(16.78)	72.72(13.85)	76.95(12.37)
Correct at 20 <sup>a</sup>	67.00(15.55)	62.50(16.67)	72.83(13.95)	75.96(12.29)
Completed at 10	30.75(9.13)	27.93(6.92)	29.72(9.95)	28.56(9.47)
Completed at 15	42.62(13.89)	41.57(9.72)	44.28(9.95)	42.37(12.64)
Completed at 20	50.12(10.66)	52.28(12.64)	56.44(12.43)	52.92(11.28)

Note: <sup>a</sup>Proportion of correct answers at different time intervals

Table 2.

*Correlations of scores among participants| (N = 67)*

Variables	TAI Score <sup>b</sup>	ASCS Score <sup>b</sup>	Correct at 20 <sup>a</sup>	GPA <sup>c</sup>	ACT Score <sup>c</sup>
TAI Score <sup>b</sup>	—	0.25	-0.35	0.05	-0.13
		<i>p</i> = 0.05	<i>p</i> = 0.004	<i>p</i> = 0.71	<i>p</i> = 0.34
ASCS Score <sup>b</sup>	—	—	0.06	-0.03	0.17
			<i>p</i> = 0.60	<i>p</i> = 0.82	<i>p</i> = 0.18
Correct at 20 <sup>a</sup>	—	—	—	0.24	0.63
				<i>p</i> = 0.06	<i>p</i> < 0.0001
GPA <sup>c</sup>	—	—	—	—	0.19
					<i>p</i> = 0.18

Note: <sup>a</sup>Proportion of correct answers at different time intervals. <sup>b</sup>*N* = 64. <sup>c</sup>*N* = 59

## Chapter IV: Discussion

Overall, students with ADHD obtained lower test scores than students without ADHD, regardless of testing condition. However, students who tested alone did not perform better than students who tested in a group. This finding does not support the Distraction-Conflict theory—the idea that social presence divides an individual’s attention between the task at hand and the social presence (Baron, 1986; Baron, Moor, & Sanders, 1978; Groff, Baron, & Moore, 1983; Sanders & Baron, 1975). This suggests the presence of others may not hold as much of an impact on performance as previously hypothesized. It may be that the presence of others only acts as a distractor or divides an individual’s attention when the task at hand is a “high stakes” task, such as a midterm or final exam. As this study did not have any potential negative outcome for participants, it can be considered a “low stakes” task and may not accurately represent students’ academic performance.

Similar to the findings of Chapell and colleagues (2005) and Zeidner (1998), students who scored higher on the TAI performed worse on the ACT English test. However, students with ADHD did not report higher levels of test anxiety than students without ADHD. This suggests students with ADHD and students without ADHD may experience similar difficulties regarding test performance and that testing accommodations may indeed offer an advantage to students with ADHD by potentially alleviating test anxiety that is also experienced by students without ADHD. Ofiesh and



colleagues (2015) found students with ADHD perceived more test taking difficulties, and Dan and Raz (2012) found students with ADHD reported higher levels of test anxiety than students without ADHD. Minimal disturbance rooms and extended time accommodations may decrease test anxiety among students with ADHD so that they experience similar levels of test anxiety as their peers without ADHD. Therefore, these accommodations may level the playing field for students with ADHD. However, the number of questions answered at different time intervals did not differ among students with and without ADHD. This may support Miller and colleagues' (2015) finding that extended time accommodations offer an advantage to students with ADHD once they exceed time and one half.

Contrary to Dan and Raz, (2012) and Thomas and Gadbois (2007), academic self-concept was positively correlated with test anxiety, meaning students who have higher levels of academic self-concept also experience higher levels of test anxiety. This may suggest those who experience higher levels of test anxiety are driven to put more effort into academic tasks, compared to those who experience less anxiety towards tests and school work. The extra effort these individuals put into academic tasks may then enhance their academic self-concept. However, the effects of test anxiety may not have been accurately represented in this study, due to the lack of consequences of poor test performance.

### **Limitations**

Since the test students took in this study can be considered a "low stakes" task, the external validity of the study may be a limitation. Students may not have put forth the same amount of effort during this study as they would have during a class exam, making

it difficult to translate these results to typical class performance among students with and without ADHD. Furthermore, the individual testing condition was not reflective of a minimal disturbance room environment. Students in both testing conditions completed the study in a classroom and could occasionally hear noise from the hallway or from adjacent classrooms. Minimal disturbance rooms are typically in a more secluded area in order to decrease the level of outside noise.

Of the 235 participants who initially participated in the study, only 91 participants completed the second in person part of the study. There may have been significant differences between the participants who completed the study and those who did not. For instance, the participants who did not complete the second part of the study may have scored lower on the ASCS and therefore may have had lower academic motivation and may have been academically less skilled. This may explain why they did not complete the in person portion of the study. There may have also been a significant difference between the 67 participants who completed the study and followed instructions and the 24 participants who did not follow instructions. One of the diagnostic features of ADHD is not following instructions, therefore it is possible that a portion of those 24 participants had ADHD and may have significantly differed from the participants who did not have ADHD.

The low proportion of students who completed both portions of this study created a power limitation for this study. Many of the results were close to significance and it is possible more hypotheses would have been supported, had more participants completed both portions of the study. Therefore, it is possible this study could have fallen in line with previous research had there been more power.

## **Future Directions**

Future studies should try to better simulate minimal disturbance rooms, rather than testing in an empty classroom. For instance, minimal disturbance rooms are often small and the student is left alone in the room during the test. In the study, the experimenter remained in the room with participants in the individual condition and may have acted as a distraction. The study was conducted in classrooms on the Murray State University campus, and it may be that part of the reason minimal disturbance rooms seem to be effective to students is due to the fact that it is simply a different environment than typical classrooms. In other words, students may perceive that simply being in a different environment than the classroom helps them focus more.

It would be beneficial for future studies to attempt to create a more “high stakes” environment for participants in order to increase external validity. One of the limitations of this study, as well as previous studies (Wadley & Liljequist, 2013), is that the academic task participants completed did not have any potential negative outcome, therefore participants may have put forth less effort than they would have for an academic task that would have impacted their grade. If a study had a perceived negative outcome, participants may be more likely to put forth the same or similar effort they would for a class and the results may be more reflective of participants’ typical performance.

In conclusion, testing alone versus testing in a group did not offer a benefit to students with or without ADHD in this study. However, one of the limitations of this study was poor power, meaning the results of this study may have been different, had there been more participants. On the other hand, based on the number of test questions

completed at different time intervals by students with and without ADHD, extended time accommodations may offer a benefit to individuals with ADHD by allowing them to complete more test questions; this finding is similar to previous research (Miller et al., 2015). However, students with ADHD obtained lower scores than students without ADHD, suggesting there is still a need for testing accommodations. Future studies should focus more on minimal disturbance rooms and trying to better simulate the “high stakes” component of class assignments in order to increase external validity.

## Appendix A

## Informed Consent

**Project Title:** Factors Affecting Test Behavior

**Principle Investigator:**

Kyrstin Sutton-Davis  
Graduate Student, Clinical Psychology  
Department of Psychology  
Murray State University  
401c Wells Hall  
Murray, KY 42071

**Faculty Mentor:**

Laura Liljequist, Ph.D.  
Professor  
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Murray State University  
401B Wells Hall  
Murray, KY 42071  
lliljequist@murraystate.edu  
(270) 809-2990

You are being asked to participate in a project conducted through Murray State University. You must be at least 18 years of age to participate. Below is an explanation of the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation.

**Nature and Purpose of Project:** The purpose of this study is to gain information about factors that may affect test behavior among individuals.

**Explanation of Procedures:** Your participation in this study will involve completing an anonymous online questionnaire. The online questionnaire should only take 5-10 minutes. Upon completion of the questionnaire, you will be directed to <https://ksuttondavis.youcanbook.me/> to sign up for Part 2 of the study which will be completed in person. During Part 2 you will complete an academic test, an additional questionnaire and a demographic information sheet. Part 2 of the study should only take 30 minutes.

**Discomfort and Risks:** There is minimal to no risk to you as a participant. At most, some participants may find the questions uncomfortable as you will be asked questions concerning school-related attitudes, as well as questions concerning symptoms of anxiety.

Please remember that your participation is voluntary, and you can refuse to answer any questions or discontinue your participation at any time with no resulting penalty. You can stop at any point and exit the survey or close your browser without penalty.

**Benefits:** There are no direct individual benefits to you beyond the opportunity to learn first-hand what it is like to participate in a research study and to learn about some of the methods involved in psychological research. A general benefit is that you will add to our knowledge of the research subject.

**Confidentiality:** Your responses on all the tasks will be completely anonymous; they will only be numerically coded and not recorded in any way that can be identified with you. Dr. Liljequist will keep all information related to this study secured and locked in a password protected file for at least three years after completion of this study, after which all such documents will be destroyed.

**Required Statement on Internet Research:** All survey responses that the researcher receives will be treated confidentially and stored on a secure server or hard drive. However, given that the surveys can be completed from any computer (e.g., personal, work, school), we are unable to guarantee the security of the computer on which you choose to enter your responses. As a participant in this study, the researcher wants you to be aware that certain “keylogging” software programs exist that can be used to track or capture data that you enter and/or websites that you visit.

**Refusal/Withdrawal:** Your participation in this study is completely voluntary. Your refusal to participate will involve no penalty. In addition, you have the right to withdraw at any time during the study without penalty or prejudice from the researchers. If you choose to refuse/withdraw at any time you will be shown a post experimental debriefing statement. Earned experimental inducements will be granted at the end of the study.

By checking “Yes”, I acknowledge that the risks and benefits involved and the need for the research have been fully explained to me; and that I have been informed that I may withdraw from participation at any time without prejudice or penalty.

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY THE MURRAY STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD (IRB) FOR THE PROTECTION OF HUMAN SUBJECTS. ANY QUESTIONS PERTAINING TO YOUR RIGHTS AS A PARTICIPANT OR ACTIVITY-RELATED INJURY SHOULD BE BROUGHT TO THE ATTENTION OF THE IRB COORDINATOR AT (270) 809-2916. ANY QUESTIONS ABOUT THE CONDUCT OF THIS RESEARCH PROJECT SHOULD BE BROUGHT TO THE ATTENTION OF DR. LAURA LILJEQUIST IN THE MSU PSYCHOLOGY DEPT., AT (270) 809-2990.

**MSU IRB APPROVED: 2/8/17 EXPIRES: 2/7/18**

## Appendix B

## The Test Anxiety Inventory (Spielberger et al., 1980)

Please rate how frequently you experience these symptoms using the scale below:

**1**= Almost Never      **2**= Sometimes      **3**= Often      **4**= Almost Always

1. I feel comfortable and relaxed while taking tests. \_\_\_\_\_
2. While taking examinations I have an uneasy, upset feeling. \_\_\_\_\_
3. Thinking about my grade in a course interferes with my work on tests. \_\_\_\_\_
4. I freeze up on important exams. \_\_\_\_\_
5. During exams I find myself thinking about whether I'll get through school. \_\_\_\_\_
6. The harder I work at taking a test, the more confused I get. \_\_\_\_\_
7. Thoughts of doing poorly interfere with my concentration on tests. \_\_\_\_\_
8. I feel very jittery when taking an important test. \_\_\_\_\_
9. Even when I'm well prepared for a test, I feel very nervous about it. \_\_\_\_\_
10. I start feeling very uneasy just before getting a test paper back. \_\_\_\_\_
11. During tests I feel very tense. \_\_\_\_\_
12. I wish examinations did not bother me so much. \_\_\_\_\_
13. During important tests I am so tense that my stomach gets upset. \_\_\_\_\_
14. I seem to defeat myself while working on important tasks. \_\_\_\_\_
15. I feel very panicky when I take an important test. \_\_\_\_\_
16. I worry a great deal before taking an important examination. \_\_\_\_\_
17. During tests I find myself thinking about the consequences of failing. \_\_\_\_\_
18. I feel my heart beating very fast during important tests. \_\_\_\_\_
19. After an exam is over I try to stop worrying about it, but I can't. \_\_\_\_\_
20. During examinations I get so nervous that I forget facts I really know. \_\_\_\_\_

## Appendix C

## Academic Self-Concept Scale (Reynolds, 1988)

Listed below are a number of statements concerning school-related attitudes. Rate each item as it pertains to you personally. Base your ratings on how you feel most of the time.

Use the following scale to rate each statement:

**SD. Strongly Disagree**                      **D. Disagree**                      **A. Agree**                      **SA. Strongly Agree**

INDICATE YOUR RESPONSE BY CIRCLING THE APPROPRIATE LETTER(S). Be sure to answer all items. Please respond to each item independently, do not be influenced by your previous choices.

1. Being a student is a very rewarding experience.  
SD    D    A    SA
2. If I try hard enough, I will be able to get good grades.  
SD    D    A    SA
3. Most of the time my efforts in school are rewarded.  
SD    D    A    SA
4. No matter how hard I try I do not do well in school.  
SD    D    A    SA
5. I often expect to do poorly on exams.  
SD    D    A    SA
6. All in all, I feel I am a capable student.  
SD    D    A    SA
7. I do well in my courses given the amount of time I dedicate to studying.  
SD    D    A    SA
8. My parents are not satisfied with my grades in college.  
SD    D    A    SA
9. Others view me as intelligent.  
SD    D    A    SA
10. Most courses are very easy for me.  
SD    D    A    SA
11. I sometimes feel like dropping out of school.



- SD    D    A    SA
12. Most of my classmates do better in school than I do.
- SD    D    A    SA
13. Most of my instructors think that I am a good student.
- SD    D    A    SA
14. At times I feel college is too difficult for me.
- SD    D    A    SA
15. All in all, I am proud of my grades in college.
- SD    D    A    SA
16. Most of the time while taking a test I feel confident.
- SD    D    A    SA
17. I feel capable of helping others with their class work.
- SD    D    A    SA
18. I feel teachers' standards are too high for me.
- SD    D    A    SA
19. It is hard for me to keep up with my class work.
- SD    D    A    SA
20. I am satisfied with the class assignments that I turn in.
- SD    D    A    SA
21. At times I feel like a failure.
- SD    D    A    SA
22. I feel I do not study enough before a test.
- SD    D    A    SA
23. Most exams are easy for me.
- SD    D    A    SA
24. I have doubts that I will do well in my major.
- SD    D    A    SA
25. For me, studying hard pays off.
- SD    D    A    SA
26. I have a hard time getting through school.
- SD    D    A    SA

27. I am good at scheduling my study time.  
SD D A SA
28. I have a fairly clear sense of my academic goals.  
SD D A SA
29. I'd like to be a much better student than I am now.  
SD D A SA
30. I often get discouraged about school.  
SD D A SA
31. I enjoy doing my homework.  
SD D A SA
32. I consider myself a very good student.  
SD D A SA
33. I usually get the grades I deserve in my courses.  
SD D A SA
34. I do not study as much as I should.  
SD D A SA
35. I usually feel on top of my work by finals week.  
SD D A SA
36. Others consider me a good student.  
SD D A SA
37. I feel that I am better than the average college student.  
SD D A SA
38. In most of the courses, I feel that my classmates are better prepared than I am.  
SD D A SA
39. I feel that I do not have the necessary abilities for certain courses in my major.  
SD D A SA
40. I have poor study habits.  
SD D A SA

## Appendix D

## Demographic Information

Age \_\_\_\_\_

Gender \_\_\_\_\_

Race \_\_\_\_\_

GPA \_\_\_\_\_

Grade level \_\_\_\_\_

SAT/ACT Score \_\_\_\_\_

1. Have you ever been diagnosed with Attention-Deficit/Hyperactivity Disorder?  
Yes/No
2. Are you currently taking medication for ADHD? Yes/No
3. Have you ever sought therapy or treatment for anxiety? Yes/No
4. Are you currently taking medication for anxiety? Yes/No
5. Have you ever been diagnosed with a learning disorder? Yes/No
6. Are you currently receiving testing accommodations for ADHD and/or a learning disorder?  
Yes/No
7. If yes, what kind of accommodations are you receiving?  
\_\_\_\_\_  
\_\_\_\_\_
8. Have you ever received testing accommodations for ADHD and/or a learning disorder?  
Yes/No
9. If yes, what kind of accommodations did you receive?  
\_\_\_\_\_  
\_\_\_\_\_

## Appendix E

## IRB Approval Letter

**Institutional Review Board**

328 Wells Hall  
 Murray, KY 42071-3318  
 270-809-2916 • msu.irm@murraystate.edu

**TO:** Laura Lijequiest  
**Psychology**

**FROM:** **Institutional Review Board**  
 Jonathan Baskin, IRB Coordinator

**DATE:** 2/8/2017

**RE:** Human Subjects Protocol I.D. – IRB # 17-097

The IRB has completed its review of your student's Level 2 protocol entitled *Testing Performance as it Relates to Academic Self-Concept and Test Anxiety in Students with and without ADHD*. After review and consideration, the IRB has determined that the research, as described in the protocol form, will be conducted in compliance with Murray State University guidelines for the protection of human participants.

**The forms and materials that have been approved for use in this research study are attached to the email containing this letter. These are the forms and materials that must be presented to the subjects. Use of any process or forms other than those approved by the IRB will be considered misconduct in research as stated in the MSU IRB Procedures and Guidelines section 20.3.**

**This Level 2 approval is valid until 2/7/2018.**

If data collection and analysis extends beyond this time period, the research project must be reviewed as a continuation project by the IRB prior to the end of the approval period, 2/7/2018. You must reapply for IRB approval by submitting a Project Update and Closure form (available at [murraystate.edu/irm](http://murraystate.edu/irm)). You must allow ample time for IRB processing and decision prior to your expiration date, or your research must stop until such time that IRB approval is received. If the research project is completed by the end of the approval period, then a Project Update and Closure form must be submitted for IRB review so that your protocol may be closed. It is your responsibility to submit the appropriate paperwork in a timely manner.

The protocol is approved. You may begin data collection now.

**Opportunity  
 afforded**

[murraystate.edu](http://murraystate.edu)

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