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ADHD Malingering In A College Setting

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ABSTRACT

An increase in the number of adults seeking ADHD evaluations as college students in recent years raises concerns of malingered or exaggerated attentional impairments. Some students may falsely report ADHD symptoms in an attempt to obtain academic accommodations as well as prescriptions for stimulant medications. Meanwhile, little attention has been given to the development of either self-reported measures or performance-based tests that can ensure the validity of reported or exhibited attentional symptoms. In 2015, Multi-Health Systems Inc. (MHS) released an improved version of a continuous performance test, the Conners Continuous Performance 3rd Edition (Conners CPT 3), which may have improved ability to differentiate genuine from feigned attentional deficit. At this time, no prior studies are known to have investigated the ability of the Conners CPT 3 to distinguish between individuals with ADHD and those mimicking attentional symptoms, and to delineate how they differ. In this study, college students with no history or diagnosis of ADHD were asked to mimic symptoms of attentional impairment while completing Conners CPT 3 assessment. Though this study is limited by small sample size and is lacking in sample diversity, significant differences were found for many variables with a few showing non-overlapping confidence intervals. The results indicate that students exaggerated the presumed ADHD symptoms, on Conners CPT 3 variables such as Detectability, Omissions, Hit Reaction Time, and Hit Reaction Time Standard Deviation. This suggests that when subjects with no history of attentional impairment attempt to present ADHD symptoms, they generally make more

mistakes than clinical samples with attentional dysfunction; frequently by reacting to stimuli discriminatively while responding less to target stimuli. In addition, simulators were seen to produce slower responses, with more variability than individuals with ADHD. These results offer initial evidence that standard neuropsychological measures of sustained attention and vigilance to task may be useful in identifying those feigning or exaggerating attentional impairment. Implications for clinical practice, assessment, and future research are described.

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CHAPTER I

INTRODUCTION

There has been an increase in the number of adults seeking attention deficit/hyperactivity disorder (ADHD) evaluations in college settings (Harrison, 2006; Musso & Gouvier, 2012). They are often seeking academic accommodations, such as note takers, professors' notes, extra time on tests, or special testing environments. In addition, some seek prescriptions for stimulant medications, such as amphetamine and methylphenidate (Edmundson et al., 2017; Smith, Cox, Mowle, & Edens, 2017; Walls, Wallace, Brothers, & Berry, 2017). The availability of academic accommodations and abuseable drugs for those with ADHD raises concerns that some students may falsely report ADHD symptoms and attempt to produce ADHD-associated behaviors in order to fraudulently obtain these rewards. With increasing numbers of college students claiming to have ADHD, little attention has been given to the development of tests that can ensure the validity of self-reported symptoms of impairment (Suhr & Berry, 2017). While there are many established symptom validity tests (SVTs) and performance validity tests (PVTs) that can help to rule out incredible report of symptoms in other psychiatric and neurological disorders, clinicians typically rely on self-report measures and continuous performance tests (CPTs) to indicate the presence of ADHD symptoms (Sollman, Ranseen, & Berry, 2010; Suhr & Berry, 2017). The problem with this diagnostic approach is that many self-report assessments and past versions of CPTs have been

ineffective in detecting non-credible responses (Marshall, Hoelzle, Heyerdahl, & Nelson, 2016). The most current version of Conners CPT (Conners CPT 3), may have improved ability to differentiate genuine from feigned ADHD performance. This study will be the first to investigate whether Conners CPT 3 can assist clinicians in detecting ADHD malingering.

Literature Review

Over the past decade, several epidemiologic studies on ADHD in adults indicate an increase in ADHD prevalence, though problems with the credibility of self-reported symptoms and concerns regarding deliberately exaggerated or feigned attentional impairment leads to questions of diagnostic validity (Fisher & Watkins 2008; Fuermaier et al., 2017; Smith et al., 2017; Suhr, Cook, & Morgan, 2017; Walls et al., 2017). In 2016, approximately 9.4% of children 2 to 17 years old (total population 6.1 million) in the United States had been diagnosed with ADHD, and this prevalence is similar to the estimates in previous years (Danielson et al., 2018). For adults in college settings, 20% to 25% of college students claim to have ADHD (DuPaul, Weyandt, O'Dell, &Varejao, 2009). In addition, the number of patients between the ages of 20 and 39, who were diagnosed and treated for ADHD more than doubled from 2007 to 2011 (U.S. Drug Enforcement Administration, Office of Diversion Control, 2012). However, these estimates may not accurately reflect the actual prevalence rate of the disorder. This is because diagnosing adults is often based on self-report during evaluation, while many of the ADHD behavior rating scales can be completed to make a person appear clinically impaired when they actually do not have such symptoms (Bryant et al., 2017; Marshall et al., 2016; McGough & Barkley, 2004).

With these limitations on the accuracy of the diagnostic tools, it is clear that self-reported ADHD symptoms are susceptible to feigning or exaggeration, a pattern psychiatrically identified as malingering (5th ed.; *DSM-5*; American Psychiatric Association, 2013). Musso and Gouvier (2012) estimated the base rate of ADHD malingering to range from 10% to 20% in college settings when the external incentives are present. Additionally, Walls et al. (2017) cite a study (Sullivan, May, & Galbally, 2007) reporting that up 48% of students who presented for ADHD evaluation were feigning symptoms. Such behavior may be expected in the demanding and competitive college environment. Furthermore, academic accommodations are not the only incentivizing factors. Many seek stimulant medications that increase awareness and attention, aid wakefulness, and alleviate distress (Rabiner, 2013). These medications can improve anyone's academic performance, whether they have ADHD or not (Advokat, 2010). However, these medications can also be misused or sold illegally, posing dangers to the students and their community.

Defining ADHD

Prior to Diagnostic and Statistical Manual of Mental Disorders, 4th ed., ADHD was recognized as strictly a childhood disorder (Quinn, 2003). After the release of *DSM-IV*, the understanding of the disorder shifted. Clinicians acknowledged that ADHD had its origin in childhood and could produce symptoms that persist into adulthood (4th ed.; *DSM-IV*; American Psychiatric Association, 1994). The recognition of adult ADHD carried over to the present diagnostic manual for psychiatric disorders, the Diagnostic and Statistical Manual of Mental Disorders, 5th ed. (American Psychiatric Association, 2013). According to *DSM-5*, ADHD is defined as a persistent pattern of inattention

and/or hyperactivity-impulsivity that interferes with normal functioning or development (American Psychiatric Association, 2013). Symptoms of inattention can present as difficulty maintaining focus, wandering off tasks, lack of persistence, and disorganization. Hyperactivity symptoms include excessive fidgeting, restlessness, constant activity, impulsivity, and difficulty waiting one's turn. These symptoms are typically present in several settings such as home, work, school, and in other social contexts. An individual typically begins experiencing inattentive or hyperactive-impulsive symptoms in childhood years, prior to the age 12, and they can persist into adulthood.

Assessing ADHD

To reliably diagnose ADHD, a comprehensive evaluation is needed. The *DSM-5* also places importance on identifying the presence of symptoms before the age of 12 since it is difficult for adults to recall childhood symptoms reliably (American Psychiatric Association, 2013). It is suggested that a comprehensive evaluation should include a detailed clinical interview, gathering information regarding behavioral patterns from reliable sources (e.g., parent and teacher interviews, first-hand observation), self-rated questionnaires, and reviewing of school records, as well as academic performance data (DuPaul & Stoner, 2014). Meanwhile, other assessment techniques, such as cognitive tests, neuropsychological tests, and continuous performance tests, are also often incorporated, although they are not necessary components of the evaluation process (DuPaul & Stoner, 2014). Similarly, in evaluating adults, an evaluation that involves clinical interviews and neuropsychological measures can help rule out other psychiatric

conditions, such as depression and anxiety, which can also interfere with attention (Sollman et al., 2010)

A difficulty that clinicians encounter during initial diagnosis in adults is that the evaluation is based primarily on self-reported current symptoms and retrospective recall of childhood behaviors (Smith et al., 2017). Often, in place of neuropsychological testing, evaluation is supplemented by the use of face-valid self-report symptom inventories and continuous performance tests (CPTs) that assess sustained attention and response inhibition (Sollman et al., 2010). However, individuals who are motivated to seek a diagnosis of ADHD can easily exaggerate the severity of impairment on the self-report inventories by over-endorsing symptoms (Harrison, 2006; McCann & Roy-Byrn, 2004). Only a few ADHD rating scales, such as the Clinical Assessment of Attention Deficit-Adult (CAT-A) and Conners Adult ADHD Rating Scales (CAARS), have validity indices to detect feigning (Marshall et al., 2016; Walls et al., 2017). Several studies support the use and further development of both the CAT-A Infrequency Scale and CAARS infrequency index (CII) to help identify feigning, as they are modestly effective in correctly differentiating actual clinical ADHD cases from feigned ADHD. Additionally, they are able to identify nonclinical individuals more correctly (Cook et al., 2018, Edmundson et al., 2017, Marshall et al., 2010; Walls et al., 2017). On the other hand, studies are inconclusive about whether CPT's such as Conners CPT II, Test of Variable Attention, and Integrated Visual and Auditory CPT can detect intentional feigning of symptoms (Booksh, Pella, Singh, & Gouvier, 2010; Homack & Reynolds, 2005; Sollman et al., 2010).

Defining Malingering

Malingering is characterized by intentional production of false or exaggerated physical or psychological symptoms, motivated by external incentives (American Psychiatric Association, 2013). Within the context of ADHD malingering, one may falsely produce or report symptoms of inattention during examination, but not in other settings such as home, work, or in social settings. Distorted self-reports of psychological status continue to concern the field of clinical assessment (Rios & Morey, 2013). While there is an extensive body of literature on malingering in neurocognitive dysfunctions and in other psychiatric disorders, there has been less attention given to ADHD malingering in educational settings (Suhr & Berry, 2017). Suhr and Berry (2017) also point out that future research should investigate the issues of overreporting and invalid reporting of symptoms. In fact, several tools have been developed to detect responses that indicate malingering.

Assessing Malingering

Rogers (2018) provides validated detection strategies for malingering, such as unlikely detection strategies and amplified detection strategies. Unlikely detection strategies focus on clinical features that are unusual, atypical, or rarely occur in genuine clinical populations. Meanwhile, amplified detection strategies focus on excessive frequency and intensity of the alleged symptoms of impairment. These strategies provide structural framework for systematic assessment that are validated (Rogers, 2018). Furthermore, Slick and Sherman (2013) recommend identifying inconsistencies as well as using multiple indicators of poor effort and symptom exaggeration. These methods are referred to as marked and implausible discrepancies and posterior probabilities (Slick &

Sherman, 2013). Therefore, in assessing for neurocognitive malingering, it is recommended that practitioners use symptom validity tests (SVTs) and performance validity tests (PVTs) along with the following suggestions: frst, determine whether the reported symptoms or cognitive profiles are consistent with known profiles; Second, determine whether the degree of self-reported impairment is beyond what is expected of genuine impairment; tird, attempt to determine whether there is evidence of motivation to feign impairment by evaluating the examinee's perception of incentives for material gain; and fourth, be aware of the broadening the conceptualization of malingering to accept any manifestation of inadequate motivation can result in results that are not precise and likely to be misleading (Rogers, 2018). With this last suggestion, it is important to note that although decades of research and test developments have improved clinicians' and researchers' ability to detect malingering, there has not been many well established strategically based approaches to understanding malingering constructs (Rogers, 2018). Rogers also points out that is no direct way to measure motivation, although motivation is an important part of malingering. Regardless, the malingering strategies Rogers (2018) describes are posited to have empirical support and are recommended for consideration by practitioners and researchers.

In light of ADHD malingering, these strategies appear to address problems that are presented in research on ADHD malingering. Studies conducted with the use of continuous performance tests are showing that malingerers often exaggerate symptoms of attention impairments beyond those with confirmed ADHD, which is relatively similar to what Rogers (2018) describes regarding malingering detection (Booksh et al., 2010; Marshall et al., 2010; Marshall et al., 2016; Quinn, 2003). Participants in these studies,

who were given incentives to malinger ADHD symptoms, made more errors and made responses with slower speeds. Therefore, these studies suggest that continuous performance tests such as the Test of Variable Attention, Integrated Visual and Auditory Continuous Performance Test, and Conners Continuous Performance Test can show the differences between malingering responses and honest ADHD, as malingerers are more likely to overestimate the level of impairment expected for ADHD (Booksh et al., 2010; Marshall et al., 2010; Quinn, 2003).

Although there are not many self-report measures that are designed to specifically detect ADHD malingering, studies have investigated the uses of several PVTs and SVTs, which were developed to reveal falsified symptoms of psychiatric disorders (Suhr & Berry, 2017). Many studies have investigated these tests and support their use with ADHD malingering, although these tests were not created specifically for ADHD assessment (Edmundson et al., 2017; Fuermaier at al., 2017). Notable tests that show promising utility in assessing ADHD malingering include: Word Memory Test (WMT) and Test of Memory Malingering (TOMM), (Edmundson et al., 2017; Sollman et al., 2010; Sullivan et al., 2007). WMT is traditionally used in forensic settings and other settings where secondary gain is present, since the test is sensitive to poor effort and exaggeration of cognitive symptoms (Sullivan et al., 2007). On the other hand, the TOMM is one of the most commonly used SVTs in the clinical context as it has demonstrated good ability to differentiate feigned from genuine responses (Sollman et al., 2010). However, while the TOMM and the WMT were demonstrated to be effective in detecting false reporting of symptoms during ADHD malingering simulation, their

abilities to correctly identify those without ADHD symptoms are only within a moderate range (Edmundson et al., 2017; Sollman et al., 2010).

It would be beneficial for such tests to include indices that directly examine sustained attention or cognitive processing speed, rather than short-term memory (Sollman et al., 2017). Another measure that is capable of assessing response validity is the Personality Assessment Inventory (PAI), which can help indicate that the examinee may be falsely reporting symptoms, (Smith et al., 2017). However, like the TOMM and WMT, the PAI is not ADHD specific, and should be used in conjunction with other tests until their further revision.

Original Study Proposal

This study proposed to investigate the ability of neurotypical individuals to mimic the performance of ADHD subjects on Conners' Continuous Performance Test 3 (Conners CPT 3). Although CPTs directly assess areas of attention central to the concept of ADHD and should theoretically be more difficult to feign, questions remain as to their ability to discriminate between true ADHD and malingered symptoms (Sollman et al., 2010). Previous versions of computerized CPTs, such as Conners' Continuous Performance Test II (C-CPT II) were unsuccessful at distinguishing between genuine and malingered ADHD (Sollman et al., 2010). Still, clinicians frequently rely on such tools to establish ADHD diagnoses. However, a new version (Conners CPT 3) with updated normative and clinical data, as well as reportedly improved reliability and validity (Conners, 2014), has not been studied for its ability to discriminate these conditions. This study would be the first to investigate whether Conners CPT 3 has the ability to distinguish the performance of students between students with ADHD, nonclinical

students, and nonclinical students feigning ADHD performance. This should help clinicians determine the utility of the test in detecting malingered ADHD symptoms. In practice, these data would guide clinicians in determining how much emphasis to put on Conners CPT 3 performance in establishing a diagnosis of ADHD.

Originally, this study intended to recruit neurotypical students and students with ADHD. The plan was to assign neurotypical students to the Nonclinical Group as the experimental group and to assign students with ADHD to ADHD Group as the control. Full recruitment for this would require approximately 80 nonclinical subjects and 20 ADHD subjects. The primary dependent variables of interest were Detectability (*d*'), Omissions, Commissions, and Perseverations for each round of testing. Secondary variables of interest include the Hit Reaction Time (HRT), Hit Reaction Time Standard Deviation (HRT SD), Variability, Hit Reaction Time Block Change (HRT Block Change), and Hit Reaction Time Inter-Stimulus Interval Change (HRT ISI Change). The independent variables were the two groups, a 2x2 mixed model ANOVA design was planned to examine the differences in Conners CPT 3 the primary and secondary variables of interest. Additionally, the plan was to assess the main effects of diagnosis (a between groups factor) and instruction (a within groups factor), as well as the interaction of these effects.

However, due to the inability to recruit subjects with ADHD, there was only one group in this study, the Nonclinical Group. Though the primary and secondary variables of interest remain the same, the research question and the study design received revisions. The revised research question asks whether the participants in this will perform similarly to Conners' normative sample under normal testing conditions or not, and whether their

performance will differ from Conners' ADHD clinical sample, when attempting to mimic ADHD symptoms. To answer this question, the Nonclinical Group underwent baseline and malingering ADHD testing procedures. Then, their performance data was compared to Conners CPT 3 normative sample as well as ADHD clinical sample performance data, which had more diverse demographic characteristics and larger sample sizes. The details on the demographic characteristics of these published samples are further elaborated in the Measures section. *T*-tests were conducted instead of the 2x2 mixed model ANOVA, and 95% confidence intervals were calculated to examine the differences.

CHAPTER II

METHOD

Participants

Participants in this study were undergraduate psychology students at Abilene Christian University. They were recruited from Abnormal Psychology and Physiological Psychology classes via class announcements and emails. There were no restrictions in study participation due to sex, gender, race, or ethnicity. Participation was restricted to those greater than 18 years of age due to issues of informed consent and the intent to focus the study of college-age students. Participants were screened for active mood disorders, anxiety disorders, psychotic disorder, or substance use disorders. Asymptomatic individuals in or out of treatment were eligible to participate and to be included in the analysis. Data from subjects with active psychiatric illness were not included in the analysis. The primary investigator managed the recruitment, obtained informed consent, and conducted data collection. To minimize coercive pressure, the consent form specified alternatives to research participation that individuals may participate in to earn extra credit. Participants were compensated with 10 points of extra credit added to their final exam grade in Abnormal Psychology and Physiological Psychology classes regardless of whether their data was included in analysis. Students who showed symptoms of active psychiatric illnesses were offered a choice of active participation in study procedures or an alternative assignment designed to take 45 minutes to complete and consisting of writing a review on a research article. However, all

of the students who enrolled elected to participate in the study. A total of 31 students were recruited. None of the students recruited met the criteria to be included in the ADHD Group. Therefore, not having an ADHD Group as intended affected the design of this study, changing the methods and the research question.

Measures

The measures used in this study are Conners' Continuous Performance Test 3rd Edition (Conners CPT 3), Structured Clinical Interview for DSM-5-Clinician Version-ADHD Module, and The DSM-5 Self-Rated Level 1 Cross Cutting Symptom Measures – Adult. The following section describes each measure and their psychometric properties.

Conners' Continuous Performance Test 3rd Edition

Continuous performance tests frequently are used in a clinical context to evaluate inattention and impulsivity related to ADHD (Sollman et al., 2010). Conners CPT 3 is a task-oriented, computerized assessment designed to detect attention-related problems and can aid in assessment of ADHD and other neurological conditions related to attention (Conners, 2014). The test requires respondents to press the space bar when any letter appears, except for "X". The entire test administration lasts 14 minutes. The test structure and the descriptions of each score is further elaborated in Appendix B. Table 1 contains brief descriptions for each of the scores.

Table 1

Conners CPT 3 Scores, Abbreviations, and Definitions (Conners, 2014).

Variable Type	Score (Abbreviation)	Definition	Higher Scores Indicate...
Response Style	C	Style of responding.	a conservative response style, while lower scores indicate a liberal response style.
Detectability	*d'*	Ability to discriminate targets (any alphabetical letter) from non-targets (letter "X").	less ability to discriminate targets from non-targets (negative raw scores can be negative, indicating greater ability).
Error Type (%)	Omissions	Rate of missed targets.	greater rate of omission errors.
	Comissions	Rate of incorrect responses to non-targets at 100 milliseconds or more.	greater rate of commission errors.
	Perseverations	Rate of anticipatory, repetitive, or random responses made under 100 milliseconds.	greater rate of perseveration errors.
Reaction Time Statistics	Hit Reaction Time (HRT)	Average response speed measured in milliseconds.	slower response speeds (lower scores indicate faster response speeds).
	Hit Reaction Time Standard Deviation (HRT SD)	Response speed consistency.	less consistent response speeds.
	Variability	Variability of response speed consistency.	higher variability of response speeds across sub-blocks.
	Hit Reaction Time Block Change (HRT Block Change)	Change in HRT across blocks.	slower response speeds in the later blocks (raw scores can be negative, indicating faster responses in the later blocks).
	Hit Reaction Time Inter-Stimulus interval Change (HRT ISI Change)	Change in HRT across ISIs	slower response speeds at longer ISI (raw scores can be negative, indicating faster responses at longer ISIs).

According to Conners CPT 3 manual, the test claims to have good reliability and validity after assessing all scores. The median split-half reliability was .92 for nonclinical samples while the median split-half reliability ranged from .92 to .94 for the clinical sample (Conners, 2014). This demonstrates that Conners CPT 3 scores have strong internal consistency for both normative and clinical groups. The median test-retest reliability was .67; The correlations across all scores were significant ($p < .01$), with the exception of HRT Block Change (Conners, 2014). This demonstrates that the respondents produced similar scores across repeated assessments, with the exception of HRT Block Change. The test also claims to be able to differentiate clinical from nonclinical cases. The discriminative validity was established by the finding of significant differences in all scores between of the ADHD sample and matched general population sample ($p < .05$), except for HRT scores ($p = .186$). The effect sizes for the scores ranges from small to moderate ($d = 0.10$ to 0.49) (Conners, 2014).

The following section describes the demographics characteristics of Conners CPT 3 normative and clinical samples that are used for comparison to the participants in this study. The sample size is larger, more diverse, and representative of the U.S. general population (Conners, 2014). While the participants in the current study were administered Conners CPT 3 test twice with different sets of instructions, the individuals in Conners' published samples only took the test once.

Conners' normative sample includes 1,400 individuals and they were divided into two age groups, 8 to 17 years and 18 years and older. The demographic characteristics of Conners' normative sample ages 18 and older consist of 600 adults between the ages 18 to 89 years, evenly proportioned between males and females. The major race or ethnic

group is White (67%), followed by Hispanic (14%), Black (11.7) and Other (7%). Almost half of the adults in this sample received high school education or less (44.7%), while 30% had attended some college, and about 25% had a university degree or higher. For this study, the nonclinical data from the 18 to 24-year-old age group, which consists of 200 individuals, was used as Norm Standard.

Conners' clinical sample consists of 346 individuals with ADHD, with 253 children ages 8 to 17, and 93 adults ages 18 to 75. The data reported by Conners is from the sample with combined age groups. Thus, the combined demographic characteristics of Conners' clinical sample consist of 61.6% male and 38% female, with 73.1% children under the age of 17 and 16.9% adults ages 18 and older. The major race or ethnic group is White (72.5%), followed by Hispanic (10.1%), Black (10.7%), and Other (6.6%). Approximately half of the individuals in this sample (49.7%) either had parents who earned a university degree or higher or had completed university themselves, while 27.7% of this sample attended some college, and 22.5% had high school experience or less. The data from the age group that is more representative to the sample in this study, which is in the 18 to 34 years old age range, was unavailable since Conners only reported data from the combined group,

Structured Clinical Interview for DSM-5-Clinician Version – ADHD Module

The Structured Clinical Interview for DSM-5-Clinician Version (SCID-5-CV) is a semi-structured interview that may be used by clinicians and researchers as a guide for making major *DSM-5* diagnoses (First, Williams, Karg, & Spitzer, 2016). It can also be used for various purposes such as to ensure systematic evaluation of major *DSM-5* diagnoses, to improve interviewing skills of mental health professionals, and to

characterize as well as to select a study population. The SCID-5-CV assesses for current symptoms of 10 psychiatric disorders that are organized into relatively self-contained modules. One of the disorders included is ADHD. This experiment will use the SCID-5 ADHD module to select a study population, ensuring that the clinical population has symptoms that meet the *DSM-5* criteria for ADHD. The ADHD assessment module begins with two screening questions ("Over the past several years, have you been easily distracted or disorganized?", "Over the past several years, have you had a lot of difficulty sitting still or waiting your turn?"), and if the answer to both questions is "no", then it is indicative that the examinee does not have problems with inattention, hyperactivity, or impulsivity in the past six months. However, if the respondent answers "yes" to at least one of the screening questions, the interviewer may proceed with the full assessment (First et al., 2016). The full assessment module assesses for inattention symptoms (Criterion A1), hyperactive/inattentive symptoms (Criterion A2), presence of symptoms prior to age 12 (Criterion B), presence of symptoms in two or more settings (Criterion C), interference with functioning (Criterion D), and for the possibility of comorbidity (Criterion E). According to the most up-to-date information on the SCID website, there is currently no reliability or validity data available for SCID-5. There is also no reliability or validity data for the adult ADHD module in the previous versions of SCID.

The DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measures – Adult

The DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measures – Adult is a self-rated measure that assesses mental health domains that are important across psychiatric diagnoses. It is part of the two-level cross-cutting symptom measure developed for research and improvement of clinical evaluation (American Psychiatric

Association, 2013). Level 1 questions consist of 23 items that assess 13 psychiatric domains including depression, anger, mania, anxiety, somatic symptoms, suicidal ideation, psychosis, sleep problems, memory, repetitive thoughts and behaviors, dissociation, personality functioning, and substance use. Each item assesses the severity of symptoms over the previous two-week period using a five-point scale, ranging from 0 ("None/Not at all") to 4 ("Severe/Nearly every day"). A rating of 2 ("Mild") or greater in any item within a domain requires further inquiry to determine if additional assessment is necessary; the exception is with substance use, suicidal ideation, and psychosis, in which a rating of 1 ("Slight") requires additional inquiry. Level 2 questions provide a more in-depth assessment of each domain. The test was found to have good test-retest reliability (r = .64 to .97) in all measures except the two mania measures (r = .53 to .56) in adult clinical samples across the U.S. and in Canada (American Psychiatric Association, 2013; Narrow et al., 2013). For the purpose of this experiment, level 1 of cross-cutting measures was used during the screening process as a guide to identify the presence of psychiatric disorders each participant may have, while questions from level 2 were used as needed to help clarify ambiguous self-report of symptoms.

Procedure

This study consisted of two sessions, a screening session and a testing session. In the beginning of screening session, the informed consent document was provided to each participant. Participants were allowed to read the informed consent document and have any questions answered about their participation in the study. After reviewing the informed consent, they completed a six-question paper-and-pencil quiz concerning their participation to ensure their understanding of the information contained in the informed

consent document. The participants were allowed to re-take the quiz if they failed. Once they had passed the quiz, they were allowed to sign the informed consent document. All participants were fully informed of the data being collected, the privacy of the data, the time required to complete the research, risks and benefits of research participation, and alternatives to participation. After reviewing and completing informed consent, all participants completed a demographics data form. Then, the participants were screened using the DSM-5 Self-Rated Level 1 Cross-Cutting Symptom Measure – Adult, and SCID-5-CV ADHD module. These screening instruments helped identify participants with clinically significant psychiatric symptoms and verified the presence or absence of ADHD.

Participants without ADHD and without active mood, anxiety, psychotic, or substance use symptoms were assigned to the Nonclinical Group. Participants with exclusionary psychiatric symptoms were offered the opportunity to participate in study procedures or to complete an alternative writing assignment for extra credit. All of the participants who met the exclusionary criteria volunteered to participate, although their data from their study performance were not included in data analysis. Participants with confirmed ADHD diagnosis, but without active mood, anxiety, psychotic, or substance use symptoms would have been assigned to the ADHD Group.

At the end of the screening process, each of the participants was scheduled to return for the testing session within three days of screening. Automated email reminders were sent 24 hours prior to the testing time to ensure that the participants were reminded of their appointments. In the testing session, the Conners CPT 3 was administered in the Psychology Department lower-level classrooms. Two classrooms were used due to

scheduling conflicts with class lectures. The Conners CPT 3 was administered on a mobile laptop computer that was set on a desk in a similar orientation in each classroom.

At the beginning of the session participants were informed that they were going to complete a computerized test twice with each round of administration separated by a 15-minute break. Prior to the first administration of the Conners CPT 3, participants were given the standard instructions used in clinical testing for ADHD, in which they were instructed to press the spacebar once for every letter except for the letter "X". The participants were allowed to complete practice tests until they felt confident enough to begin the actual test. Before beginning, the participants were reminded to turn off all mobile devices and that the test administrator would not be able to interact with the participant. After the first round of Conners CPT 3 administration was completed, the participants were allowed to take a 15-minute break. Once the break was over, the participants returned to the testing room to complete the second round. Prior to the second round of testing, the participants received an additional set of instructions asking them to mimic the performance of a person who was trying to get treatment for ADHD. Increased motivation was provided by informing participants that if they were successful at duplicating ADHD performance as indicated by increasing the computer-generated probability of having ADHD to greater than 50% (Nonclinical Group) or by increasing the probability of having ADHD by 20% over first test performance (ADHD Group), then they would receive double the extra credit points (i.e., increasing from 5 points to 10 points). However, the participants would receive ten 10 extra credit points, regardless of their actual performance. The scripts for these instructions are included in appendices C,

D and E. Once again, the participants were reminded to turn off their devices before they could start the test.

After participants complete the second Conners CPT 3 task, they were debriefed. They were informed that they would receive the full 10 points of extra credit regardless of their Conners CPT 3 performance. Any difficulties or distress experienced during the experiment were recorded. After debriefing, subjects were allowed to leave.

Revised Study Design

The subjects in the Nonclinical Group were administered Conners CPT 3 twice, with different instructions (baseline condition and malingering ADHD condition). Paired *t*-tests were conducted to investigate the difference between baseline condition and malingering condition scores (within group). For comparison, the data obtained from the current study sample were assessed in light of normative and ADHD samples used in creating Conners CPT 3 (Norm Standard, ADHD Standard). In addition, 95% confidence intervals were calculated for the means of all primary and secondary variables of interest for each testing condition in this study and for the ADHD Standard and Norm Standard. This should help display differences between fabricated ADHD performance versus genuine ADHD performance.

The first hypothesis was that, when asked to mimic ADHD symptoms, the participants will deliver significantly higher scores in all measures, reflecting decreased detectability, more commission errors, more omission errors, and more perseveration compared to their baseline performance. The second hypothesis was that subjects mimicking ADHD symptoms will show slower response speed (increased HRT), less consistent response speeds (increased HRT standard deviation), more variability of

response speeds across sub-blocks (increased Variability), slower responding in later testing blocks (HRT Block Change), and slower response times during longer interstimulus intervals (HRT ISI Change). In other words, the participants were expected to perform similarly to the normal population when completing the test under normal conditions, and they were expected to perform similarly to the ADHD population when they attempted to mimic ADHD symptoms.

CHAPTER III

RESULTS

Results

The recruitment efforts yielded 31 participants, none of whom had ADHD. The majority of the participants were Caucasian females, classified as Juniors, and majoring in psychology. The mean age was 20.2 years. This demographic profile was expected based on recent enrollment history in Abnormal Psychology and Physiological Psychology classes. Eight of the participants' data were excluded from the analysis due to the presence of psychological distress symptoms (i.e., anxiety, poor sleep quality, depression) at a moderate range.

Paired *t*-tests were calculated for all of the primary and secondary variables of interest. Statistically significant differences were found between baseline condition and malingering ADHD condition on most scores, which include the following: detectability (*d'*), Omissions, Commissions, Perseverations, Hit Reaction Time Standard Deviation (HRT SD), and Variability. As shown in Figure 1, stimulus detectability was at expected levels in subjects at baseline (*M*=-3.07, *SD*=0.89, 95% CI [-3.43, -2.71], t (22) =9.25, *p*=0.000), based on the normal standard used to develop the Conners CPT 3. When these same subjects were asked to mimic ADHD symptoms (*M*=-1.12, *SD*=1.03, 95% CI [-1.54, -0.70]), however, stimulus detectability decreased, as indicated by the less negative *d*' measure in mimic ADHD condition. In fact, detectability decreased beyond that expected of ADHD subjects.

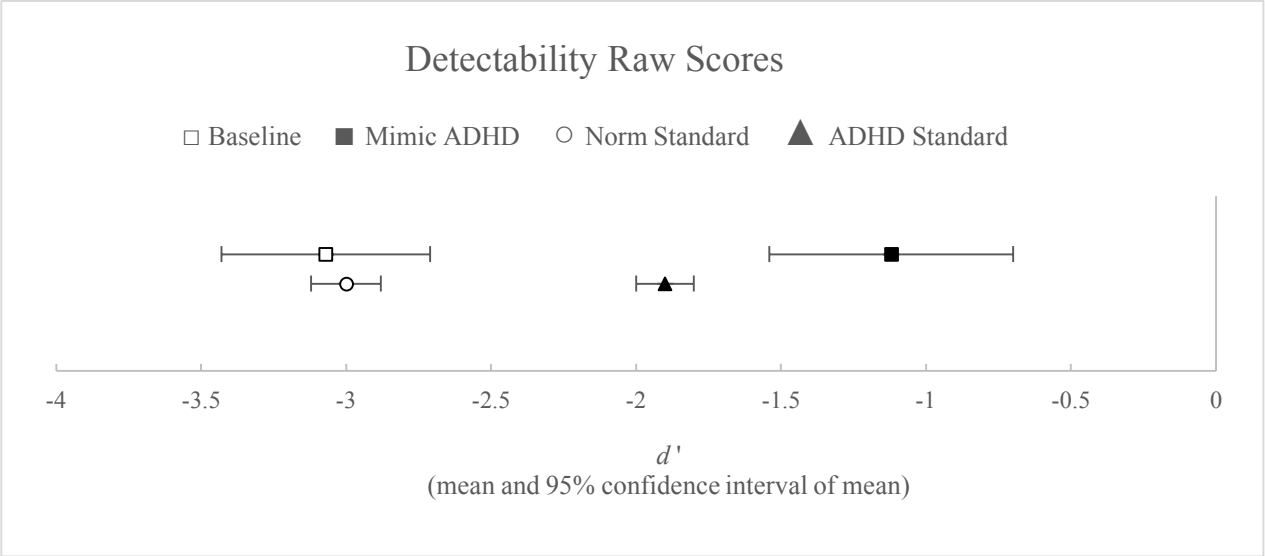

Figure 1. Mean raw scores and 95% confidence intervals for Detectability in baseline and malingering conditions as well as in Norm Standard and ADHD Standard.

Similarly, Figure 2 shows the difference in error rates between testing conditions and in comparison, with the norms established for Connors CPT 3. As expected, subjects mimicking ADHD made significantly more errors on omission (M=14.22, SD=18.12, 95% CI [13.8, 14.64]), commission (M=54.70, SD=19.00, 95% CI [46.93, 62.47]), and perseveration (M=2.04, SD=2.38, 95% CI [1.07, 3.01]) than when they were testing under normal conditions (Omissions: M=0.83, SD=1.19, 95% CI [0.34, 1.32], t(22)=3.57, p=0.002); Commission: M=30.43, SD=18.64, 95% CI [22.81, 38.05], t(22)=8.97, p=0.000); Perseverations: M=0.04, SD=0.21, 95% CI [-0.05, 0.13], t(22)=4.18, p=0.000). In addition, the study participants performed similarly to the norm standard at baseline conditions for all types of errors, and when mimicking ADHD performed similarly to the ADHD Standard for commission errors and perseveration. Only with regard to errors of omission did the 95% confidence interval not overlap the ADHD Standard.

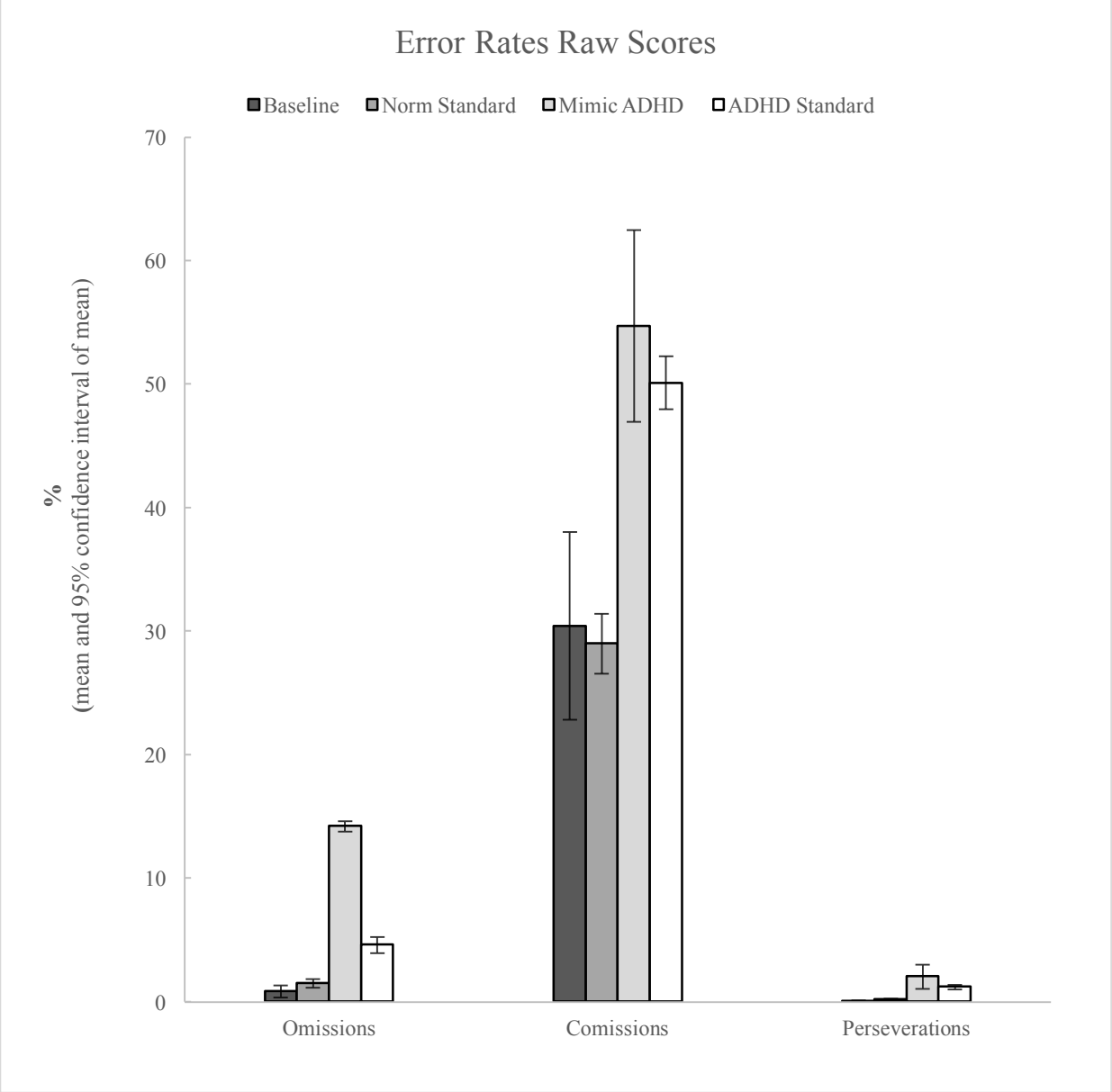

Figure 2. Mean raw scores and 95% confidence intervals for Error Rates: Omissions, Commissions, and Perseverations in baseline and malingering conditions as well as in Norm Standard and ADHD Standard.

Figures 3 and 4 show the differences in the secondary variables of interest between testing conditions. Figure 3 demonstrates that, as predicted, subjects mimicking ADHD (HRT: *M*=483.01, *SD*=129.48, 95% CI [430.09, 535.93]) respond more slowly to

stimuli than they do when performing at baseline (HRT: *M*=371.52, *SD*=80.53, 95% CI [338.61, 404.43]). At baseline, our subjects responded quickly to stimuli, but not markedly different from the reported Norm Standard. When mimicking ADHD, however, the subjects in the present study performed substantially slower than the ADHD standard.

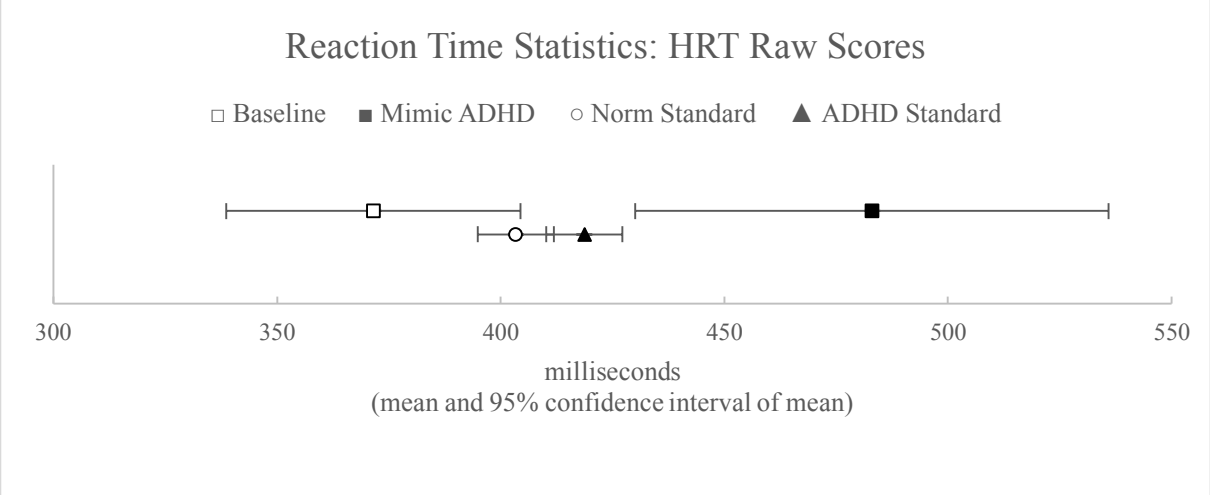

Figure 3. Mean raw scores and 95% confidence intervals for Reaction Time Statistics: HRT in baseline and malingering conditions as well as in Norm Standard and ADHD Standard.

On the other hand, Figure 4 shows that subjects mimicking ADHD show more variability in the response timing (HRT SD: *M*=0.424, *SD*=0.155, 95% CI [0.361, 0.487]) and more timing variability between sub-blocks (Variability: *M*=0.109, *SD*=0.050, 95% CI [0.089, 0.129]) compared to baseline (*M*=0.209, *SD*=0.049, 95% CI [0.000, 0.012], *t*(22)=7.29, *p*=0.000), and *M*=0.065, *SD*=0.078, 95% CI [0.033, 0.097], *t*(2)=2.49, *p*=0.02, respectively). Interestingly, this study's subjects as baseline performed similarly to the Norm Standard, but while mimicking ADHD showed more variability (both HRT SD and Variability) than expected compared to the ADHD Standard. No significant

changes were noted between testing conditions for HRT Block Change and HRT ISI Change (p>0.05).

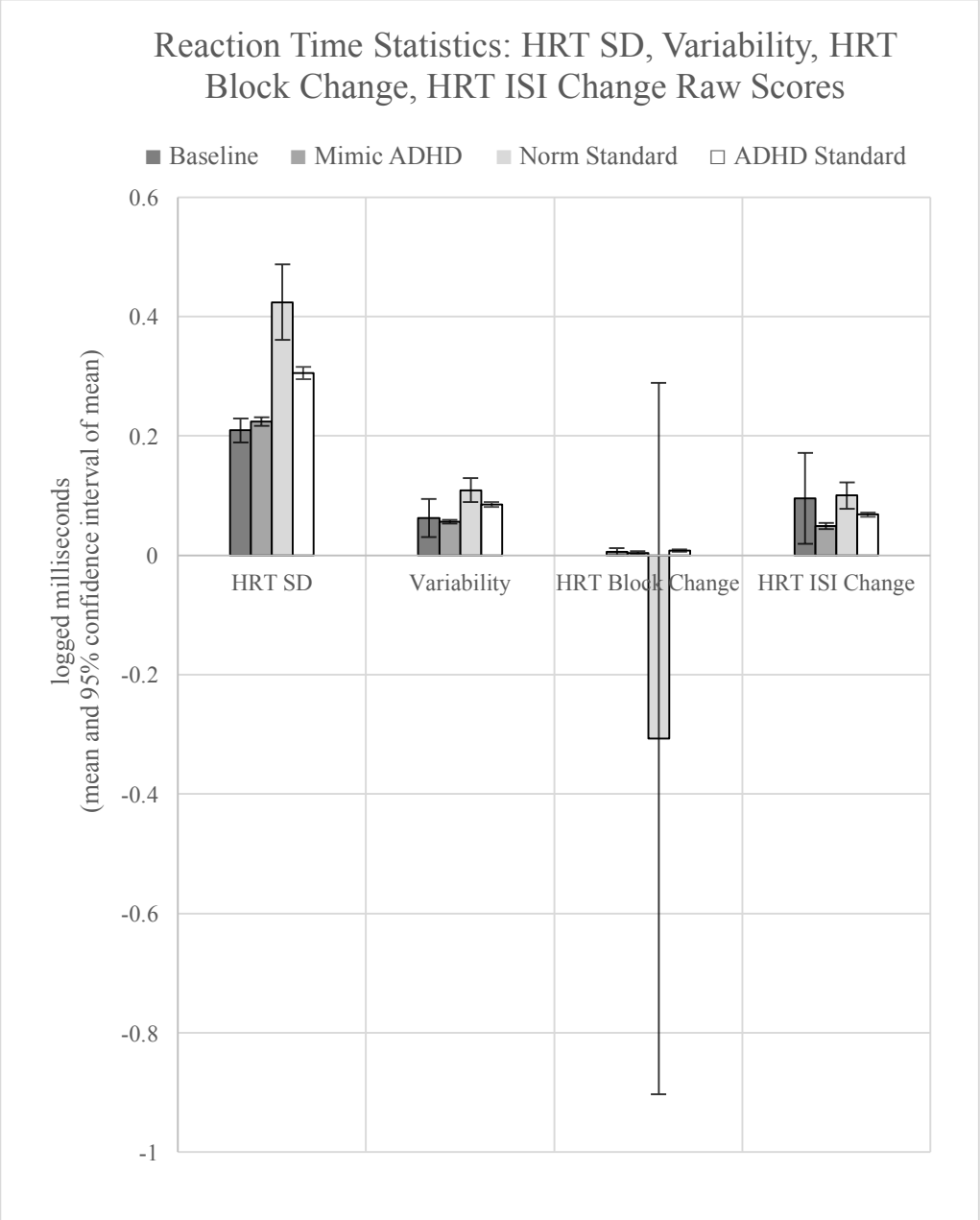

Figure 4. Mean raw scores and 95% confidence intervals for Reaction Time Statistics: HRT SD, Variability, HRT Block Change, HRT ISI Change in baseline and malingering conditions as well as in Norm Standard and ADHD Standard.

Additional Analysis Worth Noting: Response Style (*C)*

The participants response style was reported in *T*-score and was not included as one of the variables because data from Conners CPT 3 normative samples were not readily available to be compared to. However, after conducting a paired samples *t*-test to compare the response style scores, there was a significant difference between baseline condition and malingering ADHD condition. The Response Style *T*-score under malingering ADHD condition (M=57, SD=16) was higher than normal condition (M=47, SD=9, $t(22)= 3.42$, $p= 0.002$). However, these two scores fall within the Balanced response style range (*T*-score between 41-59) (Conners, 2014). These *T*-scores suggest that participants performed in a balanced manner under both conditions, though under malingering ADHD condition they performed slightly more conservatively than they did under normal condition.

CHAPTER IV

DISCUSSIONS

Current Findings

The current study aims to investigate how nonclinical individuals would perform on Conners CPT 3 when mimicking ADHD symptoms and how they would compare to the normative and clinical samples used in construction the test. The results show how scores from malingering attempts differ from normal attempts at taking the test. The results indicate that, when nonclinical individuals are attempting to mimic ADHD symptoms, they appeared less able to detect target stimuli and made more errors than when they were taking the test normally. This indicates that they responded without discriminating target from non-target stimuli, responded less to the targets, responded to non-targets more, and made greater perseverative responses. Furthermore, this decrement in performance while mimicking ADHD was greater than expected for ADHD subjects. These findings confirm the first hypothesis.

Further results partially confirm the second hypotheses concerning reaction time measures. Subjects mimicking ADHD did prolong their reaction times, HRT SD and Variability compared to baseline testing as well as ADHD Standard. In addition, the reaction times and HRT SD of subjects mimicking ADHD were moderately more prolonged than the subjects in ADHD Standard group. Unlike the reactions time and HRT SD measures, however, the Variability difference is small in magnitude. On the

other hand, they did not increase variability between block (HRT Block Change) or with different interstimulus intervals (HRT ISI Change). Thus, it is shown that in mimicking ADHD, subjects slow their response times but also increase the distribution of their response times across the entire test. These results suggest that the increased variability observed in subjects mimicking ADHD is seen across the entire test administration but does not vary much with duration of testing or speed of stimulus presentation.

The lack of significant changes in HRT Block Change or in HRT ISI Change is interesting, since Conners (2014) reports significant differences between ADHD and the general population in these scores, though with small effect sizes. In this current study, a negative value for HRT Block Change was observed. This indicates that, on average, the participants accelerated toward the end of the administration. Though this result was not significant due to a wide 95% confidence interval, it is a potentially interesting observation to follow up on, especially since this observation is the opposite of changes described in the ADHD Sample in Conner's data, which had a positive slope of change. Conners' data suggests that people with ADHD symptoms lose sustained attention and very slightly slow down instead of speed up towards the end of administration (Conners, 2014). Also, since there was barely any change for HRT ISI Change score, this indicates that the participants' reaction time across three inter-stimulus intervals (1, 2, 4 seconds) did not change with longer pauses between stimuli, suggesting vigilance was maintained (Conners, 2014).

Lastly, it is interesting to note that the response style of individuals attempting to malinger ADHD remains within the Balanced range. This is also supported by reports generated by Conners CPT 3 program. Out of 23 participants undergoing baseline

condition, 14 participants received Balanced response style classification label, while seven were labeled Liberal and two were labeled Conservative. On the other hand, the range of scores is broader in malingering ADHD condition, although most people still responded in a Balanced manner. Under malingering condition, 11 participants were labeled with Balanced response style, with three Liberal, two Very Liberal, five Conservative, and three Very Conservative. This could suggest that while many of the respondents in this study neither favored speed nor accuracy, many of the simulators deliberately took time to produce inaccurate responses during malingering condition, rather than putting emphasis on speed. In other words, the errors during malingering condition were made by cautiously responding to the incorrect stimuli.

Clinical Implications

After comparing the results between baseline condition, malingering ADHD condition, Norm Standard, and ADHD Standard, it appears that the participants performed similarly to the general population when they approached the test normally. On the other hand, they exaggerated the presumed ADHD symptoms when they were asked to pretend to have ADHD. The variables with the largest effect sizes were Detectability, Omission errors, Commission errors, Hit Reaction time, and Hit Reaction Time Standard Deviation. This suggests that when normal people are attempting to malinger ADHD, they make more mistakes by reacting to stimuli relatively indiscriminately, responding more slowly, and responding with more variable timing than persons with ADHD would. These differences may prove helpful in detecting and differentiating between genuine and malingered ADHD.

Limitations

Several limitations exist in this study. First, the sample in this study was not ideal. Initially, the plan was to include 80 nonclinical controls and 20 subjects with ADHD. It was estimated that this sample size was required to have a 50% chance of detecting a medium effect size difference in test performance between subjects between ADHD and nonclinical controls. However, the recruitment and screening yielded a small sample size with homogenous demographic characteristics (highly educated Caucasian females). In addition, the primary investigator was unable to recruit participants who had been diagnosed with ADHD, though there are 157 known students with confirmed ADHD diagnoses enrolled at Abilene Christian University (N. Sanchez, personal communication, November 9, 2018). Thus, there was no ADHD group to compare the malingering nonclinical performance to. Instead, the data in this study were compared to Conners' published data of nonclinical and ADHD performance. It is important that the sample in the present study does not closely represent Conners' published samples, which are larger and more diverse (Conners, 2014). Although the results were compared to Conners' published normative data from the nonclinical sample of a similar age group (18 to 34 years), the only published data from Conners' ADHD sample consists of a much broader age range (8 to 75 years) (Conners, 2014). Additionally, individuals in the published samples were not administered the Conners CPT 3 twice, with different instructions each time. Therefore, the lack of individual ADHD performance data limited our ability to make direct comparisons between normal baseline, mimicked ADHD, ADHD baseline, and exaggerated ADHD.

A second limitation is attributable to having two testing environments, which were the two classrooms. The ideal testing environment would be a quiet testing room that is set up in the same way for all participants. However, due to limited availability for such environment, the classrooms that were available during screening and testing schedules were reserved for this study. Though a "do not disturb" sign was posted in front of the room every time the study is conducted, noises could still be heard either from the floor above the room or from the hallway. A more consistent and controlled environment would have been helpful.

A third potential limitation is having the primary investigator serve as both screener and test administrator. This introduces potential bias, especially during the screening process. Having a separate screener and test administrator would reduce potential bias.

A final limitation is due to a decision made concerning study design. It was decided to test all subjects in the same order – baseline first, then mimic ADHD. This introduced an uncontrolled order effect and confounding variable. Behavioral changes observed while mimicking ADHD may be due to instructions to mimic ADHD or may be due to previous exposure to the testing environment. This factor should not affect data interpretation greatly, as prior practice would be expected to improve performance, and subjects performed more poorly in the second (mimicking ADHD) testing session. However, it is possible that the subjects made more errors because they were experiencing fatigue. In addition, the increase in response speeds in later blocks, as shown by very low HRT Block Change scores during the malingering ADHD condition,

could indicate that the subjects were becoming impatient to complete the test. In order to reduce these effects in future research, randomization of testing order would be helpful.

Future Implications

This study could be improved with a more sophisticated design. With the identified limitations, a future study should include a larger and more diverse sample, with both nonclinical and ADHD subjects. This would give the study two groups, which allows direct comparison by performing the intended 2x2 factorial analysis (nonclinical and ADHD by baseline and exaggerated ADHD). Recruitment could be extended to other settings outside of a college setting in order to increase demographic diversity. The testing order for both groups should also be randomized to reduce order effects or fatigue. This improved design would help us examine how nonclinical individuals differ from individuals with ADHD more representatively of the general population. Also, it would also be interesting to observe how people with ADHD will perform when they are asked to exaggerate their symptoms. Potentially, this design could help create a discriminative function Conners CPT 3 performance into categories, such as Nonclinical Baseline, Nonclinical Malingering ADHD, ADHD Baseline, and ADHD exaggerating ADHD symptoms, sorted by certain behavioral qualities.

Although there are several shortcomings to the current study, this study builds upon prior research in ADHD malingering by investigating the potential differences between behavioral performances of neurotypical individuals attempting to malinger ADHD and the performance of those with confirmed ADHD diagnosis. In light of the results in the present study, these findings are consistent with other literatures that identifies symptom exaggeration and intentional poor performance as problems that exist

in ADHD evaluation (Harrison et al, 2007; Marshall et al., 2010; Musso & Gouvier, 2012; Sullivan et al., 2007). These symptom exaggerations and intentional poor performance are characterized by participants in the current study making more errors and executing tasks at a slower speed when attempting to malinger ADHD performances. With the differences found between nonclinical performance and the published ADHD performance (Conners, 2014), the findings also add to the researches which theorizes that behavioral performance should be more difficult to feign on a CPT (Marshall et al., 2010; Quinn, 2003; Sollman et al., 2010). Although not all measures of the Conners CPT 3 show great magnitude of differences, several measures such as Detectability, Omissions, HRT and HRT SD are measures that clinicians should pay attention to, when malingering is taken into consideration. Furthermore, the findings in this study support the suggestions made by Rogers (2018) as well as the descriptions made by Slick and Sherman (2013) regarding the use of unlikely presentation and amplified detection strategies in a malingering assessment. For example, atypically poor detectability and omission errors could be considered amplified degree of inattention symptoms, while slowed response time could be considered as unlikely presentation, as they are inconsistent with a typical ADHD response according to Conners' (2014) results. Thus, future studies may consider using Conners CPT 3 to help create a profile of ADHD malingering. In turn, with a well-established ADHD malingering profile, Conners CPT could potentially benefit from including such profile in its future development.

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APPENDIX A

Institutional Review Board Approval Letter

ABILENE CHRISTIAN UNIVERSITY
Educating Students for Christian Service and Leadership Throughout the World

Office of Research and Sponsored Programs
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103
325-674-2885

November 29, 2018

Peerasin Chatchawarat

Department of Psychology

Abilene Christian University

Dear Peerasin,

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled
"ADHD Malingering in College Setting"

was approved by expedited review (Category 7) on 11/29/2018 (IRB # 18-117). Upon completion of this study, please submit the Inactivation Request Form within 30 days of study completion.

If you wish to make any changes to this study, including but not limited to changes in study personnel, number of participants recruited, changes to the consent form or process, and/or changes in overall methodology, please complete the Study Amendment Request Form.

If any problems develop with the study, including any unanticipated events that may change the risk profile of your study or if there were any unapproved changes in your protocol, please inform the Office of Research and Sponsored Programs and the IRB promptly using the Unanticipated Events/Noncompliance Form.

I wish you well with your work.

Sincerely,

Megan Roth

Megan Roth, Ph.D.
Director of Research and Sponsored Programs

APPENDIX B

Conners CPT 3 Test Structure and Scores with Descriptions

The following describes the Conners CPT 3 test structure: "The Conners Continuous Performance Test 3rd Edition (Conners CPT 3) assesses attention-related problems in individuals aged 8 years and older. Administration of the Conners CPT 3 is similar to that of previous Conners CPT software versions: individuals are seated in front of a computer, and are required to respond when any letter, except the letter *X* appears on the monitor. He inter-stimulus intervals (i.e., the amount of time between the presentations of the letters; ISIs) are 1,2, and 4 seconds with a display time of 250 milliseconds. There are 6 blocks (sets of trials), with 3 sub-blocs each consisting of 20 trials. Within each block, the sub-blocks have different ISIs (1,2, and 4 seconds) and the order in which the ISIs is presented varies between blocks… Responses from the 14-minute, 360-trial protocol are used to compute scores that assess various aspects of the respondent's attention…" (Conners , 2014).

The test objectively measures respondents' inattentiveness, impulsivity, sustained attention, and vigilance. Each of these areas of attention are assessed by variables such as Response Style (*C*), Detectability (d-prime or *d'*), Error Type, and Reaction Time Statistics. Error Type consists of Omissions, Commissions, and Perseverations scores, which are reported in percentage of responses. Reaction Time Statistics consist of Hit reaction Time (HRT), Hit Reaction Time Standard Deviation (HRT SD), Variability, Hit

Reaction Time Block Change (HRT Block Change), Hit Reaction Time Inter-Stimulus interval Change (HRT ISI Change).

Response Style

Response Style or *C* is described as "…a signal detection statistic that measures an individual's natural response style in tasks involving a speed-versus-accuracy trade-off…" (Conners, 2014). A respondent can be classified as having one of the following response three response styles: *conservative*, *liberal*, and *balanced* style. *Conservative* style emphasizes accuracy over speed and is characterized by slower reaction times, more omission errors, less commission errors; *Liberal* style emphasizes speed over accuracy, and is characterized by faster reaction times, less omission errors, more commission errors; *Balanced* style is not biased to speed nor accuracy (Conners 2014).

Detectability

Detectability (*d*') measures respondents ability to discriminate targets (any letter) from non-targets (letter "X"). Similar to *C*, *d'* is also a signal detection static that measures the difference between the target and non-target distributions; the greater the difference, the better the ability to distinguish non-targets and targets (Conners, 2014). On Conners CPT 3 this variable is reverse-coded, therefore higher raw score indicate poorer discrimination or detectability.

Error Types

Omission, commission, and perseveration errors are measured in percentages. Omissions are the rate of missed targets. Higher omissions error rates indicate that the responding was not responding to target stimuli for reason such as difficulty focusing, and is an indicator of inattentiveness (Conners, 2014). Commissions are incorrect

responses to non-targets. High commission error rates paired with slow reaction indicate that the respondent was likely inattentive; High commission error rates combined with fast reaction times indicate that the respondent was likely rushing, failing to control the impulse to respond to non-targets (Conners, 2014). Perseverations are measures of responses made within 100 milliseconds after a stimulus is presented. Since it is virtually impossible for physiologically normal persons to perceive and react to a stimulus so quickly, perseveration errors are usually either delayed responses to a preceding stimulus, a random response, an anticipatory response, or repeated response without consideration of the task requirement; High perseveration errors may be related to impulsivity problems (Conners, 2014).

Reaction Time Statistics

As mentioned earlier, reaction time statistics consist of HRT, HRT SD, Variability, HRT Block Change, and HRT ISI Change. HRT is the mean response speed for all non-perseverative responses during the entire administration, measured in milliseconds. A higher HRT score indicate slower response speed. HRT SD measures the consistency of response speed to the targets for the entire administration; A high HRT SD indicate greater inconsistency, indicating inattentiveness, suggesting less engagement and less efficiency in the ability to process stimuli during some parts of the test (Conners, 2014). Variability is similar to HRT SD, the difference is that this variable measures the response speed inconsistency that the respondent showed in 18 separate sub-blocks of the administration in relation to the overall HRT SD score. High response score indicates that the respondent's attention and information processing efficiency varied throughout the administration (Conners, 2014). high HRT SD score paired with low Variability indicate

response speed was inconsistent, though it remained in about the same level throughout the test; On the other hand, average or low HRT SD paired with high Variability may indicate that the respondent may have been unable to sustain optimal performance throughout the test although overall response speed is satisfactory. HRT Block Change is the slope of change in HRT across the test administration, whereas positive slope indicate deceleration in response speed, and negative slope indicates acceleration in response speed throughout the test. Deceleration of response speed suggests loss of sustained attention (Conners, 2014). Finally, HRT ISI Change is the slope of change in reaction time across the three ISIs (1,2, and 4 seconds), where a positive slope deceleration of reaction time at longer intervals. This indicates loss of vigilance with longer pauses between stimuli (Conners, 2014).

APPENDIX C

Solicitation Material

Note: This letter was sent as an e-mail to all students in Dr. John Casada's Abnormal Psychology and Physiological Psychology classes during the Spring 2019 semester. This e-mail was sent at the beginning of the semester and was sent again during the course of the semester to recruit additional participants.

Solicitation Material.

Dear Students,

My name is Peerasin Chatchawarat, and I am a graduate student in the department of Psychology at ACU. As a student in Dr. Casada's Physiological Psychology or Abnormal Psychology course, you have an opportunity to participate in an activity to earn extra credit in these courses.

Students in Dr. Casada's courses are invited to participate in my research study about ADHD in college undergraduates. All students are eligible to earn extra credit through participation in activities related associated with this study.

Participation in the study will entail completing self-report forms, participating in a brief interview, and taking two computerized tests. Activities will be conducted in two sessions no more than three days apart. Each session will take 45 to 60 minutes. Extra credit points will be added to your final exam grade as compensation for your time. If you are in both courses, you may choose which course you want your extra credit credited to.

Remember, participation is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me at pxc12a@acu.edu.

Thank you very much.

Sincerely,

Peerasin Chatchawarat

APPENDIX D

Baseline Testing Condition Instructions

Instructions for testing condition 1 (C1).

During the test, a series of letters will be presented on the computer screen one after another. You must press the spacebar in response to every letter except the letter "X".

To help you understand the test better, there is a practice test that runs for approximately 1 minute before the actual test. Once the practice test is over, you may choose to practice again or to click "Start." The actual test is 14 minutes long and does not pause.

It is recommended that you use the bathroom or get a drink of water before the test. Please turn off all mobile device during the test.

APPENDIX E

Malingering Testing Condition Instructions for Nonclinical and ADHD Groups

Instructions for testing condition 2 (C2): Group 1.

This test will be identical to the previous test. You will respond to every letter (expect "X") by pressing the spacebar.

In this session, however, we ask that you imagine that you are trying to pretend to have ADHD. You want to take this test in a way that would show a doctor or counselor that you had ADHD and needed treatment or academic accommodations. To help motivate you, if you are successful at duplicating symptoms and tricking the computer to increase your probability of having ADHD by 50%, you will receive double the extra credit points.

To help you know what you are trying to show, the following is a list of DSM-5 ADHD symptoms:

1. **Inattention: 5 or more symptoms in adults.**

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
    - Often has trouble holding attention on tasks or play activities.
    - Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., loses focus, side-tracked).
    - Often has trouble organizing tasks and activities.
- Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).

- Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
    - Is often easily distracted
    - Is often forgetful in daily activities.

2. **Hyperactivity and Impulsivity: 5 or more symptoms in adults.**
    - Often fidgets with or taps hands or feet, or squirms in seat.
    - Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
    - Often unable to play or take part in leisure activities quietly.
    - Is often "on the go" acting as if "driven by a motor".
    - Often talks excessively.
    - Often blurts out an answer before a question has been completed.
    - Often has trouble waiting his/her turn.
    - Often interrupts or intrudes on others (e.g., butts into conversations or games)

Instructions for testing condition 2 (C2): Group 2.

This test will be identical to the previous test. You will respond to every letter (expect "X") by pressing the spacebar.

In this session, however, imagine that you are trying to secure treatment and/or accommodations for ADHD. You will now attempt to make the it very obvious that you have ADHD. If you are successful at duplicating severe symptoms and increasing the computer-generated probability of having ADHD by 20%, you will receive double the extra credit points.

The following include a list of ADHD symptoms from DSM 5:

1. **Inattention: 5 or more symptoms in adults.**

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
  - Often has trouble holding attention on tasks or play activities.
  - Often does not seem to listen when spoken to directly.
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (e.g., loses focus, side-tracked).
  - Often has trouble organizing tasks and activities.
- Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
- Often loses things necessary for tasks and activities (e.g. school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
  - Is often easily distracted
  - Is often forgetful in daily activities.

2. **Hyperactivity and Impulsivity: 5 or more symptoms in adults.**

  - Often fidgets with or taps hands or feet, or squirms in seat.
  - Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).
  - Often unable to play or take part in leisure activities quietly.

- Is often “on the go” acting as if “driven by a motor”.
- Often talks excessively.
- Often blurts out an answer before a question has been completed.
- Often has trouble waiting his/her turn.
- Often interrupts or intrudes on others (e.g., butts into conversations or games)