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METHODS OF DETECTION OF FEIGNED ATTENTION DEFICIT HYPERACTIVITY
DISORDER IN A COLLEGE-STUDENT POPULATION

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Psychology

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Certain individuals presenting for diagnostic evaluations attempt to feign or exaggerate symptoms of Attention Deficit Hyperactivity Disorder (ADHD) in an attempt to secure prescriptions for stimulant medications or desirable academic accommodations. Differentiating these individuals from those with bona fide impairment is important and challenging for clinicians. This study sought to assess the impact of pseudo-malingers utilizing information available on the Internet on the utility of established symptom and performance validity measures, as well as to assess the potential of other scores on commonly administered neuropsychological measures for validity assessment. Undergraduate students were recruited for this between-groups experimental design. Participants were divided into one of four groups: two groups of malingering simulators (a coached group and a non-coached group), a comparison group, and a group of students with a diagnosis of ADHD (N=68). Participants completed a battery including a stand-alone (Word Choice subtest of Advanced Clinical Solutions) and embedded measure (Reliable Digit Span) of effort, the Conner's Adult ADHD Rating Scale (CAARS), the Wisconsin Card Sorting Test (WCST), and a Continuous Performance Test (CPT). Results indicated the stand-alone measure of effort had moderate sensitivity and high specificity for identifying malingerers. Experimental groups did not differ in performance on the embedded effort measure, and the self-report measure was easily feigned by malingerers. Few

significant differences between groups existed on the WCST and CPT scores. The clinical implications of these findings, recommendations for clinicians, and recommendations for future research endeavors are discussed.

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CHAPTER ONE

STATEMENT OF THE PROBLEM

Attention Deficit Hyperactivity Disorder is a mental and behavioral disorder characterized by difficulty controlling impulsivity, hyperactivity, and/or difficulty with sustaining attention and focus. This disorder was previously considered to be exclusively a disorder of childhood, although increased awareness of its continuation into adulthood for some individuals has increased diagnostic rates in this age group. Although ADHD cannot be developed over time, full symptoms of the disorder may not appear until the demands of the environment increase. Individuals with ADHD can qualify for a number of accommodations in academic and work environments, as well as for stimulant medications. While these interventions are beneficial to individuals with ADHD, there is a population of people who attempt to exaggerate or fabricate such symptoms in an attempt to gain access to these accommodations for academic gain or to the medications for performance enhancement or abuse. Detecting individuals who provide a noncredible presentation of their symptoms in an attempt to gain external rewards can be challenging. It has been found that self-report measures can be easily feigned and clinical judgment alone is not a reliable form of detection. The most widely researched and utilized form of response validity measure, Symptom Validity Tests (SVTs), tend to have moderate to low sensitivity for detecting malingerers and are very susceptible to coaching. Additionally, as more information becomes available on the Internet, test security is placed at an increased risk and sophisticated malingerers threaten the usefulness of these stand-alone tests. The current study seeks to determine the influence that coaching can have on an individual's ability to feign ADHD, as well as potentially identify embedded measures of validity that exist within standardly administered neuropsychological tests that are effective for

detection of ADHD simulators. Embedded measures have many advantages including their resistance to coaching and Internet research, as well as their economy, as they require no additional administration time if the parent measure is in the administered battery. Finding new and more effective ways to detect individuals attempting to fabricate or exaggerate ADHD symptoms is important for maintaining the integrity of neuropsychological assessment in these times of increased availability of previously privileged information and with recent increases in individuals seeking evaluation for ADHD for stimulant medications.

CHAPTER TWO

REVIEW OF THE LITERATURE

Attention Deficit Hyperactivity Disorder

Attention-deficit Hyperactivity disorder (ADHD) is a developmental disorder characterized by difficulties with inattention and impulsivity. According to the most recent version of the Diagnostic and Statistical Manual (American Psychiatric Association, 2013), ADHD can be classified into three subtypes: Predominantly inattentive presentation, predominantly hyperactive/impulsive presentation, and combined presentation. Individuals who have difficulty focusing on tasks, listening, following through on tasks, staying organized, and remembering to complete daily tasks characterize the former. The hyperactive and impulsive presentation is generally accompanied by symptoms such as restlessness, fidgeting, inability to play quietly, talking excessively, interrupting, and blurting out answers. By definition, these symptoms must begin during childhood. However, these symptoms need not fully manifest until the demands of life become great enough, such as during college (American Psychiatric Association, 2013).

The etiology of ADHD is still being researched. ADHD is considered to develop from a combination of factors, both inherited and acquired, which are deeply intertwined and influence each other (Thapar, Cooper, Eyre, & Langley, 2013). Twin studies have found up to 90% heritability with ADHD, although in these cases the relative influence of environmental and genetic factors is unclear (Thaper et al., 2013). Numerous risk factors have been identified for ADHD, including biological relatives with the disorder, certain genetic variants, early adversity, exposure to lead, and low birth weight, although the causality of these factors has not been proven (Thaper et al., 2013). Some studies have been conducted examining the potential impact

of pesticides and other toxins, industrial products, lead, and diet, although none of this work has produced definitive results (Thaper et al., 2013). Certain differences in neural structure have also been identified as being related to ADHD, including unusual white matter structure, disrupted connectivity in various areas, changes in the frontal-striatal circuitry (involved in executive functioning, sustaining attention, and shifting attention), and cortical dysfunction and disrupted development (Gallagher & Blader, 2001; Konrad & Eickhoff, 2010; Nigg, 2012). Again, the causes of these differences are uncertain, and the potential role of medication in contributing to these also remains under investigation (Konrad & Eickhoff, 2010). Overall, the etiology of ADHD has been very difficult to parse out due to the limitations of research methodologies and tools, as well as the high comorbidity rate of ADHD with other developmental, learning and psychiatric disorders (Thaper et al., 2013). The future for understanding the complex etiology of ADHD looks bright, as advances in neuroimaging and genetics will enable researchers to explore questions that have been so far left unanswered (Nigg, 2012). These authors postulate that new insights will arise from exploration of epigenetics, the impact of environment and diet, race and culture's role in the disorder and its presentation, and the phenotype (Nigg, 2012).

Prevalence

The prevalence of ADHD remains somewhat disputed, although estimates tend to range from approximately 2-10% of the population (DuPaul, Schaughency, Weyandt, Tripp, Kiesner, Ota, & Stanish, 2001; Gallagher & Blader, 2001; Polanczyk, Willcut, Salum, Kieling, & Rohde, 2014; Wender, 1995). There is widespread belief that the rates of ADHD have been increasing over recent decades. The National Health Interview Survey reported an annual average increase of 3% from 1997-2006, while a study comparing data from 2003 to 2007 found the average increase to be greater, at 5.5% (Visser, Bitsko, Danielson, Perou, & Blumberg, 2010). While

these findings point toward an increasing incidence, there is some evidence that this growing quantity may result from methodological differences in studies. Polanczyk et al., (2014) performed meta-regression analyses on the previously comprehensive reviews of ADHD prevalence worldwide and found that the prevalence stayed consistent over the span of three decades, and that methodological differences in the studies were associated with the heterogeneity in findings. The authors argued that the fear that people are over diagnosing ADHD is the result of increased awareness and increased use of services.

Diagnostic Considerations

ADHD can be a particularly challenging disorder to diagnose given the numerous factors that influence diagnosis and the number of differential diagnoses that require consideration.

Age of diagnosis. Many individuals are diagnosed with ADHD as children, either by referral from their parents, teachers, or healthcare providers. There is evidence for the continuity of the disorder into adulthood for those diagnosed as children, with somewhere between one third and two thirds continuing to have significant symptoms as adults (Gallagher & Blader, 2001; Gansler, Fucetola, Krenzel, Stetson Zimering, & Makary, 1998; Polanczyk et al., 2014). While many individuals are diagnosed as children, due to increased awareness many more adults are being diagnosed with ADHD for the first time (Wasserstein, 2005). For some individuals it requires increased environmental demands, such as entering college or the workforce, to reveal the underlying condition (Jachimowicz & Geiselman, 2004).

Diagnosing the disorder in late-adolescence and adulthood presents new challenges beyond making the diagnosis for a child. An accurate history is important in order to determine if sufficient criteria were met by the required age of onset and to rule-out other causes of the reported symptom constellation (discussed further in the etiology section) (Gallagher & Blader,

2001). Adolescents and adults can be poor historians, and while information from a family member or other collateral source is helpful, this is not always available (Bordoff, 2017; Wasserstein, 2005). Additionally, the symptoms of ADHD can change in adulthood, with occupational issues, difficulty with affect regulation, and executive functioning problems common. Symptoms generally become more internalized, such as manifesting more as anxiety with age (Hallowell, 1995; Wasserstein, 2005). Diagnosing students first experiencing difficulties at university can also be challenging as some students may be experiencing symptoms due to being underprepared for university rather than a clinical condition (Bordoff, 2017). The high comorbidity rate of ADHD with other mental disorders can also make the disorder difficult to detect. Many adults with ADHD exhibit depression, irritability, and labile affect, causing their symptoms to be mistaken for other disorders, such as personality and mood disorders (Kessler et al., 2010).

Although it is generally accepted that those with ADHD diagnosed in adulthood developed their symptoms in childhood, some recent research has suggested that adult ADHD may represent something different entirely. In a longitudinal study of over 1000 people, researchers diagnosed individuals during childhood and again at age 38. They found that 6% of the population had ADHD as children and 3% were diagnosed as adults, although there was very little overlap between the two groups; only 5% of their children diagnosed with ADHD still met criteria as adults (Moffitt et al., 2015).

Differential diagnosis. One of the challenges with diagnosis is that there is significant overlap in symptoms of ADHD with other types of disorders, making differential diagnosis difficult. Traumatic brain injuries (TBIs) of various severities can cause impairments in domains that are associated with ADHD, including selective and sustained attention, memory, and

executive functioning (Arciniegas, Held, & Wagner, 2002). Similarly, TBIs can also cause behavioral disturbances similar to those observed in some individuals with ADHD, including disinhibition and social inappropriateness (Arciniegas et al., 2002). As TBIs can be responsive to stimulant treatment, confusion with ADHD becomes more likely, as some doctors work backward to inform their diagnosis (i.e. making diagnostic decisions based on response to medications). Symptoms and neuropsychological deficits can also be similar between ADHD and psychiatric disorders, such as disturbances in behavior, attention, executive functioning, working memory, and reaction times (Gallagher & Blader, 2001). The most significant difference between these profiles is that those with psychiatric disorders generally only present this way during acute periods, while ADHD symptoms will be chronic (Gallagher & Blader, 2001). The high comorbidity rate can also complicate diagnosis, as well as the increased internalization of symptoms in adults with ADHD (Gallagher & Blader, 2001). Although not similar on the surface, ADHD and schizophrenia share similar cognitive deficits and individuals with each diagnosis can appear comparable. In a large review of factor analytic research on schizophrenia's cognitive weaknesses, seven core factors were found: Speed of Processing, Attention/Vigilance, Working Memory, Verbal Learning and Memory, Visual Learning and Memory, Reasoning and Problem Solving, and Verbal Comprehension (Nuechterlein et al., 2004). In examining this list, the first four factors are also strongly associated with ADHD neuropsychological profiles. Deficits in executive functioning and cognitive control were also found to be strongly associated with schizophrenia and ADHD (Nuechterlein et al., 2004). Another study found both attention and executive functioning are more likely to result from negative symptoms of schizophrenia, and symptoms of disorganization can further exacerbate executive functioning issues and behavioral issues such as inappropriate responses and

impulsiveness, also common symptoms of ADHD (Nieuwenstein, Aleman, & de Haan, 2001). Autism and ADHD also have overlapping symptoms, such that in previous versions of the DSM they were mutually exclusive. Individuals with ADHD can have problems establishing and maintaining friendships and engaging in appropriate social interactions with peers, and individuals on the autism spectrum often exhibit inattentive and hyperactive symptoms (Taurine et al., 2012). Additionally, deficits in attention, executive functioning, and even reward processing have been observed in both groups (Taurine et al., 2012). Taken together, these similarities in cognitive profiles of various types of disorders and dysfunction can significantly impair a clinician's ability to make the proper diagnosis, and a thorough clinical history and interview are necessary to attempt to mitigate this challenge.

Methods of diagnosis. Regardless of at what age someone presents for an evaluation, diagnosis can be difficult, and there is great diversity in how ADHD is diagnosed. ADHD, like other clinical diagnoses of mental illness and most neurodevelopmental disorders, cannot be definitively diagnosed by a blood or lab test. Rather it can be diagnosed based on a combination of observations, reported symptoms, cognitive test results, and clinical judgment. Many psychologists, psychiatrists, and other physicians will make the diagnosis based exclusively on a clinical interview. In these cases, the clinicians make the determination under the assumption the patient is an accurate reporter of their historical and current symptom patterns. However, this has been found not to be reliable (Harrison, Edwards, & Parker, 2007). Importantly, the accuracy of this type of diagnosis can vary greatly, as can the time spent assessing for the disorder and simultaneously ruling out other explanations. Although a busy psychiatrist might spend ten minutes with a patient and ask them about classic symptoms, some psychologists might spend an hour or more on an intake interview and assess for a range of deficits across domains, such as

occupational, educational, emotional, and social functioning. That being said, it is important to note time alone does not translate directly to thoroughness of the evaluation, and recent research has raised concerns that many psychologists assign a diagnosis of ADHD without a thorough evaluation. In a study reviewing documentation from college students diagnosed with ADHD, it was found that only 23% of psychologists assessed all DSM-V criteria. Just over half reported determining childhood onset, just under half assessed for level of impairment (even though these evaluations were being used to determine accommodation eligibility), and only 40% of providers ruled out alternative causes of the symptoms (Weis, Till, & Erickson, 2017).

Structured self-report forms are the most commonly used tool to aid clinicians in the diagnosis of ADHD. A variety exist, such as the Adult ADHD Self-Report Scale (Kessler et al., 2005), the Conner's Adult ADHD Rating Scale (Conners, Erhardt, Sparrow, 1999), the Brown Attention-Deficit Disorder Symptom Assessment Scale (Brown, 1996), and more. There are numerous benefits of these types of forms. They aid clinicians in remembering to assess the scope of symptoms that are often present, expedite the process of assessment, enable clinicians to see where their patient's symptoms fall in comparison to others with the disorder, and can show the stability or change of symptoms in the patient's view when used over time. However, research has exposed significant limitations in the use of rating scales. It has been suggested that adolescents and young adults have blunted self-awareness and tend to be inaccurate reporters (Wasserstein, 2005). Self-report measures have also been shown to underestimate the persistence of ADHD into adulthood by causing too many adults who meet criteria to fall below the cutoff (Barkley, Fischer, Smallish, & Fletcher, 2002). Additionally, they are not definitive and were not intended to be used alone, although many clinicians tend to over-rely on them when making diagnostic decisions (Gallagher & Blader, 2001). The cutoffs of these self-reports can be

arbitrary, causing error in diagnosis with patients who fall in the borderline range. Additionally, self-report measures have been found to be easily manipulated by individuals who are exaggerating or malingering, a weakness that will be discussed in depth later.

Lastly, some physicians require a full neuropsychological evaluation before making the diagnosis. Such an approach may not be justified as, at present, there are no specific cognitive tests for ADHD and no clear profile of neuropsychological test results associated with ADHD has yet emerged from the research (Davidson, 2008; Gallagher & Blader, 2001). This, in addition to the added cost and time of a full battery of tests, are significant limitations to this form of diagnostic assessment. However, neuropsychological testing can aid clinicians in identifying each individual's cognitive strengths and weaknesses by assessing skills across domains, which can be capitalized on when designing a treatment plan (Wasserstein, 2005). Such testing can also expose the actual level of impairment the person is experiencing in their day-to-day functioning, which is often required information to support requests for accommodations (ETS, 2017). Testing can aid in differential diagnosis of other conditions that may cause issues with attention, such as depression, anxiety, and TBIs, which differ in terms of course and consistency of symptoms (Gallagher & Blader, 2001). A well-stated argument in favor of expending the time and effort of a broader evaluation is presented by Gallagher & Blader (2001): "A simple confirmation that a person fits the developmental profile may guide broad treatment, but it may not provide the detailed description of deficits and strengths that a neuropsychological analysis of executive skills has to offer a full rehabilitation plan" (p. 164).

Neurocognitive Deficits in ADHD

As previously mentioned, a prototypical neuropsychological profile has not yet been agreed upon for individuals with ADHD, and adult profiles have been found to be even more

varied than those of children (Hervey, Epstein, & Curry, 2004; Kessler et al., 2010). However, research has converged in revealing certain deficits that are common in ADHD. The most prevailing view is that the classic symptoms of ADHD arise from core deficits in executive functioning resulting from frontal lobe impairment (Barkley, 1997; Gallagher & Blader, 2001). One of the most popularly cited theories of ADHD has been put forth by Barkley (1997) who postulated that the central deficit in ADHD is poor behavioral inhibition. This weakness in inhibiting responses and controlling interference leads to issues in executive functioning. In this way, although deceptively named, ADHD is not simply a disorder of poor attention, rather a result of the aforementioned deficits (Barkley, 1997). This theory is supported by findings of neuropsychological research. Executive functioning is the most affected cognitive function in ADHD (Frazier, Demaree, & Youngstrom, 2004). Executive functioning encapsulates diverse processes, with response inhibition, vigilance, working memory, planning, set shifting, mental manipulation being the most affected in those with ADHD (Barkley, 1997; Boonstra, Oosterlaan, Sergeant, & Buitelaar, 2005; Hervey et al., 2004; Kovner et al., 1998; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). Deficits in executive functioning lead to an inability to properly start, sustain, stop and shift attention, resulting in the symptoms commonly associated with ADHD (Barkley, 1997; Gallagher & Blader, 2001; Kessler et al., 2010). This belief is supported by research that shows the most predictive symptoms of ADHD in adulthood (mainly inattentive subtype symptoms) are related to executive functioning (Kessler et al., 2010).

Some areas of weakness have also been identified beyond this. Review studies have found that individuals with ADHD are more likely to exhibit weaknesses on general cognitive tests, yielding an approximately nine-point difference in IQ (Frazier et al., 2004; Hervey et al., 2004). Most of this is accounted for by deficits in working memory and processing speed that are

consistently found for people with ADHD (Boonstra et al., 2005; Frazier et al., 2004; Hervey et al., 2004; Wierzbicki & Tyson, 2007). Reaction times have also been found to be somewhat slower in people with ADHD (Kovner et al., 1998). Poorer performance also can occur on verbal memory tasks, although this is found to almost exclusively result from issues with encoding the stimuli when it is presented (Hervey et al., 2004; Skodzik, Holling, & Pedersen, 2017). However, not all studies find significant differences between individuals with ADHD and control groups in these areas (Sollman, Ranseen, & Berry, 2010).

Inconsistent findings have been observed when determining if different subtypes of ADHD are consistent with different neuropsychological deficits. Some studies have found that the inattentive and combined subtypes have a more similar profile to each other than the hyperactive subtype (Chhabildas, Pennington, & Willcutt, 2001; Willcutt et al., 2005). However, numerous studies have also found no significant differences between the subtypes (Frazier et al., 2004; Harrison et al., 2007; Pasini, Paloscia, Alessandrelli, Porfirio, & Curatolo, 2007).

Functional Impairment and Accommodations

ADHD can have a substantial impact on all areas of a person's life, including education, employment, and overall quality of life (Pasini et al., 2007; Wasserstein, 2005). Individuals with ADHD have been found to have lower academic achievement, including lower grades, a higher probability of being on academic probation, more difficulty adjusting to school, and more problems with time management and organization than individuals without the disorder (Green & Rabiner, 2012; Jachimowicz & Geiselman, 2004). Additionally, they may have more problems with self-esteem, struggle socially and have interpersonal problems, and are more likely to have substance abuse problems (Green & Rabiner, 2012; Jachimowicz & Geiselman, 2004). For this

reason, many individuals with ADHD seek to obtain documentation of their disability and deficits in order to gain access to treatments and accommodations.

Under the Americans with Disabilities Act of 1990, individuals with ADHD cannot be discriminated against in the academic or occupational environment. However, they bear the burden of proving that their diagnosis causes functional impairment in one or more areas of their life and that they have some form of cognitive impairment that would justify an accommodation (Americans with Disabilities Act, 1990; Harrison et al., 2007). Additionally, they are allowed “reasonable accommodations” under section 504 of the Rehabilitation Act of 1973, such as extra access to tutoring, alternate test-taking spaces, and extended time on tests. Some institutions also provide access to priority housing, aid in securing internships, and extra aid in the classroom, such as having papers reviewed early or access to special technology (Jachimowicz & Geiselman, 2004). As a comprehensive evaluation is often necessary to obtain these accommodations, these opportunities are one of the reasons individuals may seek a full evaluation beyond seeking diagnosis from their primary care physician. For example, many institutions of higher education, as well as the Educational Testing Service, require proof of functional limitations, diagnosis based on more than screening measures, and a full description of history and the impact of the disorder (ETS, 2017).

Malingering ADHD to Obtain Access to Accommodations and Medications

Academic supports that are available to students with ADHD could also be very helpful to students without ADHD (Jachimowicz & Geiselman, 2004). Students may be motivated to gain access to these due to poor grades, disinterest in school, or learning about the accommodations through friends that have them. There has been concern about the increased rates of students being diagnosed with ADHD and utilizing disability services. As of 2009, 25%

of students using disability services were diagnosed with ADHD, and that number was increasing (DuPaul, Weyandt, O'Dell, & Varejao, 2009).

Additionally, some people are motivated to feign ADHD in order to gain access to stimulant medications. These medications are used for a variety of nonmedical reasons, such as a study aid, for productivity, to stay awake, to reduce stress and anxiety, for recreational purposes, and for weight loss (Conti, 2004; DeSantis, Webb, & Noar, 2008; Novak, Kroutil, Williams, & Van Brunt, 2007; Rabiner, 2013; Teter, McCabe, Boyd, & Guthrie, 2003). Nonprescription use of stimulant medication is a significant problem that is surprisingly common (Rabiner, 2013). A random sample of 4580 college students found that lifetime and past years' prevalence rates of stimulant misuse were 8.3% and 5.9% respectively (Teter, McCabe, LaGrange, Cranford, & Boyd, 2006). Approximately 75% of those past-year illicit users reported using an amphetamine-dextroamphetamine combination agent, such as Adderall, and the other fourth reported using a methylphenidate, such as Ritalin (Teter et al., 2006). At two other universities, between 31% and 34% of students reported using a stimulant nonmedically (DeSantis et al., 2008; Garnier-Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012). Taken together, a systematic review of 21 studies about this topic yielded a sample size of over 100,000 students and found that 5-35% of college students had used non-prescribed stimulant medications and 10-25% of individuals had engaged in medication diversion (i.e. the transfer of a prescribed medication or drug from the individual to whom it was prescribed to someone else for illicit use) during their lifetime (Wilens et al., 2008). It has been found that the non-medical use of prescription stimulant drugs is higher at competitive colleges, although in general rates vary significantly (Rabiner, 2013). Beyond personal use, individuals may be motivated to obtain stimulants for sale to others, and the price

people are willing to pay per pill was found to double over the course of four years (Garnier-Dykstra et al., 2012).

In a review of stimulant prescriptions, the prescription of stimulants is rising significantly, especially among young adults in college (Rabiner, 2013). A study of stimulant prescription in medical settings assessed data from 1994-2009 and found a six-fold increase in adult stimulant prescription over that period of time and the number of office visits for stimulant medications for adults aged 18-29 grew almost 11 fold (Olfson, Blanco, Wang, & Greenhill, 2013). It can be difficult to determine how much of this increase in prescription is attributed to individuals misrepresenting or exaggerating symptoms. However, in one study, 20% of those prescribed medication for ADHD stated they “obtained fraudulent prescriptions by misrepresenting their symptoms or going to a doctor who was known to not make too many inquiries” (Novak et al., 2007). Other research has found that over 62% of people with a prescription for stimulant medications have diverted it at some point in their lifetime, and 26% reported doing so within the past six months (Green & Rabiner, 2012; Rabiner, 2013). Additionally, students who carry prescriptions themselves frequently take their medications not as prescribed, either taking more to aid them in studying or to use recreationally (McCabe et al., 2012).

Taken together, due to the abuse potential of stimulant medications and the desirability of academic accommodations, there are clear motivators for individuals to malingering having ADHD. Before discussing this topic, however, it is important to lay a foundation of what malingering is and how it is differentiated from other forms of response bias.

Malingering and Other Forms of Noncredible Responding

Many psychologists and neuropsychologists, especially those trained before the 1990s, tend to take what their patients say and do at face value (Rohling & Boone, 2007). However, as more research comes to light concerning the prevalence of noncredible responding across types of evaluations, the need to constantly consider the possibility of invalid results is highlighted. There are a wide variety of reasons that testing results can be an invalid representation of an individual's actual level of functioning.

Malingering

Malingering is “the intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives” (American Psychiatric Association, 2013). The APA makes clear that the fabrication or exaggeration of symptoms must be conscious and must be in pursuit of a recognizable goal for behavior to be considered malingering (American Psychiatric Association, 2013). Malingering requires the pursuit of a secondary gain, such as a financial gain, avoiding legal consequences, obtaining prescriptions, avoiding military deployment, etc. (Heilbronner et al., 2009). Malingering may occur in many forms. A patient may deliberately exaggerate symptoms that are hard to identify, such as pain or weakness, or exaggerate the severity of symptoms that they actually experience. Malingering can also occur in the form of purposely poor performance on any given test during the assessment. People who are malingering may endorse or deny things that are not true, both past and present, in attempts to put forth an image that is consistent with the diagnosis they seek (Rogers, 2008a).

Other Forms of Response Bias

It is important to note that not all individuals who are found to put forth poor effort or exaggerate their condition are malingering, and that malingering and poor effort are not

synonymous (Bianchini, Mathias, & Greve, 2001; Iverson, 2007; Slick, Sherman, & Iverson, 1999). Negative response bias is intentional poor performance or intentional exaggeration of symptoms, although the motivation is not necessarily known in this case (Heilbronner et al., 2009; Iverson & Binder, 2000; Slick & Sherman, 2012). Purposeful withholding of information (non-disclosure), low openness, and dissimulation are also other terms that can be used to describe response style and behavior of a patient (Rogers, 2008a). These types of results can also arise from oppositional presentations, defensiveness, fatigue, and poor or inconsistent effort (Iverson & Binder, 2000; Larrabee, 2012; Slick & Sherman, 2012). Exaggeration of symptoms that is not in pursuit of an external incentive by definition cannot be malingering (Iverson, 2007). For example, factitious presentation is the intentional production of symptoms that is motivated by the desire to play the sick role, and feigning is the term utilized for fabrication or exaggeration of symptoms without a known goal (Rogers, 2008a).

There are also numerous disorders that may yield response patterns and behaviors that are similar to malingering and other forms of noncredible responding. Somatoform and conversion disorders, certain mood disorders, and factitious disorders all can produce symptom exaggeration in an assessment, none of which are motivated by external gain (Iverson & Binder, 2000; Slick et al., 1999; Slick & Sherman, 2012; Rogers, 2008a; Vitacco, 2008). Further, certain brain injuries can cause impaired judgment that leads to exaggeration or apathy (Bigler, 2012; Slick & Sherman, 2012). Alternatively, individuals may intentionally minimize or deny their symptoms to avoid consequences, such as loss of independence (Bush et al., 2005). Exaggeration of symptoms is more common than malingering, as it can occur from any of these disorders and from certain personality characteristics (Iverson, 2007). Malingering is also not mutually exclusive from genuine impairment, and it can be extremely difficult to detect the presence, and

level of, exaggeration in such cases (Bush et al., 2005; Larrabee, 2012; Rogers, 2008a; Rogers, Bagby, & Dickens, 1992; Vitacco, 2008).

It is important to note that malingering is not necessarily an all or nothing, or even consistent, phenomenon. Motivation, effort, and energy can vary throughout the course of an evaluation, yielding scores that are more representative of a patient's true functional abilities on certain items than others (Bush et al., 2005; Larrabee, 2012). Individuals attempting to malingering also do not do so indiscriminately, and rarely malingering on every item (Berry & Nelson, 2010). Rather, malingerers are likely to simulate deficits on items related to their presenting concern, as well as attempt to overstate their pathology and emphasize any losses they claim to have experienced (Rogers, 2008a).

Misuse of the terminology in this area is common among clinicians. Improper use of terms may result from not knowing how the terms differ from each other, or from making erroneous claims about motivation when there is no evidence to support the claim. The subtle differences between the terms are very important for accurate communication of findings and communication between clinicians. Apart from sloppy use of the terms, there are also some long-standing disputes about certain ones. For example, Rogers argues that the currently widespread use of "suboptimal effort," to refer to any type of failure on an effort measure is too common of a phenomenon to be a useful term (Rogers, 2008a). Similarly, the word 'overreporting' has been criticized for being too broad and non-specific about the consequences (Rogers, 2008a).

Prevalence

While previously believed to be uncommon, individuals who are malingering make up a surprising amount of the population of individuals seeking neuropsychological evaluations (Iverson, 2007; Larrabee, 2003; Rogers, 2008a). Larrabee (2003) found that around 40% of

individuals in mild head injury cases were found to be malingering. Another study found that 25-30% of people who were claiming disability due to difficult-to-document symptoms, such as fibromyalgia, chronic fatigue, and depression, were engaging in fabrication and exaggeration (Green, Rohling, Lees-Haley, & Allen, 2001). In a study that surveyed members of the American Board of Clinical Neuropsychology, over 33,000 clinical cases were reviewed. Their criteria for malingering were conservative, following the Slick et al., 1999 criteria for malingering (Appendix A). Additionally, they found that neuropsychologists used an average of 7.53 out of 9 possible indicators of malingering to make their decision about cases, indicating quite conservative decision-making. This study found that the rates of malingering were dependent on the type of case: Twenty-nine percent of personal injury, 30% of disability, 19% of criminal, and 8% of medical cases involved probable malingering and symptom exaggeration. Further, the numbers were also dependent on the type of diagnosis the person was presenting with: Thirty-nine percent of mild head injury, 35% of fibromyalgia/chronic fatigue, 31% of chronic pain, 27% of neurotoxic, and 22% of electrical injury claims were found to be probable malingerers (Mittenberg, Patton, Canyock, & Condit, 2002). It should also be noted that determining an actual base rate of successful malingerers is technically impossible, as successful malingerers would not be identified as such (Berry & Nelson, 2010; Berry & Schipper, 2008; Youngjohn, Lees-Haley, & Binder, 1999).

Certain settings are more prone to individuals malingering, including adversarial and legal settings, when personal financial stakes are high, and when cases are referred by defense attorneys and insurers (Larrabee, 2012; Mittenberg et al., 2002; Vitacco, 2008). Less is known about the rates of malingering in school settings, such as when symptoms are exaggerated or faked to gain accommodations (Rogers, 2008c).

Overall, there is enough consistency in the studies for prominent voices in the field to argue that a base rate of 40%, ± 10 , is a reasonable estimate for the percentage of people malingering in these types of evaluations (Larrabee, 2012). Others argue that while invalid approaches to testing occur at around that rate, far less are classified as definite malingerers when the conservative Slick criteria are used (Berry & Schipper, 2008). It would be desirable to give all individuals the benefit of the doubt; however, due to these high numbers, the possibility of malingering must always be considered when there are external incentives involved, and the possibility of other types of invalid responding should always be considered (Heilbronner et al., 2009; Iverson & Binder, 2000).

Assessing Effort and Symptom Validity

As a precursor to assessing for purposeful poor performance, it is vital to measure effort in any neuropsychological evaluation (Bush et al., 2005; Heilbronner et al., 2009). For an assessment to yield valid and useful results, the patient must be putting forth effort to perform to the best of their abilities. Poor effort has been found to have a larger effect on test results than actual injuries, and to mask the deficits caused by the injuries when effort is not accounted for (Boone, 2013; Iverson, 2007). One study took 940 patients with head injuries and neurological issues and administered a series of neuropsychological tests. They determined the average z scores from all of the tests administered, combined them, and found that the mean was 1.20 SD lower in those who failed the Word Memory Test (an assessment of symptom validity and effort). They found that sub-optimal effort suppressed the overall test battery mean score 4.5 times more than a moderate to severe brain injury, and around 50% of the variance in the battery was explained by effort and cooperation. The differences between those with neurological issues and head injuries and those without impairment were only seen when the individuals exerting

poor effort were removed from the analysis (Green et al., 2001). Therefore, it is impossible to determine the accuracy of any conclusions drawn from a neuropsychological battery without measuring and reporting on the findings of the amount of effort put forth first.

It is important to measure effort in every assessment in order to be confident in the validity of the results. Although there is likely to be less incentive to malingering in a clinical setting than a legal one, there is always potential. It is also important to assess for the presence of malingering in all assessment contexts, as a clinician never knows for what purpose their evaluation will be used in the future (Bush et al., 2005; Iverson, 2007).

Detecting Malingering

Many clinicians are reluctant to diagnose malingering due to the high risks of incorrect classification (Boone, 2013; Slick et al., 1999). A false-positive error will undisputedly have a negative effect on the patient in preventing them from receiving necessary care, falsely accusing them of a crime, and simply due to the pejorative nature of the definition (Berry & Nelson, 2010). At the same time, false negative diagnoses can significantly strain the services available for individuals truly in need, prevent the prosecution of these individuals (if applicable), and damage the clinician's credibility (Bianchini et al., 2001; Franzen, Iverson, & McCracken, 1990; Tucha, Fuermaier, Koerts, Groen, & Thome, 2015). For this reason, although assessing for the presence of purposeful invalid reporting may be uncomfortable, it is necessary. In the same way, clinicians should report their methods and findings accurately and avoid extrapolating outside of what the data can and do show (Iverson & Binder, 2000; Vitacco, 2008).

Developing methods of detection. The methods by which clinicians detect malingering have changed over the years. Detection of malingering was previously determined by the presence of the judgments of a person's character, the context of the evaluation (such as being

legal vs. clinical), and lack of cooperation during the assessment (Berry & Nelson, 2010). Following this, some of the earliest objective measures to detect malingering, such as the Rey 15-item test, were developed in the 1970's. This was followed by the onset of the use of the forced-choice paradigm, described by Binder and Pankratz in 1987, upon which many assessments are still based today (Berry & Nelson, 2010; Bianchini et al., 2001). The introduction of forced-choice formats was ground breaking for the field, and these are still the most commonly used measures for detecting response bias.

As previously mentioned, one of the most influential steps forward in the field for detecting malingering was the proposed set of diagnostic criteria for malingering that were put forth by Slick et al. (1999) (Appendix A). These criteria were created for researchers and clinicians and presented what circumstances and data would be indicative of malingering, and at what levels of certainty. They presented an updated definition of malingering, and sets of criteria that guided clinicians in assessing evidence, judging the relative importance of information, using their clinical judgment, considering alternatives, and noting the certainty of findings. They differentiate between possible, probable, and definite malingering, and include what types of findings would be indicative of each, such as the presence of substantial external incentive, negative response bias, and discrepancies between data or self-report and known patterns of brain functioning (Slick et al., 1999).

Detecting malingering within the evaluation. There are numerous indicators within an evaluation that may lead an examiner to consider that the results are not a valid and reliable estimate of the patient's functioning. Clinicians should take note of inconsistencies of scores across cognitive tests, between test results and reported or observed behavior and functional impairment, over- or indiscriminant reporting, unlikely presentations compared to what is known

and expected, or report of rare or improbable symptoms or symptom combinations (Boone, 2013; Larrabee, 2012; Rogers, 2008b). Clinicians should utilize multiple strategies in their assessment, and the more failures that occur, the more likely it is the person is malingering (Larrabee, 2003; Larrabee, 2008). A focus on minimizing false-positive rates for any single detection strategy may allow adequate sensitivity to feigning with minimal cost in specificity when multiple strategies are used (Berry & Nelson, 2010)¹.

The use of standardized detection measures is important as it has been found that clinical judgment alone is not effective in detecting malingering and can result in a significant amount of error (Berry & Nelson, 2010; Boone, 2013; Faust, Hart, Guilmette, & Arkes, 1988; Garb, 1998). Today, there are numerous ways that malingering, response bias, and poor effort can be detected, including embedded measures within standard neuropsychological tests, stand-alone measures of symptom validity, and self-report inventories that include validity scales assessing invalid response styles such as inconsistency and exaggeration (Heilbronner et al., 2009).

Stand-alone measures of symptom validity. The most common and widely endorsed form of objective measures used to assess for response bias and poor effort are stand-alone measures of symptom validity (SVTs) (Bigler, 2012; Nitch, 2008). These are assessments that appear to be cognitive measures to laypeople, are insensitive to real dysfunction, and sensitive to insufficient effort or negative response bias (Bigler, 2012; Hartman, 2002). Overall, these tests have been shown to have high accuracy regarding false-positive detecting (Bigler, 2012; Iverson,

¹ Sensitivity is the proportion of people who have a trait (e.g. diagnosed with a disorder, are feigning, etc.) and are identified as such. Specificity is the proportion of people who do not have the trait who are identified as such.

2007). Individuals with certain bona fida disorders, such as dementia or severe brain injury, may fail these SVTs, although this is rare and these individuals tend to present with severe and global cognitive deterioration that would be apparent (Boone, 2007; Willis, Farrer, & Bigler, 2011).

Of note, a recent change in terminology for these measures has been suggested. Rather than referring to them collectively as symptom validity tests, it has been argued that a more accurate term to describe these assessments is “Performance Validity Tests.” This is because they are assessing the individual’s performance on neuropsychological testing, rather than their reported level of symptoms (Larrabee, 2012a). Larrabee suggests that the term SVT should be reserved to describe the measures assessing the validity of symptom reporting, such as embedded scales on self-report measures. This differentiation is relatively new, but has been found to be an important distinction. The validity of individual’s performance on neuropsychological testing and stand-alone measures of performance validity have been found to be separate from the validity of their symptom report, and these need to be considered separately when discussing what portions of an evaluation can be interpreted and which ones have questionable validity (Dyke, Millis, Axelrod & Hanks, 2013). For this review, while the importance of this distinction is acknowledged, these tests will continue to be referred to as symptom validity tests to maintain consistency, as the vast majority of the literature cited and discussed uses this terminology.

The interpretation of scores on forced-choice SVTs is generally clear at the extremes of performance, but can cause difficulties with mid-level scores. A forced-choice measure involves presenting the examinee with a list of information, either verbal or pictorial, that appears long and therefore difficult to remember. After presentation, examinees are then asked to select each stimuli they were originally shown out of two choices. In this way, the task appears difficult and as though individuals with memory or attentional impairment would perform poorly, while in

reality, virtually only poor effort or purposeful low performance will yield poor results. Passing an SVT infers valid performance and appropriate effort and attendance to the stimuli. On the other side, below chance performance on a forced-choice measure is generally indicative of purposefully poor performance (Bianchini et al., 2001; Bigler, 2012; Larrabee, 2012; Larrabee, Greiffenstein, Greve, & Bianchini, 2007). However, when performance is poorer than average but higher than chance, the interpretation of performance is more difficult and intent cannot be attributed (Bigler, 2012; Boone, 2007; Heilbronner et al., 2009). For example, poor performance can result from either a lack of sufficient effort or from significant effort being utilized to make mistakes (Bigler, 2012; Heilbronner et al., 2009; Rogers, 2008a; Slick et al., 1999). Malingering requires a significant level of effort in order to maintain a consistent strategy and engage in believable performance (Heilbronner et al., 2009; Slick & Sherman, 2012). Therefore, poor performance on forced-choice tasks is best categorized as “noncredible performance” or “negative response bias” rather than “poor effort” (Boone, 2013).

A meta-analysis reviewed several of these tests and concluded that, on average, they were moderately sensitive and highly specific for the detection of feigned neuropsychological impairments, an imbalance that most argue is preferable (Vickery, Berry, Inman, Harris, & Orey, 2001). These tasks are generally only moderately sensitive due to the fact they appear simple and sophisticated malingerers are unlikely to purposely perform below chance. Different “cut scores” have been considered in attempts to increase the sensitivity of forced-choice measures. Binder (1993) found that using above-chance cut scores could increase the sensitivity of a measure without compromising the specificity among a group of compensation-seeking individuals. Test cutoffs are generally set up to maintain >90% specificity. These cutoffs do represent a limitation of SVTs, as cut scores by their very nature are somewhat arbitrary, subject to judgment, and

yield imperfect classifications (Bianchini et al., 2001; Bigler, 2012; Dwyer, 1996; Willis et al., 2011).

A good forced-choice measure will also have a high positive predictive value, which takes into account the base rate of the disorder and is the proportion of patients with positive test results who are correctly classified (Berry & Schipper, 2008; Heilbronner et al., 2009). This goes beyond the sensitivity and specificity of the test to include the characteristics of the population, such as the base rate, and thereby tells the clinician how confident they can be in the result (Bianchini et al., 2001).

There are also stand-alone measures that are non-forced choice that have been utilized, such as the Rey 15-item test (Rey, 1964) and the Dot Counting Test (Rey, 1941), which rely on floor-effect principles. For example, the Rey 15-item test involves showing participants 15 items on a card organized into columns, removing it after a short period of time, and asking them to recall and draw the items. The test is made to sound difficult, but due to the redundancy of the items, the task is surprisingly easy. Therefore, poor performance is generally indicative of insufficient effort or purposeful poor performance. Additionally, there has been new research into using response latencies and response latency consistency, reaction times, and error rates as detection measures on computerized tasks (Bianchini et al., 2001; Bolan, Foster, Schmand, & Bolan 2002; Ord, Boettcher, Greve, & Bianchini, 2010; Woods, Wyma, Yund, & Herron, 2015).

Although SVTs are just one or two stand-alone tests within an entire battery, it has been found that low performance on an SVT correlates with poor performance across a battery (Bigler, 2012; Green, 2007). In this way, clinicians can feel reasonably comfortable making inferences about the reliability of the rest of the findings based on performance on these measures.

Embedded validity scales. Beyond stand-alone measures, some commonly used neuropsychological tests have embedded measures of performance validity within them. These are parts of the tests that have been found to be sensitive to noncredible performance or insufficient effort while insensitive to bona fide deficits (Heilbronner et al., 2009). These measures may evaluate random, unrealistically slow, or inconsistent responding, as well as highlight uncommon patterns, such as failing easier items when hard ones are passed. Atypical patterns of performance on standard neuropsychological tests have been studied regarding their ability to detect malingerers compared to stand-alone measures. One study divided individuals who were malingering, based on Slick et al., 1999 criteria, worse-than-chance performance on SVTs, and individuals who did not have medical records to support their claims, against individuals with validated head injuries. Using specific unusual results on five different neuropsychological tests, the researchers found that using any given two failures, 87.5 % of malingerers and 88.9% of genuinely impaired subjects were correctly classified. Using three failures, the sensitivity was reduced to 50%, while no one was misclassified as a malingerer (Larrabee, 2003).

Embedded measures have numerous advantages. They are resistant to Internet research and coaching (elaborated on later), are less transparent than stand-alone measures, and are economic in that the same test can simultaneously assess genuine and feigned deficits (Berry & Schipper, 2008; Bianchini et al., 2001). Additionally, a clinician can rest assured that they can generalize the findings regarding the presence of response bias from the measure to the actual cognitive test results as the information comes from the same source (Sweet & Nelson, 2007).

Self-report measures. Many self-report measures that are available also have one or more validity measures built into them. These can include scales assessing inconsistent responding,

exaggeration, negative or positive response bias, or unusual symptom reporting, among others (Heilbronner et al., 2009).

Importantly, the validity of cognitive symptoms and psychiatric symptoms need to be assessed separately. It has widely been shown that malingering is heterogeneous, and individuals who are trying to malingering will do so on some tests and not others. Similarly, individuals are more likely to feign deficits on tasks that appear to be related to the areas they believe would be impaired based on their diagnosis. In one study of 105 patients, only 3.5% failed SVTs in both cognitive and psychological domains, arguing that these two domains are distinct and separate (Ruocco et al., 2008). Therefore, it is important to use a variety of response bias measures and to use ones that assess different domains. Additionally, it is important to be conservative when speaking about results, and only call into question the validity of the test findings that are in the same domain as the failed effort or validity measures (neuropsychological, psychological, etc.)

Considering this foundation of information regarding the detection of malingering and noncredible responding as well as different causes of invalid results, it is relevant to consider the ways in which individuals malingering symptoms to attain a diagnosis of ADHD, as well as how currently used detection methods have been studied.

Malingering Attention Deficit Hyperactivity Disorder

In the past, many clinicians and researchers in the field were under the impression that ADHD was unlikely to be malingered by adults, as it was a disorder of childhood (Alfano & Boone, 2007). However, an increasing number of adult, university students are seeking ADHD evaluations and the accommodations that would come with the diagnosis (Harrison, 2006; Suhr, Hammers, Dobbins-Buckland, Zimak, Hughes, 2008; Sullivan, May, Galbally, 2007). Some research argues that the rates of malingering ADHD are in line with the prevalence of

malingering in more traditional contexts, such as litigation (Alfano & Boone, 2007). The rate of students feigning the disorder has been found to range from around 20 to even 50% of students seeking evaluations (Edmundson, 2014; Harrison, 2006; Sullivan et al., 2007). The exact rate of this behavior is further masked by the spectrum nature of feigning, such that students can exaggerate symptoms they actually experience all the way to fabricating the existence of symptoms at all (which is arguably less common) (Rogers, 2008c). As attentional difficulties are common, ADHD becomes an even more attractive disorder to malingering (Rogers, 2008c, Suhr et al., 2008; Young & Gross, 2011). Additionally, some consider it a relatively easy disorder to feign, due to its complex etiology, rather flexible diagnostic criteria, heavy reliance on self-report, and diverse presentation (Tucha et al., 2015). As significantly more students receive accommodations for ADHD than would be expected based on the disorder's base rates, it is likely that a subset of individuals have successfully feigned the disorder (Alfano & Boone, 2007).

Methods by Which ADHD is Malingered

In previous research done on malingering ADHD, individuals have been found to use a variety of different strategies. In one study in which participants were warned about detection measures and asked to feign convincingly, the most common strategies employed included simulating problems attending to information, responding inconsistently, appearing less intelligent, missing difficult items, and showing difficulty paying attention (Frazier, Frazier, Busch, Kerwood, & Demaree, 2008). Quinn (2003) questioned student simulators about their strategies for feigning the Continuous Performance Test (CPT), a computerized measure of attention, response speed and inhibition. Students reported making commission and omission errors, using general inattention, ignoring visual stimuli, and double clicking the mouse as their

most common strategies of feigning, only the first two of which would be expected on the CPT in actual ADHD. In another study, the most common strategies employed by uncoached undergraduates included trying to emulate friends with ADHD, fidgeting, “zoning out” or being easily distracted, completing tasks overly quickly, carelessly or slowly, skipping items, and deliberately answering questions wrong (Harrison et al., 2007).

There is also recent research to suggest individuals may malingering differently or to a different extent based on their end goal. Cook and colleagues (2017) assigned participants in a simulation study to malingering ADHD either to obtain a prescription for stimulants or to obtain accommodations in the form of extra time. While both malingering groups obtained higher scores on the Conner’s Adult ADHD Rating Scale (CAARS) than individuals with ADHD, more individuals in the medication-seeking group scored above the cutoff for over-reporting on various subscales than individuals in the accommodation-seeking group (Cook et al., 2018).

Detecting Malingerers of ADHD

Measuring effort via objective methods in ADHD assessments is important. A unique retrospective study sought to determine if diagnostic outcome would have changed if validity testing had not been performed. It was found that individuals who put forth suspect effort based on the 1999 Slick, Sherman, and Iverson criteria had test performance that was not consistently distinguishable from individuals who had put forth adequate effort and been diagnosed with ADHD following their evaluations. Researchers found that, of those whose effort was suspect, 25% provided an interview consistent with ADHD and 46% had an indeterminate interview. Although there were a few tests in which those with suspect effort performed more poorly than those with ADHD, generally the suspect effort group obtained mean T-scores in the average range and tended to perform similarly to those with bona fide ADHD. Taken together, using just

the interview, 71% of those with suspect effort would have received the diagnosis, and using the interview and the behavior scales would have led to 65% being diagnosed. Even adding in the CPT would have reduced the rate only to 62% receiving the diagnosis (Marshall, Hoelzle, Heyerdahl, & Nelson, 2016).

Symptom validity tests. SVTs have been found to be reasonably useful for detecting the malingering of ADHD. Although there is some concern that those with ADHD might not pass traditional forced-choice SVTs due to boredom or other symptoms of ADHD, this has not found to be the case. In a study using children with ADHD who were given a full neuropsychological battery, including two or more SVTs, most children were able to pass the SVTs that were administered. After accounting for behavioral observations and those with severe impairments outside of the testing environment, no individual failed more than one SVT, and the failure rates were between 2.5% and 6.8% depending on the SVT. Another study found that the Victoria Symptom Validity Test and the Validity Indicator Profile were both able to differentiate between malingerers and people with ADHD (Frazier et al., 2008). These studies provide evidence that SVT use is appropriate for those with ADHD as long as they are used in context.

However, concerns have been raised about the sensitivity of the current SVTs to ADHD. When trying to identify someone who is malingering, the detection strategy must be congruent with the symptoms the person is likely to be trying to exhibit (Harrison & Armstrong, 2016). For example, a person claiming to have suffered memory loss from a TBI is likely to feign memory loss on a forced-choice measure (such as the Test of Memory Malingering) that appears to be a memory test at face value. This fact creates multiple issues for the detection of ADHD in that very few, if any, appear to be measures of attention at face value (Rogers, 2008b). Therefore, although the current SVTs may have excellent and accurate specificity for the malingered

ADHD population, their sensitivity leaves much to be desired (Alfano & Boone, 2007). Specifically, in this population of young college-aged students, the sensitivity is likely to decrease due to their education level (Tucha et al., 2015).

Self-report measures. While self-reports play a large role in the diagnosis of the disorder, these have consistently been found to be the susceptible to malingering (Harrison, 2004; Harrison et al., 2007; Quinn, 2003; Tucha et al., 2015). Many self-report measures are without symptom validity scales designed to detect exaggeration, and rather include validity scales that only assess consistency of responding. Additionally, self-report measures have a high face validity and are therefore relatively easy to malingering or on which to overreport (Suhr et al., 2008). Self-reports also can tend to misclassify average individuals as having ADHD, with one study suggesting up to 20% of the control population can be identified as having clinically significant symptoms of ADHD (Suhr et al., 2008).

The Conner's Adult ADHD Rating Scale (CAARS) is commonly used self-report measure assessing symptoms of ADHD (Conners et al., 1999). It includes eight clinical scales for severity of symptom assessment and diagnostic guidance, and includes one validity scale. However, this scale assesses for consistency of response style, rather than validity of responses in terms of exaggeration. Although the CAARS manual indicates that T-scores over 80 should raise concern for overreporting, such scores occur very commonly even in true diagnosed cases of ADHD (Harrison & Armstrong, 2016). In Harrison and Armstrong's study using the CAARS, they found assigned malingerers obtained significantly higher T-scores than individuals with ADHD, but scores above 80 also misclassified 20% of people with ADHD and 10% of clinical controls. Suhr et al. (2008) also found that neither the CAARS inconsistency score nor the high T-scores were helpful in determining the credible from the non-credible group in their simulation

study. A third study comparing undergraduate students asked to fake having ADHD to control individuals and people diagnosed with ADHD found that those who were told to simulate ADHD were able to feign the disorder on the CAARS, even though, again, their scores were overall quite high (Harrison et al., 2007).

ADHD has been found to be easily fabricated on other self-report measures as well. Quinn (2003) used undergraduate students who had been diagnosed with ADHD (not taking medication) compared to peers who were either requested to take the tests to the best of their ability or to malingering ADHD. Those assigned to the malingering group were provided with a list of criteria for ADHD diagnosis, although no additional suggestions or advice were provided. The researchers found that those who were told to malingering were able to successfully fake their reports of childhood and current symptoms of ADHD on self-report measures. Even utilizing the over-reporting cut score on this scale (The ADHD Behavior Checklist), the identification rates between those actually diagnosed and the malingerers was lower than chance.

Another study provided naïve and coached feigners with a self-report measure for ADHD symptoms, the Brown Attention Deficit Disorder Scale for Adults (Brown, 1996). They found that 0% of their control participants would meet criteria for ADHD based on their responses, while 92% of naïve simulators, 96% of coached simulators, and 100% of individuals who carried a diagnosis of ADHD would meet criteria. The scores on the self-report measures were virtually indistinguishable between the feigners and the honest responders who met criteria for the disorder (Tucha, Sontag, Walitza, & Lange, 2009).

Increasing the validity of self-report measures. In an attempt to examine the utility of adding an embedded measure of response validity into a self-report measure, Harrison & Armstrong (2016) added items from the Dissociated Experiences Scale to the CAARS. They

found that individuals who were suspected of faking (due to failure on at least one SVT and meeting Slick criteria) were more likely to endorse these uncommon items at a level that had reasonable sensitivity and excellent specificity. This study highlights the need for embedded measures and the need for validity scales of symptom endorsement, rather than just consistency of responding or potential over-reporting, in order to use self-report measures to detect malingerers (Harrison & Armstrong, 2016).

Suhr, Buelow, & Riddle (2011) attempted to derive a validity scale from the CAARS using items already on the form. Utilizing university students with and without ADHD, the authors identified items least commonly endorsed. The scale was then initially validated using clinical data from adults presenting for psychological evaluation, who had already been classified as having ADHD, a learning disability, presenting with other psychological symptoms, receiving no diagnosis, or presenting as noncredible reporters. This scale was found to have 67% overall accuracy at distinguishing the noncredible group from the ADHD group, and was more accurate than using T-score cutoffs from subscales of the CAARS to differentiate groups (Suhr et al., 2011). Further validation of the study found this scale to have 97% specificity and 52% sensitivity to detect non-credible symptom reporters based on extreme scores on multiple subscales of the CAARS, although utility was weaker for detecting those who failed stand alone or embedded measures of validity on cognitive tests (specificity around 80% and sensitivity from 13-17%) (Cook, Bolinger, & Suhr, 2016).

Cognitive measures. The results of cognitive tests have shown inconsistent usefulness regarding detecting and classifying malingerers in simulation studies. In the earlier study by Quinn (2003), malingerers performed differently from those with ADHD. Specifically, malingers performed significantly worse on both auditory and visual attention tasks, and the vigilance and

comprehension indices were significantly different between the two groups, with malingerers scoring significantly worse on both indices than those with ADHD. In the study done by Harrison et al. (2007), they found those who were told to feign ADHD did worse on cognitive tasks, including having more commission errors and presenting with overall slower processing speed. However, even considering all of the data together, their study still had a 25% error rate in classifying individuals, highlighting the need for improved measures of identification.

Malingerers of ADHD have also been found to make more omissions and commissions, as well as have increased response time, on computerized continuous performance tasks (Leark, Dixon, Hoffman, & Huynh, 2002).

This dichotomy between the ability to mangle on self-report measures and cognitive measures has also been observed outside of the simulation study paradigm. In one study that used the Word Memory Test to categorize individuals into credible or noncredible effort, neither of the self-report measures employed (The Wender Utah Rating Scale and the Conners Adult ADHD Rating Scale) were found to be able to differentiate between the groups, while malingerers did significantly worse on measures of executive dysfunction and memory (Suhr et al., 2008). Noteworthy is that the noncredible reporting group performed significantly worse than the group diagnosed with ADHD across the cognitive evaluation.

Limitations of This Research

It is important to note that all simulation studies carry the same inherent limitations. Individuals participating in simulation research do not have the same level of motivation to successfully fabricate their disorder as someone who may be facing real world consequences or who is seeking a stimulant medication prescription. Even when participants are provided monetary incentives to mangle in these studies, the motivation level is not fully comparable.

Additionally, participants in simulation research are generally only given a few minutes to prepare before being tested, while individuals trying to simulate a disorder in reality are likely to engage in a longer preparation period. Lastly, student participants may put forth questionable or suboptimal effort to follow the instructions provided in these studies, as they are generally participating just as a requirement for course credit or to earn a small reward.

Warning, Coaching, and Evaluation Preparation

The accuracy of many psychological tests relies on examinees being naïve to the tests, their scoring, and sometimes their purpose (Ruiz, Drake, Glass, Marcotte, & van Gorp, 2002). However, there is evidence that examinees can be informed of some of this privileged information before an evaluation begins. While this problem has been mostly discussed in the forensic setting, the problem of examinees using the Internet to obtain similar information is emerging as a new concern within the field. The following sections explore the research that has been done on the effects of warning and coaching participants, as well as on the decreased security psychological tests face due to the Internet.

Coaching in the Forensic Setting

Much of the research on coaching has been conducted in the field of forensic psychology. Although psychologists are obligated to protect the security of test materials and rely on the fact that their clients are naïve to the nature of the tests, there is evidence that attorneys coach clients (Lees-Haley, 1997; Victor & Abeles, 2004; Youngjohn, 1995). Although attorneys may feel they are doing their duty to their client, such actions could call into question the validity of the results (Victor & Abeles, 2004). Attorneys have been found to coach individuals on test content, how to prepare to be tested, how to answer on tests, what deficits to emphasize, and what examiners are looking for (Essig, Mittenberg, Petersen, Strauman, & Cooper, 2001; Lees-Haley, 1997;

Youngjohn, 1995). One common practice of attorneys is to review symptom lists with their clients (Essig et al., 2001; Lees-Haley, 1997). Additionally, one study found 44% of attorneys requested the names of the tests that would be used on their clients in the majority of their cases, 41% of whom stated they received this information and could share it with their clients (Essig et al., 2001).

The base rate of coaching is unknown (Berry & Schipper, 2008). A widely cited study found that almost 50% of attorneys, as well as 33% of law students believed that clients should be informed about the presence of validity scales within an evaluation (Wetter & Corrigan, 1995). A study by NAN found that 75% of attorneys prepared their clients for the types of tests and the appropriate response patterns (Victor & Abeles, 2004).

Warning Versus Coaching

Coaching should be distinguished from warning or alerting examinees to the presence of effort and validity tests in the battery. Coaching is defined as “any attempt to alter the results of psychological or neuropsychological tests in such a way that distorts the true representation of the examinee’s cognitive, emotional, or behavioral status or hinders an accurate assessment of such attributes” (Victor & Abeles, 2004, p. 374). In this way, coaching provides information that is aiding the person’s likelihood of being successful at avoiding detection (Bender & Rogers, 2004). Coaching can include informing participants about the condition they are to simulate or informing them about the detection strategies they will face, the latter of which is arguably more effective for successful malingering (Berry & Schipper, 2008).

In contrast, warning involves informing a client of the presence of validity measures and the likelihood of them being caught if they exaggerate or simulate symptoms. Research is split on whether this lowers the rates of malingering. In a 1997 article, Johnson and Lesniak-Karpiak

found that 45% of a group that was warned about validity measures end up being classified as “normal” rather than malingerers, leading the authors to argue that their warnings had served as a deterrent. However, others, including those in direct response to that article, argue it merely causes malingerers to be more judicious in their strategy (Bender & Rogers, 2004; Youngjohn et al., 1999). Research has shown that failure rates on SVTs are lowered when individuals are warned, although some argue this results from improvement in their malingering, rather than prevention of the behavior (Boone, 2007; Youngjohn et al., 1999). In one study where control and simulation groups were warned about the embedded and stand-alone validity indices, the forced choice SVTs proved to be ineffective for classifying the participants, with over 40% of the simulators being misclassified (Booksh, Pella, Singh, & Gouvier, 2010). Regardless of potential influence, it is important to note that warning clients of effort testing within the evaluation is an important part of informed consent and therefore should be a part of regular practice.

The Influence of Coaching and Warning on Detection

Most research finds that even minimal coaching can make malingerers harder to detect (Victor & Abeles, 2004). As stated, even minor warning can have a significant effect on the ability to detect malingering. In one study, in which both warned and unwarned simulators of head injuries were compared to normal individuals, the warned simulators still performed worse than the control group, but better than those who were not warned. The specificity of the symptom validity measures used remained high (73.6% for naïve malingerers and 84.8% for warned malingerers), although the sensitivity of these measures decreased significantly. The forced-choice tasks detected 31.6% of the naïve malingerers and only 6.5% of the warned malingerers (Suhr & Gunstad, 2000).

In another study, uncoached malingerers who were given instructions to fake a head injury were compared to coached malingerers who were also given information about common head injury symptoms as well as information about basic strategies for avoiding detection. Forty-seven percent of the uncoached group were detected, while only 29% of the coached group were identified. The researchers found only one of the four measures they administered, the Portland Digit Recognition Test, had a greater than chance accuracy at detection. When examining the performance on all four tests administered, it was found that the uncoached group's strategy was to perform poorly on all of the assessments, while the coached group exhibited more restraint in their performance, thus appearing to have more natural variability and believable levels of impairment (Rose, Hall, Szalda-Petree, & Bach, 1998).

One study using undergraduate simulators informed their participants of either the symptoms of closed head injuries, the symptoms as well as the nature of validity scales on the personality test being used (the Minnesota Multiphasic Personality Inventory, Second Edition, or MMPI-2), or nothing. The researchers found a main effect of information on the validity scales, and found that providing individuals with more information about the nature of the symptoms and about the nature of the validity scales they were facing aided them in realistic feigning that was more difficult to detect (Lamb, Berry, Wetter, & Baer, 1994).

In most studies that have been performed, the "coached" group is warned about the measures of validity and/or provided a list of common symptoms to look over. However, in one study asking students to simulate the symptoms of a head injury, the coached group was provided information on how to defeat the malingering measures in a manner that would appear convincing, such as to score better than chance on forced-choice measures and keep their performance consistent throughout the evaluation. Another group was given information about

head injuries, such as common symptoms that occur, and a third group was provided all of the aforementioned information (Dunn, Shear, Howe, & Ris, 2003). In analysis, when all three malingering groups were collapsed, the sensitivity of detection was low, while the specificity was high. Importantly, the coached groups were found to mangle in a less blatant fashion and perform slightly better across tasks, while an unexpected finding was that those given information performed even more poorly across measures. Although both effects were small, these preliminary findings highlight the need for more research in this area.

In a study from 1993 conducted by Martin and colleagues, 33 individuals with bona fide head injuries were compared with control participants, naïve malingerers, and sophisticated malingerers who were provided with information on how to minimize their chances of being detected. They found that individuals with TBIs and control participants performed well on the computer-based symptom validity tests, sophisticated malingerers performed above chance, and only naïve malingerers produced below-chance performance. The authors suggested below chance cutoffs are unlikely to be sensitive to more sophisticated and coached malingerers, and higher cutoffs, such as >80%, are more likely to produce an appropriate balance of sensitivity and specificity (Martin, Bolter, Todd, Gouvier, & Niccolis, 1993).

Coaching in Simulated ADHD Malingering Studies

Some studies have also examined the effects of coaching on individuals simulating ADHD. In one recent study 31 undergraduates who were coached using information from the Internet and provided with financial incentives were compared with control students and students with ADHD. This study had a significant strength in that their ADHD group was well validated by excluding participants who were diagnosed based solely on self-report or a short medical evaluation. They found that malingerers were able to produce profiles that would be consistent

with a diagnosis of ADHD, especially on self-report measures. Somewhat surprisingly, the neuropsychological measures the researchers employed were largely insensitive to feigning. All four of the SVTs were highly specific and showed moderate sensitivity to feigning (Sollman et al., 2010).

A more recent study done in 2014 gave an extensive neuropsychological battery of tests to naïve fakers and those given information about ADHD and its symptoms (Edmundson, 2014). The researchers also accounted for each individual's knowledge of ADHD before starting the study. The coached group was given information that would be readily available on the Internet. As with former studies, using two SVT failures yielded excellent specificity ($SP = .86$). Sensitivity to coached and non-coached malingerers was lower ($SN = .57$), although the noncoached group overall was easier to detect than the coached group ($SN = .39$ and $.30$, respectively). On self-report measures, their results were almost indistinguishable between those who were coached and those who were not, although the coached malingerers reported symptom rates that were slightly more similar to those of people diagnosed with ADHD. In a review that considered numerous aspects of these types of studies, overall malingerers had longer reaction times, slower processing speed, more variable response time, and poorer memory performance, with the non-coached malingerers performing the worst on measures compared to those with ADHD and those who were coached. The SVTs were still useful, although coached malingerers did slightly better on these tests than those who were not coached (Edmundson, 2014).

Using undergraduate simulators compared to control students and those previously diagnosed with ADHD, one study sought to determine the influence that prior knowledge of ADHD has on participant's ability to simulate the disorder. Both groups were warned about the validity indices they would encounter. The researchers found participants successfully feigned

ADHD retrospectively, and simulators tended to endorse much higher current symptoms of ADHD than participants diagnosed with ADHD. Overall, the study found malingerers performed similarly to individuals with ADHD on cognitive measures, although generally obtained scores indicative of greater cognitive impairment. They found that use of SVTs did aid in correct classification over clinical judgment alone, although still over 40% of individuals were misclassified in this study (Booksh et al., 2010).

Another study administered a comprehensive battery including intelligence estimates, cognitive tests, behavioral measures, and a measure assessing knowledge of ADHD to participants. The methodology of this study emphasized training their simulators, including giving them diagnostic criteria and information about their motivation to feign a week before the testing session. The simulators in this study obtained lower scores on neuropsychological and cognitive tests, and reported more pathology on the behavioral scales than those with ADHD and controls. Individual tests that differentiated between the groups were a measure of fluid reasoning, the full scale intellectual quotient (FSIQ), and two stand-alone measures of cognitive inhibition, flexibility, and processing speed (Rahban, 2010). However, these differences were not sufficient to detect the feigning group reliably. Simulators were found to perform more poorly on seemingly complex and difficult tasks, endorsed more depression and anxiety than the ADHD group (which notably was not screened for comorbidity), and endorsed higher levels of hyperactivity, impulsiveness, and inattention than the ADHD group. Lastly, these authors noted that the simulators were more likely to engage in behaviors during testing that are stereotypically expected from children with ADHD, but are not seen as frequently in adults, such as fidgeting and moving in their chairs.

Jasinski and colleagues (2011) performed a unique simulation design in that they had both ADHD and control participants divided into honest responding and exaggeration groups. For those in the non-honest groups, their participants were told either to feign ADHD (controls) or to attempt to portray their diagnosis in a slightly exaggerated fashion due to needing to be reevaluated for accommodations (those with ADHD). Their participants were provided information from the Internet to aid them in their feigning/exaggeration. The researchers administered five SVT tests and found that when considering two or more failures, their sensitivity was .475 and their specificity around 1.00. Their ADHD group and two feigning groups endorsed significantly more symptoms than honest responders, with the ADHD exaggeration group tending to endorse the most issues, but maintaining a believable level of symptoms. The researchers argued that use of at least two SVTs is best practice for detecting both feigners and exaggerators (Jasinski et al., 2011).

Measures That are Subject to Coaching

Traditionally, clinicians have relied on forced-choice measures to identify poor effort and purposeful exaggeration, although these measures are becoming less and less effective over time (Boone & Lu, 2007; Larrabee, 2012). As many of these measures rely on the floor effect (i.e. simple tasks that can be completed by even those most impaired individuals), these measures are easy to fake and are very subject to compromised test security and the increasing sophistication of malingerers (Larrabee, 2012; Rogers, 2008b). As more and more SVTs are used and their popularity increases, so do concerns that sophisticated malingerers, or those who have been coached, will be able to alter their performance to avoid detection on such 'primitive' forms of detection (Larrabee, 2003; Nitch, 2008).

Self-report measures also tend to be extremely susceptible to coaching. Jachimowicz & Geiselman (2004) gave university students the criteria for ADHD and five minutes to study it, and then administered one of four self-report measures of ADHD. They found the percentage of students in each group that obtained a score consistent with a positive diagnosis of ADHD was very high. Seventy five percent obtained such a score on the ADHD Rating Scale (ARS), 95% on the Brown Adult ADHD Scale (BAAS), 90% on the CAARS, and 65% on the Wender Utah Rating Scale (WURS), indicating each one of the self-report measures could be easily feigned to create a profile believable as ADHD.

As discussed previously, embedded measures are arguably the most resistant to coaching (Boone, 2007). Some include performance curves, which involve comparing performance between “easy” items and “hard” items within a test. Individuals who are malingering are unlikely to be able to differentiate these during testing, and therefore are prone to make a larger number of errors on easy items than expected (Bernard & Fowler, 1990). In other words, performance curves are difficult to fake (Rogers, 2008b). Additionally, magnitude of error is very resistant to coaching, as few people pay attention to the level of the mistake they are making (Rogers, 2008b). In one study, people who failed the SVTs also tended to have longer and more variable response time, and response time has been found to be more resistant to coaching (Dunn et al., 2003; Rogers 2008b). Finally, regardless of the type of detection strategies employed, it has been suggested that utilizing a greater number of detection strategies increases the chance of appropriate categorization of malingerers, even after being coached (Dunn et al, 2003).

Knowledge of the Disorder

It is important to also examine the extent to which knowledge of a disorder is related to one’s ability to fake that disorder. In most simulation studies, it is important to note that if the

participants in the malingering group do not have a comparable foundational knowledge of what they are trying to feign, the results will be affected. People's knowledge of mental health disorders vary greatly, so saying "pretend you have ADHD" will mean very different things to people and they will likely have varying degrees of success (Harrison & Armstrong, 2016). However, one study found the knowledge of ADHD was not significantly related to one's ability to simulate ADHD on objective attentional measures (Booksh et al., 2010). Therefore, this is an area where continued research is necessary.

Test Security

With the invention and rapid expansion of the Internet, information is widely available to individuals across the globe. This fast and convenient form of information sharing has numerous advantages, although it comes with the disadvantage that some information is available that was previously thought to be secure or restricted. Almost all information someone could desire is readily available on the Internet if they are willing to look for it. This is true across topics, and the field of neuropsychological testing is no exception.

The diagnostic criteria for ADHD and lists of common signs and symptoms are easily found on the Internet. This is not inherently a negative situation, as individuals who believe they may have the disorder, family members of those diagnosed, and individuals wishing to learn more about ADHD are likely to find this information useful. However, the availability of this information is then also on hand for individuals wishing to malingering, and therefore they would be likely to be informed about the disorder's presentation prior to an evaluation (Rogers, 2008c; Sollman et al., 2010; Young & Gross, 2011). Although information about testing materials and signs of malingering was available before the Internet in other settings, such as in books and journal articles, the Internet makes this information much easier to access, and one can do so in

the privacy of their own home (Ruiz et al., 2002). Adolescents are much more likely to get information about ADHD from the Internet (44%) than from professional sources (9%) (Bussing et al., 2012).

It is unclear to what extent knowledge of the disorder an individual is trying to feign influences their ability to successfully avoid detection. Some literature has found that knowledge of brain injuries did not significantly influence the ability to feign the impairment (Hayes, Martin, & Gouvier, 1995). A similar finding was observed in a study where knowledge of ADHD was not significantly related to one's ability to simulate it on objective attentional measures (Booksh et al., 2010). Regardless, it is unlikely that individuals presenting for an evaluation or participating in a simulation study will know nothing about ADHD. In a study of knowledge of and misconceptions about ADHD, 98% of adolescents surveyed knew of ADHD, 79% knew someone with the disorder, and around half felt they were knowledgeable about ADHD. However, misconceptions about the disorder (such as thinking the etiology was related to consumption of excess sugar) were fairly common within the sample (Bussing et al., 2012).

Even though knowledge of the disorder has a questionable influence on aiding someone in defeating malingering checks, this knowledge is likely helpful for simulators during the intakes and when completing questionnaires. Importantly however, is that much greater threats to the validity of neuropsychological assessments are present on the Internet.

Recent Exploration of Test Security Violations

Professionals in psychology are required to “make reasonable efforts to maintain the integrity and security of test materials and other assessment techniques” (American Psychological Association, 2016, Standard 9.11). However, there are many ways that privileged information can be released into the public sphere. As previously discussed, lawyers may request

names of tests, as well as test data, and are not restricted from doing with this information as they please (Rohling & Boone, 2007; Sweet & Nelson, 2007). Journal articles and other academic material may contain information that is an unintentional threat to test security as well (Rohling & Boone, 2007).

Previous attempts have been made to assess the nature of information that is available on the Internet. Ruiz et al. (2002) had psychology graduate students and non-psychologists search for information that would help them simulate depression for a disability evaluation. The searches were conducted in 2000. They found that seventy to eighty-five percent of the articles surveyed contained little information that would benefit malingerers. Twenty to twenty-five percent posed an “indirect threat” to test security, such as including the names of motivational instruments or signs of malingering clinicians look out for. Two to five percent of the websites posed a “direct threat” to test security, such as including examples of test stimuli, detailed information about the tests and their interpretation, and advice on how to respond appropriately to questions on common tests, such as the Rorschach and MMPI-2. Additionally, some sites had advice on “how to present themselves in a manner to obtain disability benefits.” One of the limitations of this study was their search terms, which mostly fell under the category of psychological jargon, such as “psychological evaluation,” “malingering,” “MMPI,” and “forensic evaluations.” The authors argued that the information available on the Internet would be most useful to individuals with “average to above average intellectual abilities, who were interested in presenting themselves in the most favorable light possible,” which falls in line with the exact population being considered in the current study (Ruiz et al., 2002).

In a study conducted in 2004, the information available on the Internet regarding three commonly used tests – The Test of Memory Malingering (TOMM), the Word Memory Test

(WMT), and the Victoria Symptom Validity Test (VSVT) – was investigated (Bauer & McCaffery, 2006). They searched each of the tests, classifying the first 50 websites to appear based on their level of threat to the tests' security, from no information provided to a "high threat", such as including sensitive information such as explanations of scoring or pass-fail cutoffs. They found that the TOMM had the most high threat level websites available, followed by the VSVT and the WMT. While no websites were found aimed directly towards assisting people in "fooling" the tests, the number of high threat level websites could easily provide a sophisticated individual with sufficient information to aid their performance. For example, 26% of the websites about the TOMM were classified as "moderate" or "high" threats to test security, and included information about the format of the test, what actual and malingered responses would look like, the cutoff scores, and populations that should perform well on the test. The authors argued also that while a number of the websites used psychological jargon, it would not be difficult to determine the gist of the information for a layperson. A significant limitation of this study is that it assumes the patients have access to the names or initials of the tests, which is a reasonable assumption in the forensic environment, but not necessarily in the clinical realm. It highlights the need to research the accessibility of this information to a layperson seeking information for deceiving in other contexts.

Additionally, certain tests have more published studies on them than others, and usually the amount is directly comparable to the popularity. For example, the Rorschach inkblot cards have been widely published, such as being available for purchase as a poster, and there are numerous websites that provide information about "appropriate" and "inappropriate" answers to each card (Interruptus, n.d.; Psych Watch, 2009). Therefore, the more popular the test being employed, the more likely threats to the security exist on the Internet.

Current Information Available Online Regarding Malingering ADHD

The current state of information on the Internet related to ADHD was also explored using search questions and terms similar to what a layperson would search. The search phrase “How do I convince my psychologist I have ADHD?” yielded over 3 million results, while “How do I fake ADHD?” yielded over 24 million results as of June 2019. Just among the top sites that were explored, there were numerous sites offering direct advice to individuals trying to accomplish this goal. One site entitled “Adderall Tips: How to convince your shrink you have ADD/ADHD” offers advice about how to respond to common intake questions (Magomedov, 2006). For example, it includes advice on how to answer questions such as:

Q: Do you maintain hobbies for long periods of time?

A: No. Usually only a few months. Video games are an exception.

Q: How did you perform in grade school?

A: Average to below average. Dependent [*sic*] on tutors just to keep up.

Q: How many jobs have you held?

A: Take the actual number of jobs and multiply by three.

Another site entitled “How to get your doctor to prescribe you Adderall in 5 easy steps” includes advice such as “make sure you keep looking all around the room, ask your doctor to repeat himself at least 5 times, and pick-up something in his office and play with it. Just trust me” (Miller, 2015).

On a popular video sharing website, numerous significant threats to security were located. These included a video entitled “What ADHD might look like in adults” with an actress depicting daily life and challenges that are typical of those with ADHD, demonstrating behaviors that are consistent with the diagnosis, and a full list of criteria (Dr. Dawn Psych MD, 2016).

Another one of the videos available discusses the development and use of the Quotient Test, a

computer-based measurement tool for symptoms of ADHD, and clearly exposes which behaviors clinicians look for to determine real from fake ADHD, such as repetitive fidgeting motions being more indicative of true ADHD rather than shifting or just appearing restless (TSAI05, 2010).

For more sophisticated searchers, there is significant information available on the Psychological Assessment Resources Incorporated site. The names and acronyms of effort and malingering tests are clearly listed, as well as pictures of the testing materials and forms that are given to the examinees. Tests listed include the most common self-report measures administered, including the Structured Inventory of Malingered Symptomology (SIMS), Miller Forensic Assessment of Symptoms Test (M-FAST), Memory Validity Profile (MVP), Structured Interview of Reported Symptoms – Second Edition (SIRS-2), and Victoria Symptom Validity Test (VSVT).

Even the New York Times has published questionable test information. They posted a PDF of the Adult A.D.H.D Self-Report Scale with scoring and interpretation criteria attached. The stated intent of the webpage was to encourage people to screen themselves and use the information to start a dialogue with their health care providers, although the information could easily be used for individuals to practice responding to see what it takes to meet criteria (Alderman, 2011).

The Influence of Test Security on Test Usefulness

Clinicians use forced-choice measures because they have a great deal of evidence and research, however, the population is becoming more savvy at learning how to detect what clinicians are putting in front of them (Nitch, 2008). Even non forced-choice stand-alone measures are so much easier than the other tests that sophisticated patients can easily identify them as effort tests that should be passed (Nitch, 2008). As the popularity of SVTs increases, so

does their presence on the Internet (Rohling & Boone, 2007; Sweet & Nelson, 2008). Decreases in test security have been argued to be a main cause for the decline in the sensitivity of forced-choice measures; Boone and Lu (2007) documented that SVTs have experienced a decline in sensitivity over time. The Rey 15-item test was found to drop from 71% sensitivity to 56% sensitivity. They speculated that this resulted from a combination of the effects of compromised test security as well as the increased sophistication of probable malingerers (Boone & Lu, 2007).

Future Directions

Considering the vast amount of information that is available on the Internet, Berry & Schipper (2008) suggested that in future simulation studies, participant malingerers be given as much information as possible, as this would more closely mirror malingering in today's day and age. Additionally, this research highlights the need for increased complexity of effort measures (Bianchini et al., 2001; Nitch, 2008). As mentioned, embedded measures are the most resistant to Internet research (Berry & Schipper, 2008; Sweet & Nelson, 2007). As neuropsychologists cannot create an infinite number of forced-choice measures to counteract the threats to security online, and as the structure of these tests is generalizable, pursuing the development of embedded measures within other cognitive tests or more complex paradigms that are more resistant to Internet searching and coaching is recommended (Rohling & Boone, 2007; Sweet & Nelson, 2007).

The Current Study

The current study sought to determine the extent to which information available on the Internet about ADHD and psychological testing could influence the performance of students feigning ADHD. Such attempts could be used to gain access to desirable academic accommodations and medications. This study compared the test results of Internet-coached and

uncoached students instructed to feign ADHD as convincingly as possible to individuals performing to the best of their abilities and to individuals diagnosed with ADHD. The goal of the study is two-fold: First, to gain insight into the extent to which information on the Internet aids feigners in their ability to deceive an examiner. Second, to determine if commonly used forms of validity testing are effective in identifying coached and uncoached malingerers and to identify if certain embedded scales or performance patterns on commonly used neuropsychological assessments can be used to reliably differentiate feigners from those with a diagnosis.

Measures Utilized

The test battery for this study consisted of the following measures:

North American Adult Reading Test. The North American Adult Reading Test (NAART) is a modified version of the National Adult Reading Test (NART) (Nelson, 1982), normed for usage with North American populations. It has been found to be a valid and reliable measure to estimate intelligence. The NAART estimates verbal intellectual ability by requiring examinees to read increasingly complex words out loud, and is based on the knowledge that reading ability is highly correlated with intelligence. In a norming study of over 3550 adults ages 18-91, the validity coefficient between the WAIS-R vocabulary and the NAART scores was found to be .75 and consistent across age and gender groups, and the correlation between these scores was .93 (Uttl, 2002). In a norming study using both Canadian and North American populations, scores on the NAART were highly correlated with FSIQ (.75) (Blair & Spreen, 1989). Additional norming was performed using a larger sample size, in which the correlation between FSIQ and the NART-R was .46. This study also found that the NART performs more accurately at average IQ levels, while it is more likely to overestimate lower IQs and underestimate higher IQs (Wiens, Bryan, & Crossen, 1993).

Assessing general intellectual functioning is important in this type of simulation work for two reasons. First, it is important to establish that the groups are not significantly different from each other in regards to IQ, especially because random assignment was not possible for all groups (e.g. those diagnosed with ADHD vs. not). This procedure has been followed previously by Harrison et al., 2007. Additionally, it was important to assess for the IQ of participants due to caveats in result interpretation at the extremes of IQ scores. Research suggests that effort tests should not be used with individuals with an IQ of <70 (Dean, Victor, Boone, & Arnold, 2008) and individuals with ADHD with an IQ of >120 have been found to perform within the average range on neuropsychological tests, even though relative weaknesses may be present (Antshel et al., 2010).

Word Choice (Advanced Clinical Solutions). The Word Choice subtest from the Advanced Clinical Solutions Suboptimal Effort measures (Word Choice) is a stand-alone measure of effort designed to provide information about if sufficient effort was put forth during testing, or even if purposeful poor performance occurred. This assessment utilizes a word list provided both visually and verbally as stimuli and forced-choice options for each question. As with most forced-choice measures of effort, this assessment was designed to detect malingerers of memory impairment. Although this task seems difficult to the untrained eye due to the number of stimuli presented, it is a remarkably easy task and the vast majority of clinical participants obtain high scores.

To assess effort put forth by an examinee, performance on this measure is compared against the scores obtained by clinical populations (including those with ADHD) and against scores of individuals known to be purposely performing poorly, rather than to healthy populations as with most neuropsychological tests. The ACS manual offers cut scores for

performance at a variety of base rates in the population (Wechsler, 2009). Clinicians can therefore determine what base rate they wish to use for classifying performance based on how liberal or conservative they wish to be, although the literature generally suggests using a 10% base rate (Boone, 2007; Larrabee et al., 2007). Based on the normative sample only 9% of those with ADHD scored below the cutoff (and would have therefore been identified as false positives for poor effort) whereas 70% of simulators would have obtained scores below the cutoff. Finally, although this subtest was designed to work within the set of five effort measures in the ACS set, it has been shown to have a strong and statistically reliable discriminating power on its own (Miller et al., 2011).

Digit Span (WAIS-IV). Digit span forward and backward are subtests assessing working memory from the Wechsler Adult Intelligence Scale, currently in its fourth edition (Wechsler, 2008). In this task, participants are read a string of digits and asked to repeat them back to the examiner, either as they were heard or in reverse order. These tasks assess a participant's attention and their ability to retain and manipulate information in their working memory. The Reliable Digit Span (RDS) is an embedded measure of effort that is derived from this test, originally proposed by Greiffenstein, Baker, and Gola in 1994. The score is derived from calculating the number of digits in the last string recalled correctly for both trials of that digit string length, and summing this number for digits recalled forward and digits recalled backward. A cut-off score of 7 was found to produce high specificity and moderate sensitivity in detecting malingerers (Berry & Schipper, 2008). However, others have found that a score 6 or less is required to maintain higher specificity (Babikian, Boone, Lu, & Arnold, 2006).

Most of the work done on the Reliable Digit Span has been done on individuals feigning head injuries. In a review of the literature, the authors found that the cutoffs of <5 forward, <3

backward, and a Reliable Digit Span score of ≤ 7 consistently had specificity above 90% and sensitivity around 50% (Babikian & Boone, 2007). Additionally, Larrabee (2003) found a RDS score of ≤ 7 correctly identified 50% of feigners and 93.5% of those with bona fide closed head injuries. A cutoff score of ≤ 7 was also found to produce the best balance of sensitivity and specificity in other studies (Ord, Greve, Bianchini, & Aguerrevere, 2010).

The Reliable Digit Span presents a potentially useful measure for detecting individuals feigning ADHD, as the task appears to assess attention at face value. Therefore, unsophisticated malingerers may be more likely to assume that individuals with ADHD would perform poorly on this task. Inconsistent findings have emerged from simulation studies on this test comparing people with ADHD to feigners. Some previous literature has found that individuals feigning ADHD perform worse than individuals with ADHD as well as controls (Booksh et al., 2010). In a study comparing those with ADHD to feigners, the mean number of digits recalled by the feigners was two digits less than the honestly responding group (Marshall et al., 2010). However, another study found that those feigning ADHD did not perform significantly differently than those with ADHD (Edmundson, 2014).

Only one study has compared college students with ADHD to known feigners in a clinical setting using this task. Harrison, Rosenblum, & Currie (2010) used Slick (1999) criteria to identify students feigning ADHD and learning disability symptoms from a university counseling center. They found that scores of < 6 occurred in only 5% of the clinical population thought to have been honest in their assessments, yet occurred in 36% of the people in the malingering group. Depending on the base rate considered, using a cutoff score of < 6 yielded a positive predictive value of 44-75% for identifying malingerers. While this study had the benefit

of a real clinical population over simulators, its findings are limited by a very small sample size. In order to obtain such high specificity by using a cut off of 6, sensitivity is sacrificed.

Wisconsin Card Sorting Test². The Wisconsin Card Sorting Test (WCST) is a card-based test of executive functioning, requiring inhibition, learning, and set-shifting (Grant & Berg, 1948; Heaton, Chelune, Talley, Kay & Curtiss, 1993). In this task, participants are required to match cards with symbols on them to one of four key cards, and improve their performance and learn the rules based on feedback from the examiner or computer.

Although it has been shown that individuals with ADHD tend to exhibit weaknesses on neuropsychological measures of executive functioning, this does not hold true for scores obtained on the Wisconsin Card Sorting Test (Hervey et al., 2004; Willcutt et al., 2005). Failure to maintain set is one score on the test that has potential to be used as an embedded measure of validity, as it has been shown to not distinguish between control participants and those with ADHD (Frazier, et al., 2004). Other studies had found that ADHD participants and controls perform similarly in terms of shifting between sets and forming concepts on this test (Gallagher & Blader, 2001)

As the WCST appears to require sustained attention, there is potential that individuals feigning attentional difficulties would believe this is a test they should perform poorly on (Bernard, McGrath, & Houston, 1996). Additionally, it has been shown that the WCST is sensitive to suboptimal effort. The average effect of effort on total errors, perseverative responses, and conceptual level responses was found to be .42, which was greater than the effect of mild, moderate, and severe head injuries (Ord et al., 2010).

² For this study, the Wisconsin Card Sorting Test – 64 card version was utilized.

The WCST presents a variety of new ways to detect malingering. There are unusual response patterns that are unlikely to appear in both control and various clinical populations, such as “other” sorts, where a card is matched to a key card with which they share no similarity (Bernard et al., 1996; Ord et al., 2010). The WCST also has the benefit of having many “subtle” scores within it that can be tested for use as embedded measures and are thereby more difficult to feign. For example, laypersons are likely to know that less categories completed is indicative of poor performance, but they are unlikely to know about expected patterns of perseverative and nonperseverative errors (Bernard et al., 1996; Ord et al., 2010). Additionally, it would be almost impossible to keep track of these scores during testing even if one did know about them, if one was trying to feign. Suhr & Boyer (1999) suggest using number of categories or perseverative errors (as they were found to account for largely the same variance in this study) and failure to maintain set to identify feigners. In their study, this formula maintained 82.4% sensitivity and 93.3% specificity, and correctly classified 87.5% of participants, between malingerers and those with head injuries.

Most of the research that has been conducted on the use of the WCST for detecting feigners has been conducted with individuals with head injuries. Using undergraduate simulators compared with individuals who had suffered closed-head injuries and those with various CNS pathologies, the researchers found malingerers obtained the lowest scores on the test, with the number of categories completed being the only variable to distinguish the groups (accounting for 74% of the variance). They found a more subtle score, perseverative errors, accounted for only 17% of the variance. Their participants obtained low category scores without elevating their perseverative errors, which is an unusual pattern of performance that would alert to the potential for malingering, and considering the scores together led to 86% sensitivity and 91% specificity,

significantly higher sensitivity than stand-alone measures consistently achieve (Bernard et al., 1996). In a study of individuals referred for workers compensation and other injury cases, it was found that individuals categorized as being probable and definite malingerers (based on the Slick 1999 criteria) completed significantly less categories, had more total errors, and had more non-perseverative errors than those putting forth legitimate effort. Additionally, there was a trend for them to produce more “other” matches and miss cards that are identical to the key cards, although these were not found to be significant differences. They found that using unique responses, failure to maintain set, and categories completed presented the most potential for identifying profiles with questionable validity (Greve, Bianchini, Mathias, Houston, & Crouch, 2002). Failure to maintain set has consistently been found to be useful for identifying malingerers, with a FMS score of >1 correctly classifying 48% of malingerers and 87.1% of those with moderate to severe head injuries in one study (Larrabee, 2003).

Although the research so far has been limited to identifying malingerers of head injuries, pursuing the use of this test for detecting malingering of ADHD is an important next step. The WSCT appears to require attention at face value, which increases the chance those attempting to feign ADHD will perform poorly on it, while research has consistently shown people with ADHD perform similarly to controls on this test in actuality. The current study sought to determine if any of the usual patterns of performance on the WCST arose from feigners of ADHD.

Continuous Performance Test. The Continuous Performance Test (CPT) is a task of sustained attention originally designed to assess alertness and attention in individuals with various neurological impairments (Rosvold, Mirsky, Sarason, Bransome, & Beck, 1956). The test was created to assess attentional abilities over a relatively long period of time, or sustained

attention, as lapses in attention could be missed on shorter tasks. The task was divided into two parts. First, participants were shown a series of stimuli (letters) in succession and told to respond only to a specific stimuli (X). The second half of the test includes a similar but more complex task; participants are again shown a series of letters in succession, but only should respond when shown a specific pattern (an A followed by and X). The original study found individuals with various neurological impairments made more mistakes (omission and commission errors) than individuals in the control group, and their performance declined further with the more complex half of the task.

Numerous versions of the CPT have been developed over the years, including visual and auditory versions, most of which are computer-based. The different versions tend to assess an individual's vigilance, attentiveness, sustained attention, inhibition, and sometimes response speed. Continuous performance tests are used for diagnosing ADHD, traumatic brain injuries, and other disorders that can impact attentional abilities, and have been used in research on both individuals with ADHD as well as simulators. The majority of the recent research has been conducted using the Conners' Continuous Performance Test, now in its third edition. Regarding those with ADHD, some studies have found individuals with ADHD have more varied response times across the task, more commission and omission errors, and slower reaction times (Boonstra et al., 2005; Hervey et al., 2004; Pasini et al., 2007). Specifically, Marshall found an omission T-score of <20 had a sensitivity of 56.52% and a specificity of 100% for detecting and classifying malingerers, while commissions had the same specificity but only a 4.35% sensitivity (Marshall et al., 2010). In contrast, some studies have found the CPT is unable to reliably differentiate between ADHD and control participants. Sollman et al. (2010) found their control participants and those with ADHD produced statistically similar profiles across the majority of indices. In

another study, they found that a subset of their participants who had “significant confounding variables that raised questions as to the validity and relevance of [the diagnosis of ADHD]” had the most elevated T-score (poorest performance), suggesting the CPT may be assessing functions that are not exclusive enough to warrant use in aiding differential diagnosis (Roy-Bryne et al., 1997, p. 138).

Individuals malingering have been found to produce profiles that lack internal consistency across indexes on continuous performance tests. Reaction times are also expected to be lower (Edmunson, 2014). Using a visual and auditory version of the CPT developed by Sanford and Turner, simulators performed worse on attention in both domains than those with ADHD, and the vigilance scale of the visual version was the most effective for distinguishing simulators from those with ADHD (Quinn, 2003). The CPT is best at detecting malingerers who exaggerate their symptoms significantly more than necessary, such as producing scores that are three or more standard deviations below the mean, which would be unusual for individuals with ADHD putting forth good effort (Quinn, 2003; Sollman et al., 2010).

Conner’s Adult ADHD Rating Scale. The Conner’s Adult ADHD Rating Scale (CAARS) is a diagnostic instrument for ADHD that was developed by Conners et al. in 1999. This self-report measure asks participants to report the extent to which they experience symptoms associated with ADHD using a 4-point Likert scale. Both a long and short form are available, with little decrease in reliability for the shorter version (the shorter version was used in this study). The only validity scale on the CAARS assesses for inconsistency, and therefore is not designed to be used to detect individuals feigning or exaggerating symptoms, and has not been shown to be useful in this regard (Conners et al., 1999, Harrison & Armstrong, 2016; Sollman et al., 2010).

Numerous studies have found that simulators can successfully feign ADHD, producing profiles that are statistically indistinguishable from profiles created by individuals with ADHD (Edmundson, 2014; Harrison et al., 2007; Jachimowicz & Geiselman, 2004; Sollman et al., 2010). Both coached and uncoached simulators can produce profiles that would be interpreted as having ADHD (Edmundson, 2014; Jasinski et al., 2011). In looking for feigners and exaggerators, it has been suggested that T-scores on clinical scales that exceed 80 should raise suspicion (Conners et al., 1999; Harrison et al., 2007). However, many individuals with diagnosed ADHD regularly produce profiles in this range, and utilizing this score as a cutoff could lead to unacceptable levels of false-positives for non-honest reporting (Harrison & Armstrong, 2016).

Hypotheses

Based on the review of the literature, the following hypotheses were examined:

- H1) It was hypothesized that control participants, coached feigners, and those with ADHD would obtain passing scores on the ACS Word Choice (defined in this study as a score that has a base rate of >10% in the normative group). Individuals in the uncoached malingering group would obtain non-passing scores on this measure (a score that has a base rate of $\leq 10\%$ in the normative population).
- H2) Uncoached feigners would be significantly more likely to obtain Reliable Digit Span scores ≤ 7 . Coached malingerers, those with ADHD, and control participants were postulated to be likely to perform within normal limits for this task (e.g. obtain scores >7).
- H3) Uncoached and coached feigners would likely endorse levels of ADHD symptoms consistent with those endorsed by individuals with ADHD. Neither the CAARS

inconsistency scale nor the cutoff for cautious interpretation (T score >80) would be able to reliably differentiate between the groups. Control participants would endorse some symptoms of ADHD but most profiles would fall in the average range, below what is expected for diagnosis.

- H4) Coached and uncoached feigners would obtain significantly lower scores on the Wisconsin Card Sorting Test than control participants and participants with ADHD. Uncoached feigners were expected to be likely to perform poorly on all measured scales, including scoring significantly lower in categories completed and level of conceptual responses, making significantly more perseverative and non-perseverative errors, and obtaining significantly more failures to maintain set (defined as making an error after five consecutive correct responses). Coached feigners would likely perform significantly worse than the other three groups only on more subtle aspects of the test, including making significantly more perseverative errors and more failures to maintain set.
- H5) On the Continuous Performance Test individuals with ADHD and the control group would have significantly more total correct responses during the X (easy portion) of the test than malingerers. Individuals with ADHD, coached, and uncoached malingerers would have significantly less correct responses during the AX (more difficult) portion of the task than control participants. The relative percentage of correct responses (the number of correct responses over the number of attempts made) would be significantly different between some of the groups, with the control group having the highest relative percentage correct, the ADHD and coached malingerers having significantly lower scores than control participants but being not significantly different from each other, and the uncoached malingerers having a significantly lower relative percentage correct than all

other groups. Those with ADHD and coached malingerers would have significantly more difficulty with the harder portion of the task than the easy portion of the task, while control participants and uncoached malingerers would not, with uncoached malingerers making significantly more mistakes across both portions of the task.

CHAPTER THREE

METHOD

Participants

Participants were undergraduate students at a medium-sized northeastern university. They were recruited from the subject pool at the university and participated in the study to earn research credits towards fulfilling a psychology course requirement. Participants were required to be 18 years of age and were precluded from participation if they reported having ever had a moderate to severe head injury (i.e. loss of consciousness of >30 minutes), as this has been found to influence neuropsychological test performance (Arciniegas et al., 2002). Potential participants were also prescreened with the question “Have you ever been diagnosed with ADHD (Attention Deficit Hyperactivity Disorder)?” in order to recruit participants for the ADHD group. A conscious decision was made to frame the question in a broad fashion to aid with recruitment for the study, rather than asking about current or recent diagnosis of the disorder. Specific invites for participation were sent to subject pool members who answered positively to this question to recruit a comparable number of individuals with ADHD to the other groups. The university’s Institutional Review Board for the Protection of Human Subjects approved this study.

Seventy-two participants were recruited for the study with 71 individuals completing the entire study. One individual left early due to a family emergency and her data were removed before initial analysis. Partial data are missing from another participant due to technical difficulties, although the data available for this participant were sufficient in quantity to be retained for analysis. Data were collected from April to May, 2018 and September to October, 2018.

Design

This study utilized a simulated between-groups experimental design. The study included four groups: A control group of college students without ADHD, a comparison group of students diagnosed with ADHD, and two simulation groups of students assigned to feign having ADHD throughout completing the cognitive measures and questionnaire. One of these latter groups was provided with additional information intended to simulate information available on the Internet about ADHD and techniques to feign the disorder. This group is referred to as the “coached malingerers” group, while the other simulation group, provided with no additional information intended to help them feign the disorder, is referred to as the “uncoached malingerers.” The independent variable in the study is group membership, while the dependent variables are the results from each cognitive measure and symptom assessment in the battery (Appendix B).

Measures

Measures administered on the computer were obtained through the Millisecond Library under the university’s license with Inquisit. Paper and pencil tests were either obtained through the public domain (if available) or purchased directly through the publisher.

Assessment Battery

The following measures were administered to each participant in this study:

1. North American Adult Reading Test (NAART): This reading-based task was administered to each participant as an estimate of IQ to ensure the groups were not significantly different in terms of general cognitive abilities.
2. Advanced Clinical Solutions Word Choice Subtest (ACS Word Choice): This stand-alone measure was used as a validated assessment of effort.

3. Reliable Digit Span from the WAIS-IV (RDS): This embedded measure of effort was used as a validated assessment of effort.
4. Wisconsin Card Sorting Test (WCST): This measure of executive functioning was included to assess if any of the scores previously found to detect feigners of head injuries would also be useful for detecting feigners of ADHD.
5. Continuous Performance Test (CPT): This measure of sustained attention was included to assess the extent to which malingerers would produce scores similar to or significantly different from those with ADHD.
6. Conners Adult ADHD Rating Scale (CAARS): This self-report measure was included to assess the extent to which self-report could be feigned by simulated malingerers.

Procedures

Eligible participants were divided into one of four groups. Participants who responded positively to the prescreening question about having been previously diagnosed with ADHD were automatically assigned to the ADHD group. All other participants were randomly assigned to one of the other three groups (control, uncoached malingerers, coached malingerers) using a computer randomizer. The study was conducted in the Psychology building on campus in private research rooms. Two researchers tested participants: the lead researcher and a trained graduate student from the Clinical Psychology Doctoral Program³.

Upon arrival, the first researcher greeted participants. All participants were given a consent form describing the nature of the research, risks and benefits, and other necessary

³ A small number of participants in the ADHD and control conditions completed the entire assessment with one examiner rather than two due to researcher schedules and other logistical concerns.

information (Appendix C). Participants were also given a copy to retain for their records. The purpose of the study was described as “examining college student’s performance on neuropsychological measures.” Participants were given a chance to ask questions before consenting to participation.

The procedure and order of administration varied slightly for each group, and a visual representation of the procedures for each condition is offered in Figure 1. Each group started by receiving their initial instructions, which informed participants they would be completing a series of tasks, and to do their best on the first tasks they were given. The exact scripts for each group are available in Appendix D. All participants first completed the North American Adult Reading Test. Following this, participants in the control group, the ADHD group, and the uncoached malingering group each completed a “filler task” (a 4-5 minute computer test of visual-spatial skills), before receiving their second set of instructions (Appendix D). The filler task was included to add time with the first researcher, mimicking the time required to prep the coached malingerers (discussed later) and thereby better masking the condition to the second researcher who was blind to subject assignment. Participants were then given the instructions relevant to completing the second portion of the study. Control participants and participants in the ADHD group were provided with roughly the same script as each other, stating they would be completing the rest of the tasks with a new researcher and to continue doing their best work. The uncoached malingerers were at this time informed of their assignment to complete the rest of the tasks while feigning symptoms of ADHD. Participants in this group were provided with a vignette to orient them to this task, describing how their poor grades were jeopardizing their status at the school, and they had decided to undergo an evaluation for ADHD in an attempt to gain academic accommodations and stimulant medications (Appendix E). Clarification of the

assignment was provided if necessary, although no additional information about how to feign having ADHD or the symptoms of the disorder was provided, even if participants inquired specifically.

Rather than complete the filler task, the coached malingerers were given their second set of instructions immediately following completing the NAART. The instructions included the same assignment as the uncoached malingerers, with an addition to the vignette that stated the student in the story searched the Internet for information to make their performance of ADHD more convincing to the evaluator. Participants were then provided with the “Additional Information About ADHD” (Appendix F) pages on a computer, and told to take their time reviewing the mock-websites to prepare themselves. Participants spent on average 3.82 minutes reviewing the pages (Ranging from 2.67 minutes to 6.75 minutes).

Before the second researcher was brought in, all participants were informed of the ability to earn a monetary reward (stated also in the consent form), in order to increase motivation to perform their assignments to the best of their ability. Participants in the ADHD and control groups were informed that if they completed the tests to the best of their ability, their name would be entered into a drawing to win a \$50 gift card. Participants in the malingering (coached and uncoached) conditions were told that if they put forth their best effort to fool the examiner, their name would be added to this drawing. At the end of the study, all participants who completed the study were entered to win the gift card regardless of test scores.

After answering any final questions, participants were introduced to the second examiner who was blinded to condition. The second researcher administered the ACS Word Choice, Digit Span, the CPT, the WCST, and the CAARS. The ACS Word Choice was administered first, as some literature has suggested if forced-choice measures are administered later in a battery they

can be more easily identified by malingerers as an easy assessment (Bush et al., 2005; Guilmette, Hart, Whelihan, Sparadeo, & Buongiorno, 1996; Iverson, 2006). The other measures were administered generally in the order presented here, although variations were permitted if necessary (e.g. computer needed to be restarted, etc.).

Non Clinical Control	ADHD	Uncoached Malingerers	Coached Malingers
Consent and Initial Instructions			
Administer: NAART			
Filler Task			Vignette and second instructions
Second instructions		Vignette and second instructions	Information from Internet
<i>Change Researchers</i>			
Administer: ACS Word Choice, Digit Span, CPT, WCST and CAARS			
		Complete manipulation check form	
Complete demographic form and gift card entry form			
Debriefing			

Figure 1. The order of the study divided by condition.

After completing testing, participants completed a short demographic questionnaire. Participants in the malingering conditions also completed a manipulation check assessing their understanding of the assignment and whether or not they followed the instructions to the best of their abilities. All participants were debriefed about the purpose of the study and provided the debriefing form for their records (Appendix G). They were also given the opportunity to enter their name and contact information for the gift card drawing if they wished to be included. Participants were thanked for their time and provided an opportunity to ask questions.

Data Analysis

A detailed list of variables in the study are listed in Appendix B. The demographic makeup of the participants was assessed before data analysis. The data were reviewed to assess

for accurate data entry and to remove participants when appropriate (e.g., failed manipulation check, insufficient data as discussed).

Before running each statistical analysis, data were checked to determine if assumptions were met for the planned analyses (e.g. The Shapiro-Wilks Test of Normality, Levene's test for equality of variance). In cases where assumptions were violated, steps were taken to resolve the violation (e.g., transforming data) or alternative tests from those originally planned were pursued. When appropriate, effect sizes were calculated as well.

A one-way Analysis of Variance (ANOVA) was utilized to determine if participants within the four groups differed significantly on IQ.

In order to answer the research questions, the following statistical analyses were conducted.

- H1) Word Choice: As data violated the assumptions required for an ANOVA, a nonparametric Kruskal-Wallis test was performed to determine if the experimental groups obtained significantly different rates of passing the Word Choice test. A Dunn post hoc test with Bonferroni adjustment was planned to assess the nature of any significant findings. To assess the sensitivity and specificity of the Word Choice Test with this particular data set, a Receiver Operator Characteristic Curve was conducted.
- H2) Reliable Digit Span: Two one-way ANOVAs were used to assess performance on the Digit Span subtest: one was used to assess for significant differences between the groups in Reliable Digit Span scores, and the other was conducted after the data had been transformed into pass and fail scores. Tukey-Kramer post-hoc tests were planned to analyze the source of any differences.

- H3) CAARS: After removing self-report protocols deemed invalid due to inconsistent responding, a series of ANOVAs were conducted to assess for significant differences between the groups in scores on the various CAARS subscales. Tukey-Kramer post-hoc tests were planned to analyze the source of differences. Data were also split between those with potential invalidity due to overreporting (any scales with T-scores above 80) and those with scores in the likely valid range (T-scores under 79) and a chi-square test was used to assess for differences in validity of reporting between the groups.
- H4) WCST: Based on previous literature, data analysis for this measure were conducted in two phases: planned analyses and exploratory analyses. One way-ANOVAs with Tukey post-hoc tests were conducted on the scores of the WCST anticipated to be significantly different between the groups based on previous literature (total errors made, perseverative and non perseverative errors made, numbers of categories completed, number of failures to maintain set, and number of conceptual level responses made). In cases where Levene's test revealed a violation of the assumption of homogeneity of variance, a Welch ANOVA with a Games-Howell post-hoc test was utilized instead. The same tests were conducted in the second phase for exploratory analyses on remaining variables available.
- H5) CPT: Differences between the groups in raw scores and relative (the number of correct responses over the number of attempts made) and absolute (the number of correct responses made over the number of correct responses possible) percentages correct on this measure were assessed using a non-parametric Kruskal-Wallis Test due to violations of assumptions required for parametric tests. To assess if the relative difficulty of the more difficult portion of the task (part AX) versus the easier part of the task (part X) differed between groups, a Mann-Whitney U test was conducted (as assumptions required

for the T-test were not met). To determine if differences observed between groups held after performance on part X was controlled for, a non-parametric version of an ANCOVA, Quade's test of rank order analysis of variance, was conducted, as multiple violations of the assumptions for a parametric test were present.

CHAPTER FOUR

RESULTS

Participants

Participants were divided into four experimental groups. Students were assigned to the ADHD group if they reported having been formally diagnosed with ADHD before. Participants without ADHD were assigned randomly to one of the three other conditions, so named “non-clinical controls,” “uninformed malingerers” (UM), and “coached malingerers” (CM). Seventeen participants were assigned to the control condition, 19 to the uncoached malingerer condition, and 18 to the coached malingerer condition (all by computer randomizer), and 17 participants with ADHD were recruited. Twenty-four percent (N=4) of participants with ADHD were taking stimulant medication at the time of the evaluation. Due to the small sample size, medicated and unmedicated participants with ADHD were kept in the same group and their data analyzed together.

Manipulation Check

Participants in the malingering conditions were administered a manipulation check at the end of the study to ensure they followed instructions. Three participants indicated either that they did not understand the assignment and/or they did not follow directions to malingering ADHD during the study, one from the uncoached group and two from the coached group. These cases were removed before the data analysis, leaving 18 participants in the uncoached condition and 16 in the coached condition, and a final total of N=68 individuals for analysis.

Demographics

Participants were all undergraduate students. Participants ranged in age from 18-27, although 95% of participants were between the ages of 18-21 (Figure 2). Forty-nine percent of

the participants identified as male and 51% as female (Figure 3). The racial makeup of participants was 85% White or Caucasian, 9% Black or African American, 4% Hispanic or Latinx, 2% Asian/Pacific Islander, and 1% other (Figure 4). Seventy-five percent of participants were in their first year of undergraduate education, 19% were sophomores, and the remaining 6% were juniors or seniors (Figure 5).

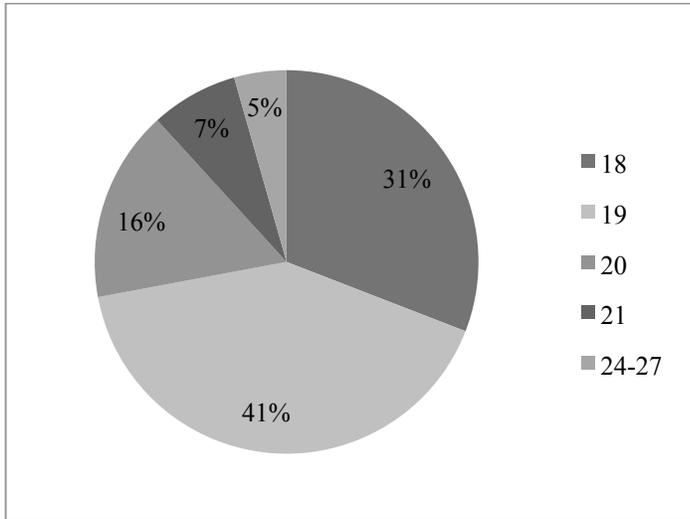


Figure 2. Pie chart showing the ages of the participants.

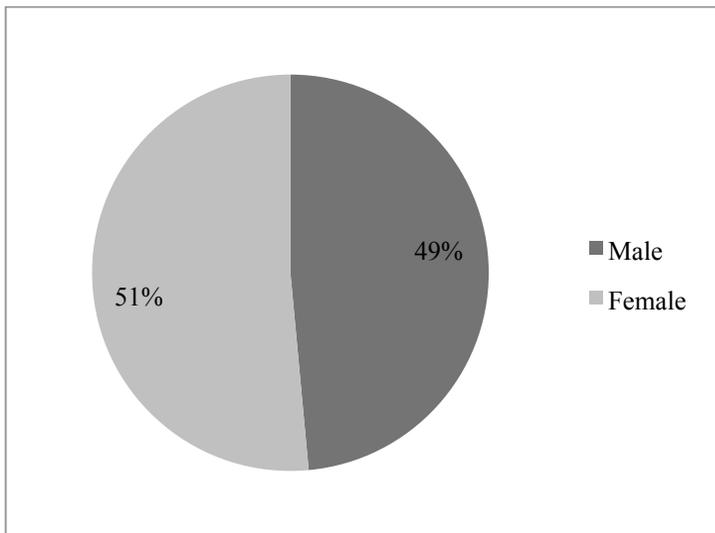


Figure 3. Pie chart showing the percentages of males and females in the sample.

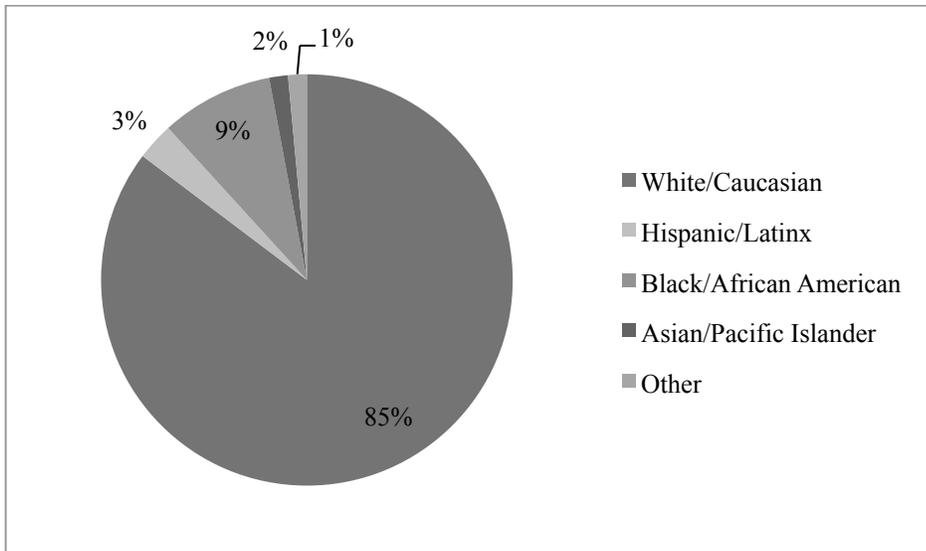


Figure 4. Pie chart showing the racial/ethnic makeup of the sample.

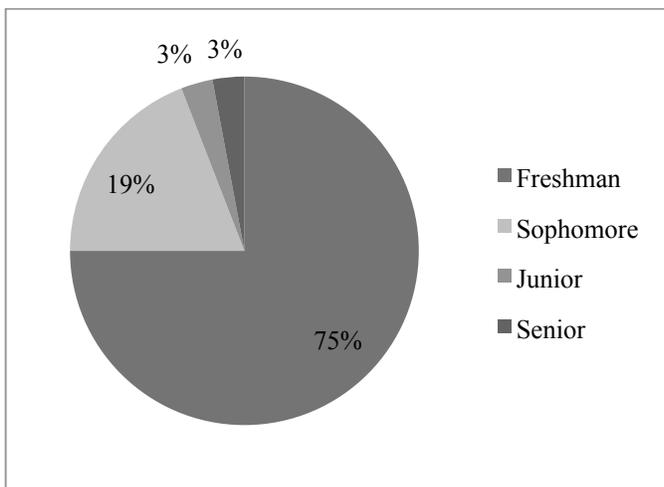


Figure 5. Pie chart showing the academic year of the participants.

Battery Scores

The following section discusses the performance of participants in each of the groups on the measures in the test battery.

North American Adult Reading Test

Participants were given a screening measure to estimate intellectual functioning. Raw scores were converted to the estimated Full Scale IQ using scoring criteria from the manual. No

outliers were detected in the data. The mean IQ scores of each group along with standard deviations are presented in Table 1. The mean IQ for all participants was 100.19 (SD = 6.586) with scores normally distributed and ranging from 84-112 (Figure 6). The IQ of participants did not differ significantly between groups ($F(3, 64) = 1.394, p = .253$).

Table 1
Mean and Standard Deviation of Scores on the NAART by Condition

Group	Participants	NAART Scores	
	<i>N</i>	<i>M</i>	<i>SD</i>
Control	17	99.471	6.709
Uncoached Malingerers	18	102.833	5.227
Coached Malingerers	16	99.563	7.624
Diagnosed ADHD	17	98.706	6.478
Total	68	100.191	6.586

Note. *M* and *SD* represent means and standard deviations, respectively

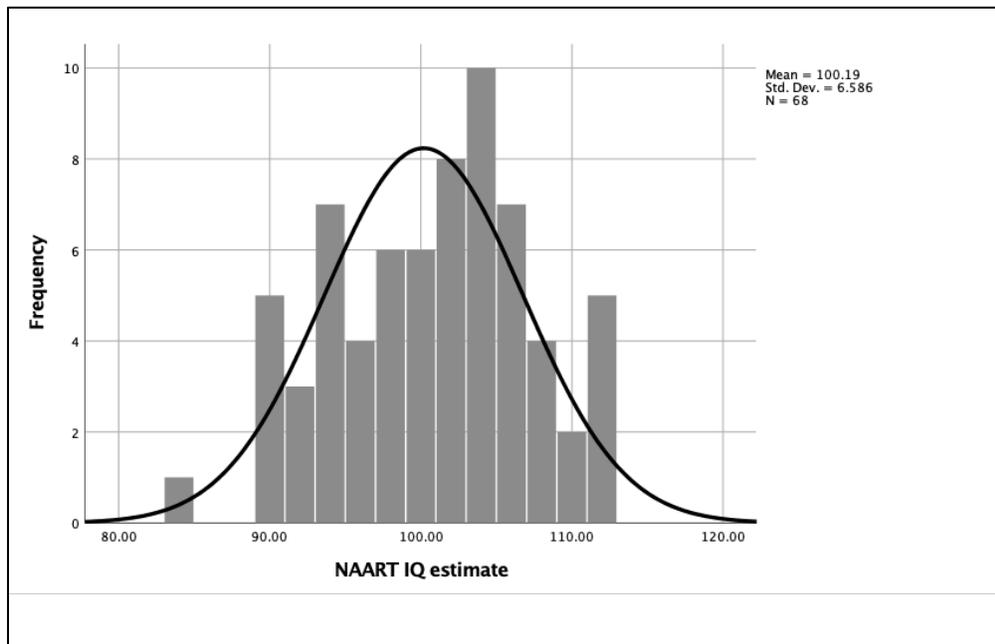


Figure 6. Distribution of IQ scores across participants.

Word Choice

Raw scores obtained on the Word Choice subtest were translated into “pass” or “fail” scores. A failure was defined as a score ≤ 45 , which has a base rate of $\leq 10\%$ in the general clinical population. This cutoff is a balance between a liberal and conservative cut point and consistent with recommendations put forth in the literature (Boone, 2007; Larrabee et al., 2007). One hundred percent of control participants and 94% of participants with ADHD passed this objective effort measure. In contrast, 44% of uncoached malingers and 56% of coached malingers passed (Figure 7). After collapsing groups into malingers and non malingers, 97% of non-malingers obtained scores with a base rate of $>10\%$ (passing scores) while only 50% of malingers obtained a passing score. The range of raw scores obtained on this subset was 26-50.

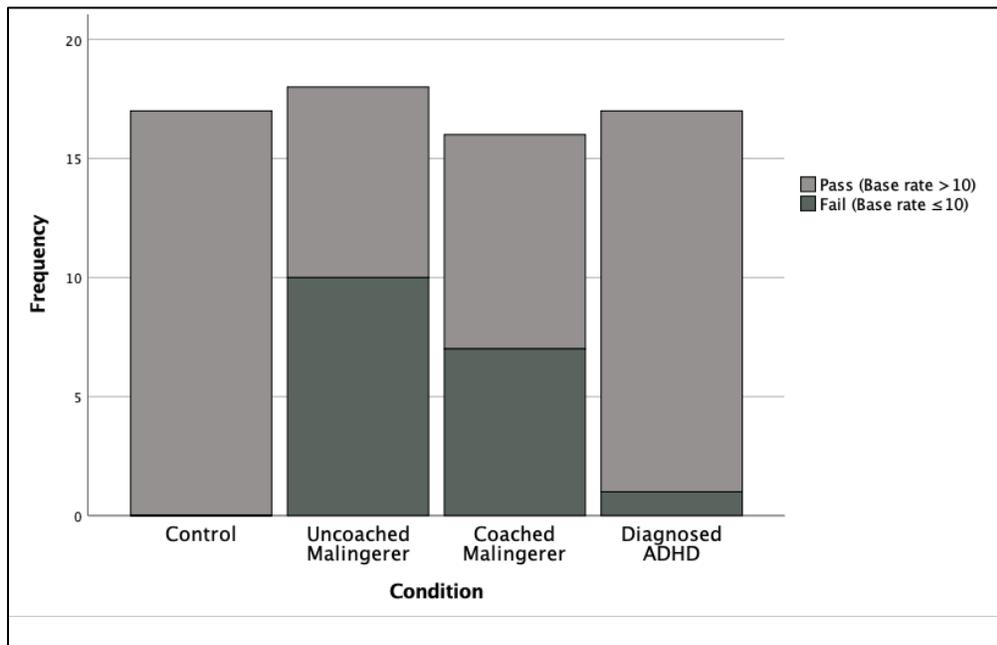


Figure 7. Rates of passing and failing the stand-alone effort measure, ACS Word Choice, by condition.

As data were not normally distributed, a Kruskal-Wallis test was performed to examine the relationship between malingering status and performance on the task. There was a statistically significant difference between scores on the Word Choice measure between different groups ($H(3) = 18.818, p=.000$) (Table 2). The effect size of this difference was large ($\eta^2 = .28$). A Dunn post hoc test with Bonferroni adjustment was conducted to determine the source of this significant finding (Table 3). Uncoached malingerers obtained significantly lower scores on the Word Choice than the control group ($p=.012$) and the ADHD group ($p=.003$). The coached malingerers also scored significantly lower than the ADHD group ($p=.019$) and scored lower than the control group, although this difference only trended towards significance ($p=0.062$).

Table 2
Kruskal-Wallis Test of ACS Word Choice Scores by Condition

Group	<i>N</i>	Mean Rank	<i>df</i>	Kruskal-Wallis <i>H</i>	<i>p</i> -value
			3	18.818	.000*
Control	17	42.94			
Uncoached Malingerers	18	23.44			
Coached Malingerers	16	26.28			
Diagnosed ADHD	17	45.40			

Note. Significance level defined as $p \leq .05$ and denoted with an asterisk.

Table 3
Pairwise Comparisons Between Groups for Scores on the ACS Word Choice

Group	Comparison Group	Test Statistic	<i>p</i> -value
Control	Uncoached Malingerers	19.497	.012*
Control	Coached Malingers	16.660	.062
Control	Diagnosed ADHD	-2.559	1.00
Uncoached Malingerers	Coached Malingerers	-2.837	1.00
Uncoached Malingerers	Diagnosed ADHD	-22.056	.003*
Coached Malingerers	Diagnosed ADHD	-19.219	.019*

Note. All *p*-values are adjusted by the Bonferroni correction. Significance level defined as $p \leq .05$ and denoted with an asterisk.

To assess how the suggested cutoff score of 45 functioned with this data set over other potential cut scores, a Receiver Operator Characteristic Curve was conducted. At a cutoff score

of ≤ 45 , the sensitivity of Word Choice was .500 while the specificity was .971. The sensitivity was improved to .559 when the cut score was raised to ≤ 46 (with a score of 45 indicating insufficient effort), although the specificity was lowered to .941 with this change. When the cut score was lowered to ≤ 44 , the specificity improved to 1.00, although the sensitivity was lowered to .441.

Digit Span

Scores on the Digit Span subtest were used to calculate Reliable Digit Span for each participant. No extreme outliers were identified in the data. Scores obtained ranged from 4-15, and the mean and standard deviation for the scores are provided in Table 4. Scores of ≤ 7 on Reliable Digit Span were considered failures of the effort measure. Data were found to meet the assumptions required for a one-way Analysis of Variance, and an ANOVA was conducted.

There were no significant differences in Reliable Digit Span scores between any of the groups, $F(3, 64) = .738, p = .533$.

Table 4
Mean and Standard Deviation of Scores on Reliable Digit Span by Condition

Group	Reliable Digit Span Scores	
	<i>M</i>	<i>SD</i>
Control	9.118	1.933
Uncoached Malingers	8.278	2.164
Coached Malingers	8.313	1.815
Diagnosed ADHD	8.647	1.498

Note. *M* and *SD* represent means and standard deviations, respectively

The actual Reliable Digit Span scores were also transformed into pass and fail scores. The number of participants with passing and failing scores divided by group is presented in Table 5. A Chi-square analysis was conducted to assess if groups had significantly different rates

of passing. There were no significant differences between the groups in passing and failing rates, $\chi^2(3, N=68) = .690, p = .876$ (Figure 8).

Table 5
Pass and Fail Rates on Reliable Digit Span by Condition

Group	Reliable Digit Span Performance	
	<i>N with RDS >7</i>	<i>N with RDS ≤7</i>
Control	12	5
Uncoached Malingers	14	4
Coached Malingers	12	4
Diagnosed ADHD	14	3

Note. RDS >7 indicates a passing score (e.g. adequate effort) and RDS ≤7 indicates a failing score (e.g. poor or insufficient effort).

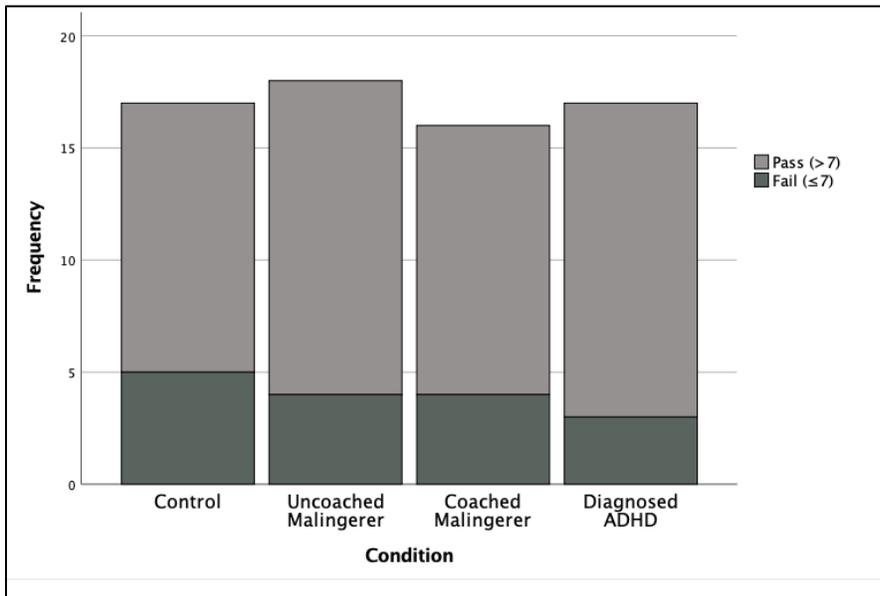


Figure 8. Rates of passing and failing the embedded effort measure, Reliable Digit Span, by condition. Error bars represent the 95% confidence interval.

As performance on the Digit Span subtest correlates with overall IQ score, RDS scores were plotted with IQ in a scatterplot to determine if a relationship existed that could explain the aforementioned results (Figure 9.). There does not appear to be a significant relationship between estimated IQ and Reliable Digit Span score.

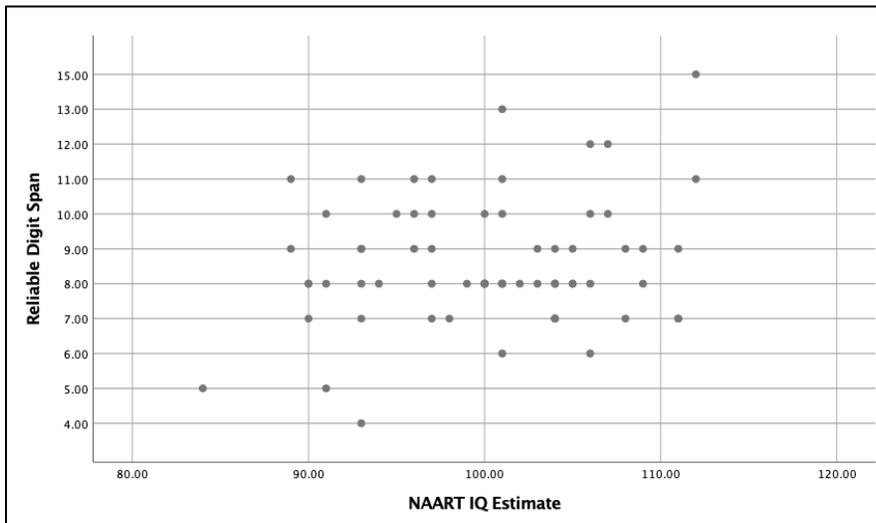


Figure 9. Relationship between Reliable Digit Span scores and estimated IQ of participants.

Conners Adult ADHD Rating Scale

The Inconsistency Index on this form has a cutoff score of eight, such that scores of eight or higher indicate inconsistency in reporting to an extent that affects interpretability. A Chi-square analysis was conducted to assess if rates of unacceptable inconsistency scores differed between groups. There were no significant differences in number of unacceptable inconsistency scores between any of the four conditions ($\chi^2(3, N=68) = 4.764, p = .194$). The self-report measures with unacceptable levels of inconsistency (≥ 8) were then removed from analysis, as the validity of the other scores would be called into question if they were retained. Following this criteria, 15 cases were removed from the CAARS analysis, including one from the control group, five from the uncoached malingering group, three from the coached malingering group, and six from the ADHD group.

On the CAARS, T-scores are representative of level of symptoms endorsed, with lower scores associated with less pathology and higher scores associated with a greater severity of symptoms reported. Data were split between participants with a T-score over 80 on any of the

scales (indicating potential overreporting according to the test manual) and those with T-scores 79 and below. No outliers were identified in the data. Data were assessed with a Chi-square analysis. There were no significant differences between the groups in validity of reporting based on this split, $\chi^2(3, N=68) = 1.964, p = .584$. Data for participants who scored T-scores >80 were still retained for further analysis as scores were still considered interpretable, and groups were recombined.

A one-way Analysis of Variance was conducted to assess the effect of condition on each of the five scales of the CAARS self-report measure. The data were assessed for homogeneity of variance and normal distribution and no violations were found. As the groups were left with unequal sample sizes after the measures with unacceptable consistency of responding were removed, Tukey-Kramer Post Hoc tests were selected. Results of the ANOVA indicated there were significant differences between the groups on the Inattention/Memory Problems scale ($F(3,49) = 4.587, p=.007, \eta^2_p=.219$), Impulsivity/Emotional Lability scale ($F(3,49) = 2.974, p=.041, \eta^2_p=.154$), and the ADHD Index scale ($F(3,49) = 3.958, p=.013, \eta^2_p=.195$). No significant differences existed between the groups on the Hyperactivity/Restlessness scale ($F(3,49) = 1.413, p=.250$) and the Problems with Self-Concept scale ($F(3,49) = 1.643, p=.194$) (Figure 10).

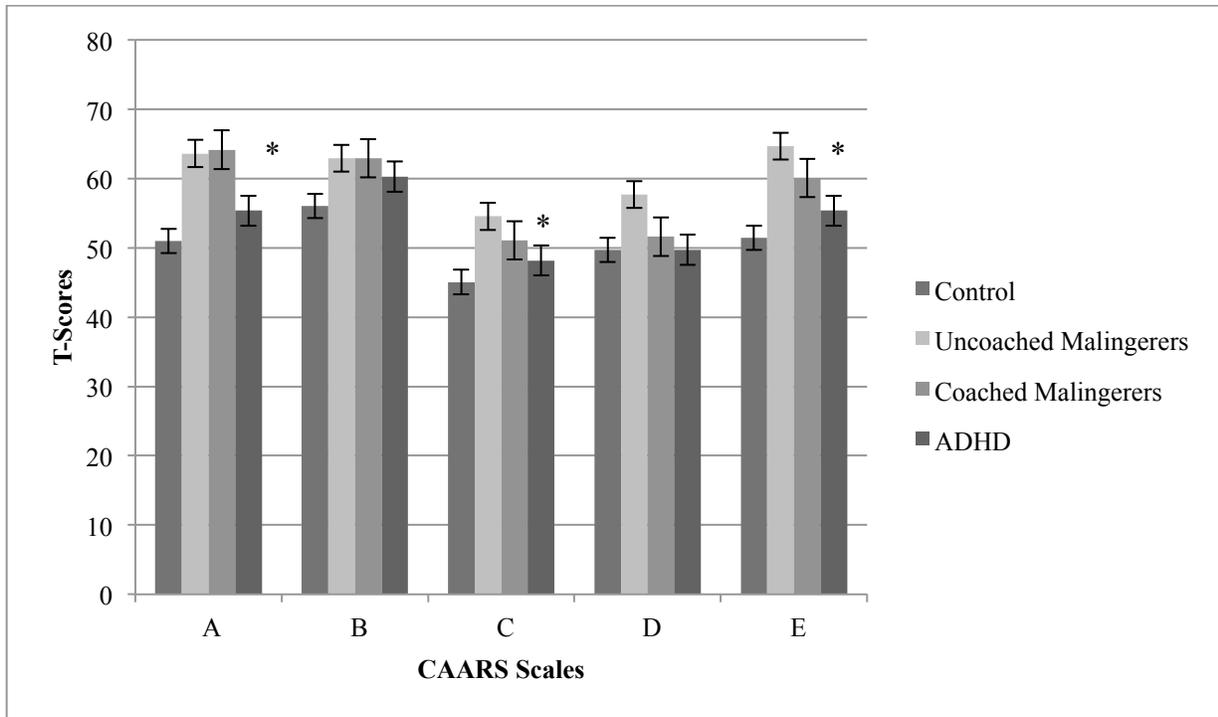


Figure 10. Mean T-Scores obtained on each of the CAARS subscales by participants divided by condition. The subscales are A=Inattention/Memory Problems, B=Hyperactivity/Restlessness, C=Impulsivity/Emotional Lability, D=Problems with Self-Concept, and E=ADHD Index. Error bars represent Standard Error. Significant differences ($p < .05$) are denoted with an asterisk.

For those scales with significant differences, Tukey-Kramer Post-hoc tests were conducted (Table 6). On the Inattention/Memory Scale, control participants had significantly lower T-scores ($M = 51.00$, $SD = 9.80$) than both of the malingering groups (uncoached malingers $M = 63.62$, $SD = 10.28$, $p = .022$ and coached malingers $M = 64.15$, $SD = 13.63$, $p = .016$), although their scores were not significantly different than those diagnosed with ADHD ($M = 55.36$, $SD = 11.53$). The malingers did not produce significantly different T-scores from those with ADHD. On the Impulsivity/Emotional Lability scale, the control group ($M = 45.06$, $SD = 6.84$) produced significantly lower T-scores than the uncoached malingers ($M = 54.54$, $SD = 10.99$, $p = .030$). The coached malingers ($M = 51.08$, $SD = 7.22$) and individuals with

ADHD (M = 48.18, SD = 10.25) were not found to be significantly different from each other or from either of the other groups. On the ADHD Index scale, this same pattern was reflected. The control group (M = 51.43, SD = 7.70) produced significantly lower T-scores than the uncoached malingerers (M = 64.69, SD = 11.91, $p=.010$). The coached malingerers (M = 60.08, SD = 11.54) and individuals with ADHD (M = 55.36, SD = 12.55) were not found to have significantly different scores from each other or from either of the other groups.

Table 6
Pairwise Comparisons Between Scores on Subscales of the CAARS by Condition

Scales	Comparison	CAARS Scores		Significance Value		
		N	M(SD)	UM	CM	ADHD
Inattention/ Memory scale	Control	16	51 (9.798)	.022*	.016*	.759
	UM	13	63.615 (10.284)		.999	.295
	CM	13	64.154 (13.625)			.243
	ADHD	11	55.364 (11.535)			
Impulsivity/ Emotional Lability scale	Control	16	45.063 (6.836)	.030*	.275	.804
	UM	13	54.539 (10.989)		.751	.307
	CM	13	51.077 (7.216)			.854
	ADHD	11	48.181 (10.245)			
ADHD Index scale	Control	16	51.4375 (7.702)	.010*	.157	.792
	UM	13	64.693 (11.905)		.700	.167
	CM	13	60.077 (11.536)			.715
	ADHD	11	55.364 (12.548)			

Note. Conditions: Control = Non-clinical group, UM = Uncoached Malingerers, CM = Coached Malingerers, ADHD = Diagnosed ADHD, Significance level defined as $p \leq .05$

Wisconsin Card Sorting Test

One-way ANOVAs were conducted with planned comparisons between groups for the total errors made, total perseverative and non perseverative errors made, numbers of categories completed, number of failures to maintain set, and number of conceptual level responses made.

Extreme outliers in the data were identified and corrected for using a winsorizing technique⁴.

Tests of homogeneity of variance were conducted and the data for failures to maintain set violated this assumption. Therefore, this factor was removed from the ANOVA interpretation and was assessed separately. There were significant differences between the groups in scores on number of perseverative errors made ($F(3,63) = 4.948, p=.004, \eta^2_p=.191$), and number of categories completed ($F(3,63) = 3.361, p=.024, \eta^2_p=.139$). There were no significant differences between the groups on total errors made ($F(3,63) = .099, p=.960$), number of nonperseverative errors made ($F(3,63) = .650, p=.586$), or number of conceptual level responses ($F(3,63) = .204, p=.893$) (Table 7).

Table 7
One-Way Analysis of Variance (Planned and Exploratory) for WCST Scores by Condition

Scores	Between Groups Results				
	SS	df	MS	f	p-value
Total Errors	17.139	3	5.713	.099	.960
Sum of Perseverative Errors	100.518	3	33.506	4.948	.004*
Sum of Nonperseverative Errors	148.363	3	49.454	.650	.586
Categories Completed	18.677	3	6.226	3.382	.024*
Conceptual Level Responses	60.147	3	20.049	.204	.893
Sum of Perseverative Responses	170.506	3	56.835	4.245	.009*

Note. Significance level defined as $p \leq .05$ and denoted with an asterisk.

Tukey Post-hoc tests were completed to assess the source of the significant differences (Table 8). Individuals with ADHD made significantly more perseverative errors ($M = 6.44, SD = 2.39$) than uncoached malingerers ($M = 3.06, SD = 2.46$). There were no significant differences in number of perseverative errors made by the control participants ($M = 5.12, SD = 1.96$) versus

⁴ In the winsorizing technique, outliers in a data set are accounted for by transforming the upper and lower outliers to a set percentile, such as setting the scores below the 5th percentile to the 5th percentile score, and doing similarly for the scores above the 95th percentile. In this technique outliers are replaced rather than discarded, as occurs when data are trimmed.

the coached malingerers ($M = 4.00$, $SD = 3.43$), or between these and the individuals with ADHD and the uncoached malingerers. Regarding categories completed, there was a significant difference between control individuals and the uncoached malingerers, with the control participants completing more categories ($M = 3.12$, $SD = 1.27$) than the uncoached malingerers ($M = 1.89$, $SD = 1.68$, $p = .045$). No other significant differences between the groups were found, with coached malingerers completing an average of 2.19 categories ($SD = 1.28$) and individuals with ADHD completing an average of 3.00 categories ($SD = 1.10$).

Table 8
Pairwise Comparisons (Planned and Exploratory) Between Scores on Subscales of the WCST by Condition

Scales	Comparison	WCST Scores		Significance Value		
		<i>N</i>	<i>M(SD)</i>	UM	CM	ADHD
Sum of Perseverative Errors	Control	17	5.118 (1.965)	.099	.904	.470
	UM	18	3.056 (2.461)			
	CM	16	4.000 (3.425)			
	ADHD	16	6.438 (2.394)			
Categories Completed	Control	17	3.118 (1.269)	.045*	.211	.995
	UM	18	1.889 (1.676)			
	CM	16	2.188 (1.276)			
	ADHD	16	3.0 (1.096)			
Sum of Perseverative Responses	Control	17	7.294 (3.619)	.119	.769	.634
	UM	18	4.500 (3.618)			
	CM	16	6.063 (4.074)			
	ADHD	16	8.813 (3.291)			

Note. Conditions: Control = Non-clinical group, UM = Uncoached Malingers, CM = Coached Malingers, ADHD = Diagnosed ADHD, Significance level defined as $p \leq .05$ denoted with an asterisk.

As Levene's test revealed the homogeneity of variance assumption was violated for failure to maintain set, a Welch ANOVA with a Games-Howell post-hoc test was used. The results of the Welch ANOVA indicate there was a significant difference between the groups on number of failures to maintain set ($F(3, 32.927) = 3.361$, $p = .023$, $\eta^2_p = .138$) (Table 9). The post-hoc comparison revealed a trend towards significance between control individuals and the

uncoached malingerers, with the control participants having less set losses ($M = .47$, $SD = .62$) than the uncoached malingerers ($M = 1.44$, $SD = 1.42$, $p = .064$) (Table 10). No other significant differences between the groups were found, with coached malingerers having an average of 1.31 set losses ($SD = 1.25$) and individuals with ADHD having an average of .56 set losses ($SD = 1.03$).

Table 9
Welch Analysis of Variance for Scores on the WCST by Condition

Scores	Welch ANOVA			
	Statistic	df1	df2	p-value
Failure to Maintain Set	3.632	3	32.927	.023*
Trials for Complete First Category	2.855	3	33.927	.052*

Note. Significance level defined as $p \leq .05$ and denoted with an asterisk.

Table 10
Pairwise Comparisons Between Scores on Failure to Maintain Set by Condition

Scale	Comparison	WCST Scores		Significance Value		
		N	M(SD)	UM	CM	ADHD
Failure to Maintain Set	Control	17	.471 (.624)	.064	.102	.990
	UM	18	1.444 (1.423)		.990	.181
	CM	16	1.313 (1.25)			.271
	ADHD	16	.563 (1.031)			
Trials to Complete First Category	Control	17	13.353 (3.517)	.037*	.685	.948
	UM	18	19.389 (8.030)		.329	.085
	CM	16	15.25 (5.905)			.908
	ADHD	16	14.063 (3.958)			

Note. Conditions: Control = Non-clinical group, UM = Uncoached Malingerers, CM = Coached Malingerers, ADHD = Diagnosed ADHD, Significance level defined as $p \leq .05$ denoted with an asterisk.

Exploratory analyses were conducted on certain other scores yielded on the WCST. Total correct, percent perseverative errors, percent perseverative responses, and percent conceptual level responses were not run as these were essentially translations of data already analyzed (total correct being 64-total errors and the percent of scores being translations of the raw score being analyzed). Thus, exploratory analyses were run on number of perseverative responses and the

trials to complete first category. A one-way Analysis of Variance with planned Tukey post-hoc test was conducted for the perseverative responses. The data for trials to complete first category were found to violate the assumption of Homogeneity of Variance and were analyzed separately later.

A significant difference between the groups on number of perseverative responses made was found ($F(3,63) = 4.245, p = .009, \eta^2_p = .168$) (Table 7). Post hoc analysis revealed participants with ADHD made significantly more perseverative responses ($M = 8.81, SD = 3.30$) than uncoached malingerers ($M = 4.5, SD = 3.62, p = .006$). Coached malingerers made an average of 6.06 ($SD = 4.07$) perseverative responses and control participants made an average of 7.29 ($SD = 3.62$) perseverative responses, none of which represented significant differences from the other groups (Table 8).

To accommodate for the violation of the homogeneity of variance assumption for trials to complete first category, a Welch ANOVA was used with a Games-Howell post-hoc test. The results of the Welch ANOVA indicate there was a significant difference between the groups on number of trials to complete first category ($F(3, 33.927) = 2.855, p = .052, \eta^2_p = .158$) (Table 9). The post-hoc comparison revealed control participants required significantly less trials to complete the first category ($M = 13.35, SD = 3.52$) than the uncoached malingerers ($M = 19.39, SD = 8.03, p = .037$). Uncoached malingerers also required more trials than individuals with ADHD ($M = 14.06, SD = 3.96$), a finding considered trending towards significance ($p = .085$). There were no significant differences between trials required to complete first category for the coached malingerers ($M = 15.25, SD = 5.90$) versus the other groups (Table 10).

Continuous Performance Test

Differences between the experimental groups in performance on the CPT were also assessed. As data were not normally distributed, a Kruskal-Wallis test was performed. Results indicated there were no significant differences between the groups across the variables assessed, including the absolute and relative percentages correct for the X and AX sections of the test, as well as total omissions and total commission for the test (Table 11, Figure 11, Figure 12).

Table 11
Kruskal-Wallis Tests of CPT Scores Across Categories of Condition

Variables		<i>N</i>	<i>df</i>	Test Statistics	
				<i>Kruskal-Wallis H</i>	<i>p</i> -value
Absolute percentage correct for X	Condition	67	3	2.767	.429
Absolute percentage correct for AX	Condition	67	3	4.663	.198
Relative percentage correct for X	Condition	67	3	5.383	.146
Relative percentage correct for AX	Condition	67	3	3.477	.324
Total Omissions	Condition	67	3	2.945	.400
Total Commissions	Condition	67	3	4.162	.245

Note. Significance level defined as $p \leq .05$

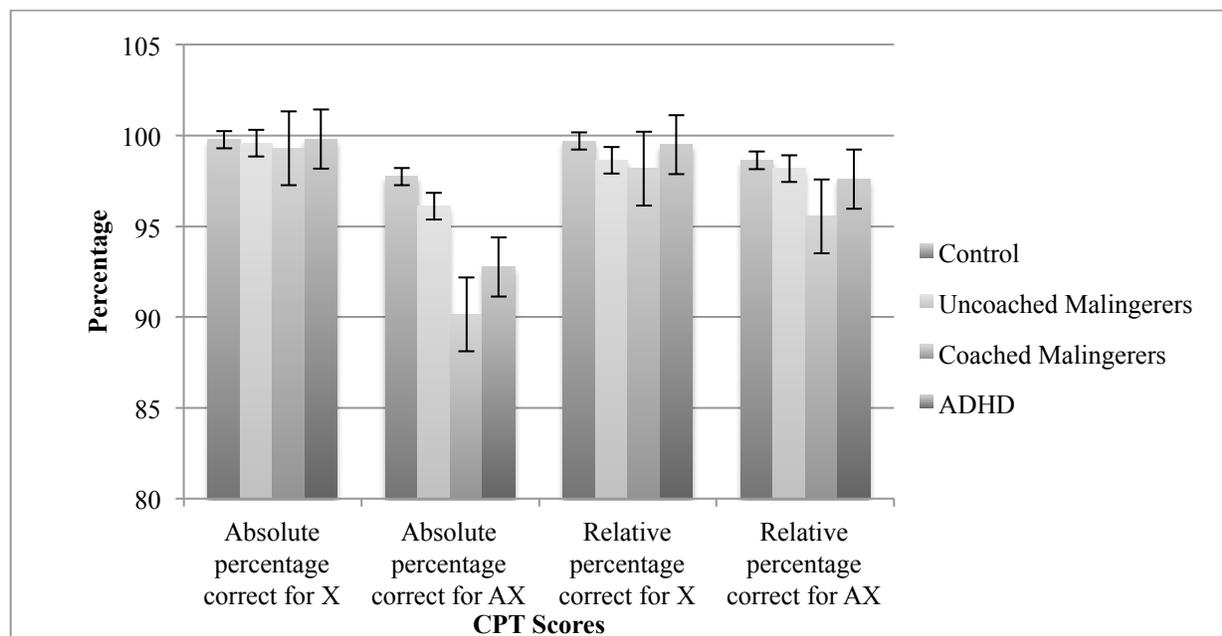


Figure 11. Absolute and relative percentage scores on the CPT by condition. Error bars represent Standard Error.

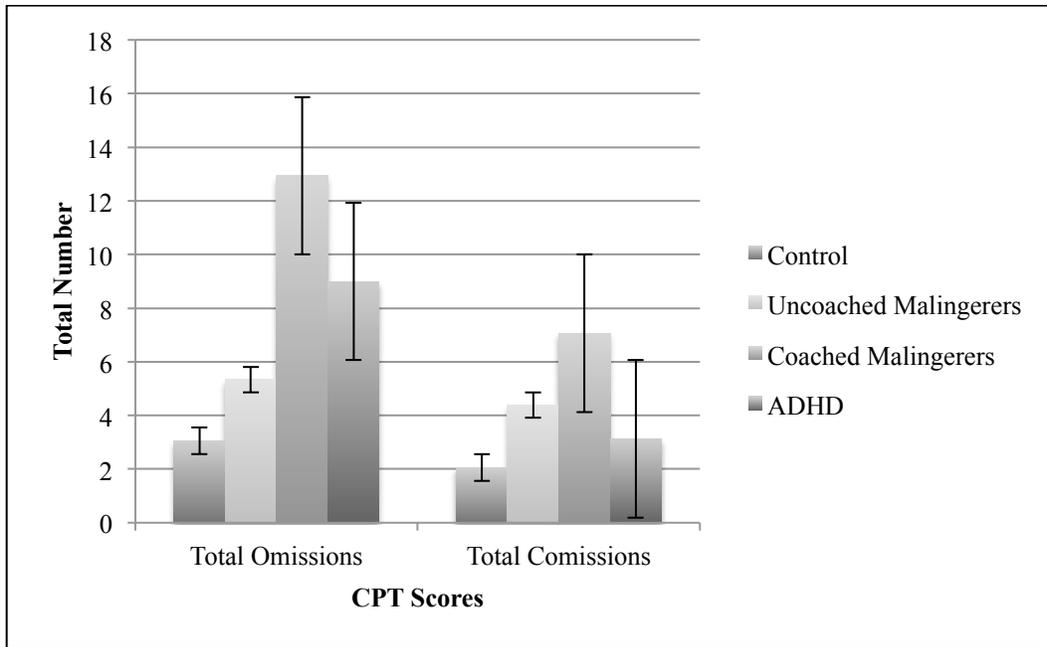


Figure 12. Total commission and omissions on the CPT by condition. Error bars represent Standard Error.

Consistent with analyses conducted by Rosvold et al. (1956), analyses were conducted to determine if the relative difficulty of the AX section compared to the X section differed between groups. As assumptions for the T-test were violated, related samples Wilcoxon signed rank tests were conducted for each group and effect sizes calculated (Table 12). Participants with ADHD ($p=.006$, $r= .75$), uncoached malingers ($p=.001$, $r=.691$), and coached malingers ($p=.019$, $r=.588$) all had relatively more difficulty with the AX section of the test than the X section (Figure 13.). Participants in the control group did not have relatively more difficulty with the AX section than the X section.

Table 12

Related-Samples Wilcoxon Signed Rank Tests of Relative Difficulty of Portions X and AX of the CPT by Condition

Condition	<i>Related Samples Wilcoxon Signed Rank Tests</i>						
	<i>N</i>	<i>M (SD)</i> <i>Absolute %</i> <i>correct for</i> <i>part X</i>	<i>M (SD)</i> <i>Absolute %</i> <i>correct for part</i> <i>AX</i>	<i>Test</i> <i>Statistic</i>	<i>SE</i>	<i>Stan. Test</i> <i>Statistic</i>	<i>P</i> <i>value</i>
Control	17	99.78 (0.379)	97.75 (5.084)	15.000	9.785	-1.277	.201
Uncoached Malingers	18	99.55 (1.174)	96.11 (6.170)	.000	14.287	-3.185	.001*
Coached Malingers	16	99.30 (1.017)	90.16 (17.982)	9.000	12.738	-2.355	.019*
Diagnosed ADHD	16	99.80 (0.376)	92.76 (14.548)	2.000	11.225	-2.762	.006*

Note. Significance level defined as $p \leq .05$ and denoted with an asterisk.

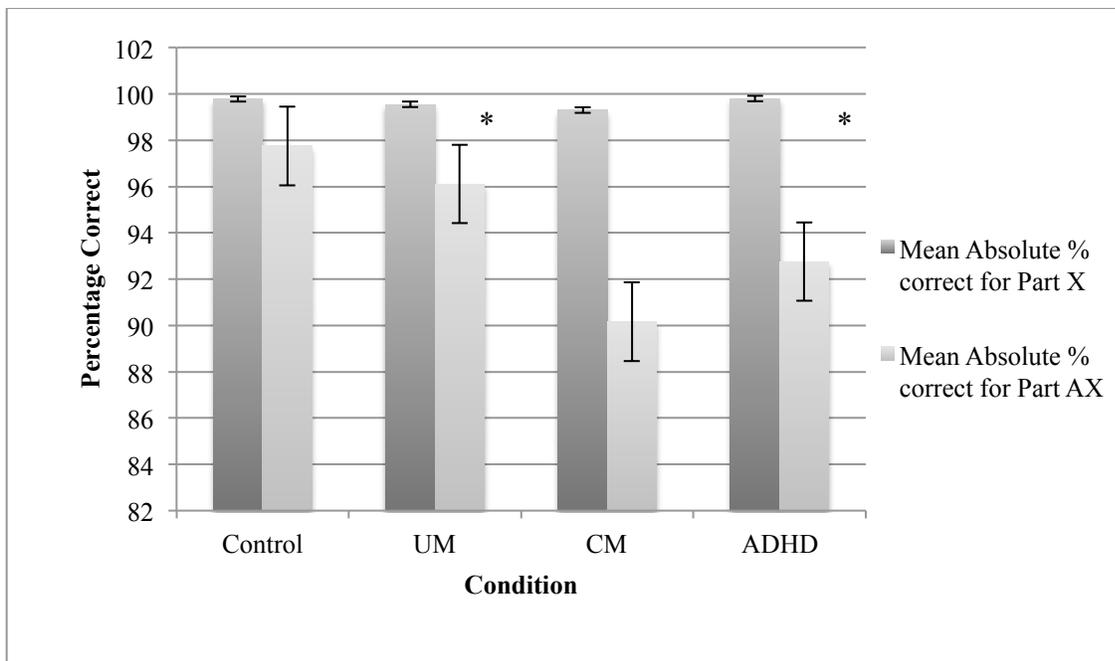


Figure 13. Mean absolute percent correct for parts X and AX of the CPT by condition.

Following this, consistent with procedures conducted by the original authors (Rosvold, et. al., 1956), analyses were run to determine if these differences in relative difficulty of the latter part of the task remained after performance on the easier portion of the task (part X) was

accounted for. An Analysis of Covariance was considered to replicate the statistical procedure used to answer this question by the original authors. However, data were found to violate multiple assumptions required for an ANCOVA. Although an ANCOVA is robust to individual violations, violations of multiple assumptions have been found to be problematic and preclude the use of the test to yield an informative result (Hsu, 1983). Therefore, a nonparametric alternative to the ANCOVA was selected, namely Quade's test, a rank analysis of covariance (Quade, 1967). The analysis was run to determine if any of the groups had relatively more difficulty with the second part of the task once their performance on the first part of the task was controlled for, and was run twice, once utilizing the absolute percentage correct scores and once utilizing the relative percentage correct scores. Quade's statistic was not found to be significant regarding absolute percentage correct scores ($F(3, 63) = 1.510, p = .221$), nor when the relative percentage scores were used ($F(3, 63) = .806, p = .495$). Therefore, there was no evidence to support that any groups had relatively more difficulty with the second half of the task than any other groups, once performance on the first part was accounted for, regardless of whether performance was scored based on absolute percentage correct or relative percentage correct.

CHAPTER FIVE

DISCUSSION

Symptom and performance validity testing is important to ensure the results of psychological and neuropsychological evaluations are as accurate as possible. Ongoing research is necessary to reassess the utility of previously established validity measures as more information, including potential test security breaches, become available on the Internet. Additionally, the accuracy and utility of embedded measures of validity should continue to be assessed with increased types of clinical populations. The purpose of this study was to contribute findings to address both of these concerns. A between-groups simulation design was utilized, comparing simulators of ADHD who had been provided information about the disorder from the Internet and simulators who have not been provided any additional information to individuals diagnosed with ADHD and a nonclinical population on a variety of neuropsychological measures. These included well-validated measures of symptom validity as well as common diagnostic measures that include scores that have been suggested to have utility for performance validity. The results of this study indicated that a stand-alone measure of effort (ACS Word Choice) was better able to differentiate between malingerers and non-malingerers than an embedded measure of effort (Reliable Digit Span). Malingerers produced profiles similar to those with ADHD on a self-report measure (Conner's Adult ADHD Rating Scale) and a computerized attention and impulse control task (Continuous Performance Test), and there were limited significant differences between the groups that would be useful for detection of malingering on a novel problem-solving task (Wisconsin Card Sorting Test). The findings from the current study have significant implications for clinical practice as well as for future research.

Findings and Implications

The findings associated with each hypothesis have specific implications for the field's understanding of malingered ADHD, clinical decision making, and the direction of future research.

Hypothesis one

Hypothesis one proposed that control participants, those with ADHD, and coached malingerers would pass the ACS Word Choice subtest, while most individuals in the uncoached condition would not. This hypothesis was partially supported, as those with ADHD and control participants passed the measure, while malingerers (coached and uncoached) both had higher rates of failing the measure. The effect size of this difference was large, indicating the importance of the finding.

The results are consistent with the overall purported utility of the measure, having high levels of specificity and adequate sensitivity, for malingerers and feigners of cognitive impairment (Miller et al., 2011; Wechsler, 2009). However, the hypothesis was only partially supported, as it was unexpected that coaching did not significantly improve pass rates for malingerers, as suggested by some previous studies (Dunn et al., 2003; Edmundson, 2014). There are a number of possible reasons for this finding. First, it is possible that insufficient information was provided to coached participants to yield an effect. Second, it is possible that the content of the information available for review was insufficient for improving performance on the test. Rather, had information about forced-choice measures and/or malingering detection been available in the coaching materials, perhaps the rates of passing may have improved for this group. A final possibility is that this test is able to maintain the purported levels of sensitivity and specificity for malingerers, regardless of their knowledge of ADHD symptomatology.

The nature of the findings, although not entirely consistent with the hypothesis based on the literature, has significant clinical implications and expands on previous research. First, the ACS Word Choice subtest is a relatively new measure, released in the last decade, and any assessment of its utility in a specific clinical population contributes to building a base understanding of this measure. Further, although these results are preliminary and some level of speculation is required, these findings suggest that the ACS Word Choice may be a useful measure to employ in ADHD evaluations, due to the relative insensitivity to coaching observed in this study. As the ACS Word Choice appears to be a memory test to the untrained eye, previous research would argue that it would function best for identifying feigners of a memory impairment (as the purported use of the test should match the cognitive domain being feigned) (Harrison & Armstrong, 2016; Rogers, 2008b). However, this test appears to function well with those feigning ADHD symptomatology, perhaps as the test gives the appearance of also assessing attention and concentration. Whether or not sensitivity to feigning would be higher with a forced-choice measure designed to have the face validity of an attention/concentration-based test is an area that would be useful to assess in future research.

Hypothesis two

Hypothesis two proposed that uncoached feigners would be more likely to obtain Reliable Digit Span scores in the failing range (≤ 7) than participants in other groups, who would obtain passing scores (> 7). In contrast to the Word Choice results, Reliable Digit Span scores and pass/fail rates on this test were not significantly different between any of the groups, indicating that this measure would not have been useful for differentiating purposeful from actual poor performance. Thus, the second hypothesis that uncoached feigners would be significantly more likely to fail this effort measure than any of the other three groups was not

supported. The finding is partially consistent with previous literature, as some have found similar results (Edmundson, 2014) while others have demonstrated feigners perform significantly worse than individuals putting forth adequate effort (Booksh et al., 2010; Marshall et al., 2010).

One important aspect of the results that was unexpected was that there was no difference in performance between coached and uncoached simulators on this measure. This finding would support the argument that embedded measures of effort may be resistant to coaching, in that coached feigners were no more likely to pass the measure than uncoached feigners. However, there was also no difference in performance between malingerers and individuals instructed to perform to the best of their abilities. First, power for this analysis was found to be lower than acceptable (.61), therefore it is possible a difference may have been present but not detectable. It is also possible that feigners, coached or not, did not believe those with ADHD would perform poorly on a working memory task such as Digit Span, and thereby did not attempt to worsen their performance during the experiment.

Somewhat alarming is the high number of failures on this effort measure of individuals instructed to put forth their best effort (those with ADHD and control participants), ranging from 21-42% of the participants in each group respectively. This is not consistent with previous literature demonstrating that embedded measures of validity tend to have high specificity, if the assumption is made that these participants were actually putting forth their best effort. It is possible certain participants in the ADHD and control groups were not putting forth adequate or consistent effort during testing, which is always a concern in simulation studies. However, the rates of failure within all groups may also be attributable to base rates of obtaining failing scores on this measure in the general population. While a RDS score of 7 is seen in 50% of simulators, it is also found in 15% of individuals with ADHD and 25% of the general population (Wechsler,

2009). Further, a review of the RDS also found that a cutoff of ≤ 7 can result in specificity in the 80s, rates that are less than ideal (Schroeder, Twumasi-Ankrah, Baade, & Marshall, 2012)

The discrepancy between the performance of the ACS Word Choice subtest in malingering detection and that of the Reliable Digit Span was not predicted. However, there is some evidence in the literature to support this discrepancy. Recent studies suggest that embedded measures have limited sensitivity compared to measures that are considered stand-alone (Armistead-Jehle & Buican, 2013; Armistead-Jehle & Hansen, 2011; Miele, Gunner, Lynch, & McCaffrey, 2012). Previous research has suggested embedded measures may be more resistant to coaching (Boone, 2007). However they may not necessarily be a better choice given their relatively limited sensitivity in comparison to stand-alone measures. Thus, a comprehensive evaluation is likely to benefit from including multiple types of effort measures.

Hypothesis Three

There is significant literature to suggest that self-report measures are among the most easily feigned diagnostic tools in ADHD evaluations (Edmundson, 2014; Harrison et al., 2007; Jachimowicz & Geiselman, 2004; Sollman et al., 2010), and the findings of the current study were somewhat consistent with this. As put forth in hypothesis three, neither the CAARS inconsistency scale nor the cutoff for cautious interpretation related to overreporting reliably differentiated between the groups. This suggests that neither of these scores developed by the authors of the scale would reliably be able to alert a clinician to feigning of the disorder under these circumstances. However, it should also be noted power for these analyses were $<.80$, and therefore the sample may not have been adequate to detect a statistically significant difference. This part of the results is consistent with previous literature that these aspects of the measure should not be relied upon for detecting malingering (Conners et al., 1999, Harrison &

Armstrong, 2016; Sollman et al., 2010; Suhr et al., 2008). Looking toward the future, it may be beneficial to continue following lines of research that are looking at new validity scales for the CAARS that have been found to have some sensitivity to feigners of the disorder (Cook et al., 2016; Suhr et al., 2011).

The other aspect of the hypothesis was that all feigners and those with ADHD would endorse symptoms at levels indicative of a diagnosis of ADHD (considered to be T-scores ≥ 65) on most scales and control participants would produce profiles with scores falling below the clinical level (T-scores < 65). The finding that was consistent with this hypothesis was that the scores attained by malingers, coached or uncoached, were not significantly different from individuals with ADHD, paralleling previous research demonstrating the CAARS is susceptible to invalid reporting, whether by informed malingers or novice ones (Edmundson, 2014; Harrison et al., 2007; Jachimowicz & Geiselman, 2004; Sollman et al., 2010). Beyond this, however, the hypothesis was generally not supported.

Control participants did produce significantly lower T-scores than all malingers on the inattention and memory problems scale, although the mean T-score of participants with ADHD was closer to that of control participants than malingers. Further, the malingers mean T-scores fell in the borderline range of ADHD symptoms, and would not have been identified as clinically significant. This was surprising as malingers tend to over-exaggerate, rather than under-exaggerate the symptoms they are feigning. Previous literature has found those with ADHD tend to score high on the CAARS, and feigners can score similarly or higher (Harrison et al., 2007; Harrison & Armstrong, 2016; Suhr et al., 2008). Similarly, although a significant difference in scores was found in the expected direction between control participants and uncoached malingers on the Impulsivity and Emotional Lability scale and on the ADHD Index

scale, all of the mean T-scores fell below the clinical range. It is possible that participants, regardless of condition, did not endorse high symptom levels due to the nature of the situation (i.e., not a real clinical evaluation). It is also possible that participants were impacted by social desirability bias and endorsed lower symptom severity due to the nature of the questions and the presence of the examiner (King & Bruner, 2000).

Another unexpected finding was the lack of significant differences between any of the groups in scores on the Hyperactivity/Restlessness scale and the Problems with Self-Concept scale. The reasons for this could include that these symptoms may not have been present in the sample population. Malingers, coached or not, may have believed these symptoms would not be indicative of a diagnosis of adult ADHD, and therefore did not feel the need to endorse them.

Overall, the lack of significant differences between control participants and those with ADHD across subscales was unexpected and not consistent with the purported use of the CAARS as a diagnostic tool for ADHD. This finding may be attributed to limitations in screening and sampling; individuals in the ADHD group were only required to have been diagnosed with ADHD during their lifetime, and were not assessed as to current symptomology. Additionally, ADHD participants were not excluded for medication use or other therapeutic treatments that may have reduced their current symptoms. There is also some research that self-report measures can underestimate ADHD symptoms in adulthood as some individuals who meet criteria still score below the cutoff on these forms (Barkley, Fischer, Smallish, & Fletcher, 2002). Alternatively, some symptoms of ADHD are expected to be endorsed by the general population, and as the control population was not screened for other mental health conditions that may present with similar symptoms, the likelihood of this increased. For example, numerous studies have demonstrated that individuals with clinical depression can exhibit impairments in attention,

psychomotor speed, and/or executive functioning (for a summary, see Hammar & Årdal 2009). It has also been shown that around 20% of patients with depression or anxiety show impairment on cognitive tests, including tests of attention and executive functioning (Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lönnqvist, 2008). It is also possible that insufficient strength due to a small sample size may have masked any of the true differences that may exist.

Hypothesis Four

Multiple scores yielded by the Wisconsin Card Sorting Test have been found to differentiate between malingerers and non-malingerers in a body of research that has focused mainly on head injuries. In this study, these scores were assessed to determine if there were differences between the groups and thereby support any of their potential use for detecting malingering of ADHD. As previous literature suggests individuals with ADHD should perform comparably to participants without the disorder (Frazier et al., 2004; Gallagher & Blader, 2001; Hervey et al., 2004; Willcutt et al., 2005), it was postulated poor performance on certain aspects of this task may then be valuable for assessing poor effort or purposeful poor performance. Hypothesis four stated that those with ADHD and control participants would perform similarly on the task, uncoached malingerers would perform poorly across certain of the measure's scales (categories completed, level of conceptual responses, perseverative and non-perseverative errors, and failures to maintain set), and coached malingerers would only be found to perform poorly on the more subtle aspects of the task, such as making more perseverative errors and more failures to maintain set (defined as making an error after five consecutive correct responses).

Certain aspects of this multifaceted hypothesis were supported. As suggested by previous research, there were no significant differences in performance on the WCST between those with ADHD and participants in the control condition (Frazier et al., 2004; Gallagher & Blader, 2001;

Hervey et al., 2004; Willcutt et al., 2005). Therefore, this aspect of the findings was expected and consistent with previous research. However, the findings regarding the performance of the malingerers were only partially consistent with expectations. A relatively consistent pattern emerged across many of the scales, in that uncoached malingerers had significantly poorer performance than control participants regarding completing less categories, having more failures to maintain set (a difference which trended toward significance), and requiring more trials to complete the first category (a finding revealed through exploratory analyses rather than planned comparisons). Based on this pattern, a possible explanation is that uncoached malingerers answered more randomly than individuals in the control condition, and may have made purposeful wrong choices if they discovered the rule of the test and passed multiple items correctly in a row. No significant differences in performance on these scales were observed regarding the coached malingerers. They were postulated to produce similar scores to those with ADHD on many of the aforementioned scales, which is consistent with the finding, however, they were expected to make more failures to maintain set (as this was believed to be a more subtle scale robust to coaching) than those with ADHD. It is possible that the information provided through the coaching reduced their likelihood of making purposeful changes in approach after a streak of correct responses, possibly due to information provided about not wanting to overly exaggerate impairment.

Arguably of greater importance for the research question at hand is the scales that differentiated between malingerers and those with bona fide ADHD. Two scales yielded a significant difference between those with ADHD and the uncoached malingerers: number of perseverative errors and perseverative responses. Consistent with prior literature, those with ADHD made more perseverative responses than those with poor effort (Ord et al., 2010). This is

consistent with the theory that uncoached malingerers may approach the task with more random responding, whereas those with ADHD may have difficulty shifting to a new response pattern when it is warranted. This finding supports the potential use of this discrepancy for identification of poor effort. However, it raises some concern that coached malingerers performance was not significantly different from those with ADHD, indicating that the coaching may have aided the simulators in their performance. This was unexpected, as perseverative errors were suggested to be a more subtle aspect of the test and therefore more resistant to coaching. It is possible information provided in the coaching dissuaded the malingerers from responding too randomly, or suggested to them that those with ADHD would be perseverative and have difficulty being flexible.

Neither type of simulator had significantly different performance to those with ADHD on the other scales that were suggested in the hypothesis, a finding that was not expected. This suggests that none of these scales would have been potentially useful in identifying feigners (as suggested by prior literature that used simulators of ADHD and head injuries) (Bernard et al., 1996; Greve et al., 2002; Larrabee, 2003; Suhr & Boyer 1999). This may indicate that the prior findings about which scales can differentiate bona fide vs. malingered head injury may not extrapolate to the ADHD population. Noteworthy, however, a difference that trended towards significance was identified for one score; uncoached malingerers required more trials to complete their first category than those with ADHD. Although this finding is preliminary and should be considered with some caution, this suggests that this score on the WCST may potentially be useful for differentiating between malingerers and those with ADHD, and therefore warrants further research.

Lastly, contrary to previous research and expectations, there were no differences in performance between any of the groups on number of non-perseverative errors or number of conceptual level responses. It is possible that any differences in performance that may have occurred were not able to be seen due to limitations such as small sample size. It is also possible that no real relationship exists with these variables in the context of ADHD vs. malingered ADHD, and previous findings from the head injury literature are not applicable for ADHD.

Hypothesis Five

Hypothesis five postulated numerous results, including that both groups of non-malingering individuals would make significantly less mistakes (omissions and commissions) on the easy portion of the CPT than malingerers, and individuals with ADHD and both sets of malingerers would make significantly more mistakes than control participants on the more difficult portion of the task. It was also hypothesized that differences in percentage of correct responses across the task would emerge. This hypothesis was not supported, as no significant differences in performance were found between any of the groups. This is not consistent with previous research suggesting malingerers would produce more omission and commission errors, and that malingerers employed strategies that would produce lower scores such as purposefully ignoring stimuli, answering incorrectly, or responding more than once to an item (Quinn, 2003). There are a few possible explanations for this finding. It is possible the task was not sufficiently difficult for those with ADHD to have significantly more difficulty than their counterparts without the diagnosis. It is also possible that those without ADHD had difficulty sustaining attention due to the nature or length of the task. It is possible that malingerers, coached or uncoached, felt the task was easy enough that those with ADHD would perform well, and therefore did not exaggerate poor performance. Differences in performance in other aspects of

the task, such as reaction time or reaction time consistency that were not measured in this study, might have differentiated feigners from non-feigners (Boonstra et al., 2005; Hervey et al., 2004; Pasini et al., 2007). Lastly, this finding may indicate that there truly was no difference between groups, consistent with some previous literature showing that the CPT did not adequately distinguish between those with ADHD and those without (Sollman et al. 2010, Roy-Bryne et al. 1997).

It was also predicted that those with ADHD and coached malingerers would have significantly more difficulty with the harder portion of the task than the easy portion of the task, while control participants and uncoached malingerers would not, with uncoached malingerers having more difficulty across both aspects of the task. This hypothesis was partially supported, in that participants with ADHD and both malingering groups had relatively more difficulty with the harder portion of the task (AX) than the simple response section (X). This finding suggests malingerers, both coached and uncoached, produced profiles similar to those with ADHD and therefore could have potentially inaccurately provided evidence for the diagnosis. Although it was expected uncoached malingers would not have this split between the portions of the task due to performing so poorly across the task, this aspect of the hypothesis was not supported. The increase in difficulty in the task may have cued malingerers, whether or not they were coached, to begin to perform even more poorly than they had been at the beginning of the task. In this way, the profile of malingerers would appear similar to the worsening of performance on the latter half of the task by those with bona fide ADHD. When performance at the beginning of the task was taken into account, however, all differences between the groups vanished. This likely resulted from the conservative nature of the statistical test required to analyze this finding, and a

larger sample size would be required to determine if the relationship truly does not exist, or if it was missed due to the limitations of that statistical test.

Taken together, there was no evidence that the results of the CPT would provide useful evidence to differentiate between feigners of the disorder and those with ADHD. Rather, malingerers were easily able to produce profiles consistent with those produced by those with ADHD. However, given the limits of the study, including small sample size, utilization of an uncommonly used form of the CPT, and inability to assess for response time and latency, future research on the use of the CPT and its scores as an effort measure remains warranted.

Clinical Considerations

The current study contributes to the body of literature that exists on symptom validity testing and ADHD. The ultimate goal of this research is to improve clinician's diagnostic abilities by providing them with tools to aid in accurate diagnosis as well as identification of poor effort or malingering. Accurate differentiation is extremely important because individuals with bona fide impairment deserve an accurate diagnosis and access to the available and beneficial interventions and accommodations. At the same time, individuals found to be exaggerating or malingering should be prevented from gaining access to such perks to reduce strain on the system. Unfortunately, the problem of symptom exaggeration and feigning is common and unlikely to decrease in prevalence in the foreseeable future. Research has shown that people do malingering ADHD at rates similar to malingering other cognitive concerns, such as brain injury, in clinical and legal settings (Alfano & Boone, 2007; Edmundson, 2014; Harrison, 2006; Sullivan et al., 2007). Additionally, this disorder's relatively simple presentation at face value, the desirability and value of stimulant medications, and the draw of academic accommodations for college students make it an attractive disorder to feign. Therefore, the

development and refinement of tools available to clinicians should be a primary focus of research endeavors.

The current study sought to contribute to this body of literature, and certain findings have significant clinical implications. Although literature suggests that forced-choice measures may be more compromised by informed malingerers (Boone & Lu, 2007), the results indicated that pass rates were not significantly affected. Further, although having many benefits such as resistance to coaching and economy, the embedded measure in this study provided no valuable information for malingering detection. This is consistent with previous research that arrived at the same conclusion (Berry & Schipper, 2008; Bianchini et al., 2001; Sweet & Nelson, 2007). Significantly more research is needed to determine under what conditions stand-alone and embedded measures perform with the highest sensitivity and specificity, in order to aid clinicians in selecting both the right number and type of tests for their given circumstances and population. Another noteworthy finding was that simulators in this study did not perform fully within expectations on self-report measures, often producing profiles in the non-clinical range rather than the clinical range of symptom severity. However, their profiles still were not significantly different than those produced by individuals with ADHD, further supporting the concern that self-report measures are easily feigned and warrant a critical eye when used by clinicians. Further, in building on previous research on brain injuries and the Wisconsin Card Sorting Test, rates of perseverative responses and perseverative errors were found to be significantly different between those with ADHD and uncoached malingerers. It will be important to follow-up on this finding in particular to assess these scores relevance for differentiating between feigners and those with bona fide impairment, and to assess their sensitivity to informed malingerers, as these findings suggest it may be susceptible. Finally, although individual scores on the CPT did not

differ in an informative way between malingerers and non-malingerers, it is possible that differences exist on scores that were not available with this version of the CPT or exist within response patterns of combinations of scores within a profile, and these lines of inquiry warrant greater exploration in the future.

The results together highlight the significant difficulty that clinicians face when assessing for poor effort, either purposeful or not. Although clinicians can be reluctant to objectively assess effort, it is strongly recommended to do so through the use of multiple validity tests (Larrabee, 2003; Larrabee, 2008). It is well established that objective measures of effort function better than clinical judgment alone, although, as this study demonstrates, objective measures are not infallible. These objective tests and neurocognitive measures do not have 100% sensitivity and specificity and rates of misdiagnosis can be high (Booksh et al., 2010). Malingerers of ADHD have been found to take a variety of approaches to faking the disorder, including random responding, making purposeful mistakes, and overreporting, all of which are consistent with findings from this study as well (Frazier et al., 2008; Quinn, 2003). Further, previous research and this study indicate coaching (i.e., in the form of prior knowledge of the disorder and how one can embody it) can lead to performance that is even more difficult to identify as false (Edmundson, 2014). Lastly, performance between groups on each individual score and measure was analyzed in this study, while in real clinical practice the clinician needs to consider the entire clinical picture and story of the patient when formulating an opinion about effort, rather than relying only on a pass or fail score alone. It is only through integrating performance on all measures within the greater context of the patient that this information is able to be responsibly used.

Given these concerns, the overarching reason for this research is to improve the diagnostic tools available to providers to improve their abilities to differentiate between bona fide impairment and invalid symptom reporting. The current project is part of a body of literature addressing these concerns, and when considered together recommendations for clinical practice emerge. The recommendations include:

1. It is important to assess effort and response validity in every evaluation. In a full neuropsychological evaluation, include at least four objective measures of effort. Failure on two or more objective assessments of effort should generally be considered the cutoff for invalid data (Heilbronner et al., 2009). Regardless of what cutoff and number of failures is selected by the clinician to indicate insufficient effort and uninterpretable results, this needs to be determined *a priori* to the evaluation (Holdnack, Millis, Larrabee & Iverson, 2013).
2. As symptoms on self-report measures are easily feigned, clinicians should not rely solely on data from self-reports for diagnosis. Clinicians should consider employing objective forms of validity assessment outside of the validity scales embedded in certain self-report measures when conducting diagnostic evaluations, as most of these scales assess for other types of interpretation concerns (such as inconsistent responding) rather than exaggeration or purposeful feigning.
3. Within a diagnostic evaluation, it is usually also important to assess for the degree of impairment the symptoms are causing the individual. This will help to inform treatment recommendations as well as aid the individual in receiving the most beneficial type of accommodations at their university or workplace for their unique needs.

4. When possible, obtain and consider corroboratory information. This can aid in assessing the validity and accuracy of what the patient is reporting, as well as serve as additional evidence for the clinician's findings. Corroboratory information could include interviewing family, close friends, or teachers/professors (with appropriate permissions), or reviewing school or medical records.
5. As with any evaluation, always consider differential diagnoses. Common complaints consistent with ADHD can also be indicative of depressive disorders, anxiety, substance use effects or disorders, certain medical conditions, side effects of medications, personality disorders, or non-clinical conditions, such as being underprepared for one's current academic or occupational demands.
6. Continue to protect the security of the objective tests and the process of effort testing, especially from being shared on the Internet. This problem needs to be as contained as possible, as it is already decreasing the utility of performance validity tests and the thereby the accuracy of clinician's findings (Boone & Lu 2007; Rohling & Boone, 2007; Sweet & Nelson, 2007).

Limitations

This study had several limitations. An inherent limitation of simulation studies is the generalizability of the findings to a real-world setting. Individuals acting as simulators in a research study will have a different level of motivation than individuals feigning a disorder for primary or secondary gain in the real world, even if, as in the current study, rewards are offered to create motivation in the research setting. Additionally, the amount of time and resources utilized to simulate the effects of Internet research on an individual's ability to feign ADHD was significantly less than would be expected by an individual actually researching exaggerating or

simulating the disorder in actuality. Researchers have shown that malingerers invest a significant amount of time and energy into their performance, almost certain to be greater than the approximately five minutes utilized in this study (Tan, Slick, Strauss, & Hultsch, 2002).

There are also limitations present regarding the sample. All the participants in the study were university students, which limits the generalizability of the findings to other age groups and non-university students. That being said, as the research question was focused on individuals feigning the disorder in university settings, arguably the limitation has less negative impact. However, the study was conducted at one university, rather than multiple, and therefore it would be difficult to determine the appropriateness of generalizing the findings to different geographical locations or university sizes. One of the most significant limitations was the sample size for this study. Due to the small sample size, the statistics available were limited and statistical power was not as large as would be desirable for certain analyses (mentioned previously where applicable). Alternative forms (i.e., non parametric tests) of analyses had to be selected at times when the assumptions of other tests were not met, which lowers power and may have limited findings. Regarding group assignments, it is acknowledged that the knowledge base of individuals participating in the malingering groups regarding the symptoms of ADHD may have varied. Base knowledge of ADHD was not assessed, and should be taken into consideration in future studies to determine how much impact this may have on performance. Additionally, this study did not assess for mental health comorbidities in any of the groups (including the ADHD group). In this way, the presence of other mental health conditions or other medical conditions (outside of the presence of the history of TBI) that could have impacted cognitive functioning were not able to be controlled for.

One important limitation to consider is the purity of the ADHD group. Individuals were recruited and classified into the ADHD group based on self-report of a previous diagnosis with ADHD during their lifetime. For this reason there is no information available about how the diagnoses were made, by whom, and their validity. It is always a consideration that some of these individuals may have been misdiagnosed or may themselves have feigned or exaggerated symptoms in the past in order to gain the diagnosis. Beyond this, there may have been participants within the ADHD group who have limited functional impairment from their ADHD and therefore would not be expected to perform any differently on the cognitive measures in the study. Lastly it is noteworthy that both individuals currently taking medication to treat their ADHD symptoms and individuals who were not on medication at the time of the study were grouped together within the same experimental group. This was done purely due to sample size restraints and it would be important to control for this in future studies.

There are many factors relevant to this research that were not able to be fully assessed and considered within the current study and should be considered for future research endeavors (discussed more thoroughly in the Future Directions section below). The current study did not assess what strategy the participants used when approaching the task of malingering ADHD. Future studies should also make attempts to achieve a larger sample size, provide more time for coaching, assess baseline knowledge of ADHD and its symptoms for all participants, and make attempts to improve the diagnostic validity and purity of the ADHD group (as well as consider taking steps to have homogeneity within the group in regards to medication status). Additionally, future research should consider collecting more in-depth data from the measures when possible, such as assessing for response time on the CPT.

Future Directions

Continuing to conduct research in the area of malingering is very important for maintaining and improving diagnostic accuracy in the clinical field. Within the past few decades there has been an uptick in research conducted on the topic of malingered ADHD specifically. These studies have provided valuable information for clinical decision-making and helped to establish a foundation of knowledge about this clinical issue, as well as raised countless questions to be addressed in future research.

The vast majority of studies that have been conducted thus far are simulation design studies. Although it is extremely difficult to study malingering and other forms of poor effort or symptom exaggeration in real-world clinical settings, this type of research is important due to the generalizability of the results and for moving past the limitations inherent in all simulation studies.

Future research on symptom validity testing can focus on refining and improving existing measures as well as developing new assessments. Although the vast majority of established symptoms validity tests have excellent specificity, limited sensitivity to malingering and poor effort remains a significant issue. Although stand-alone forced-choice measures tend to be the approach of choice at present, these measures have been shown to be becoming less and less effective over time (Boone & Lu, 2007; Larrabee, 2012) and future research should continue to work towards developing detection strategies that are resistant to more sophisticated malingerers (such as people who have studied on the Internet) and maintain efficacy over time (Berry & Schipper, 2008; Bianchini et al., 2001; Nitch, 2008; Sweet & Nelson, 2007).

There are many future paths that can be pursued in the area of assessment of ADHD and identification of feigners of this disorder more specifically. There is currently limited research on

the impact baseline knowledge of ADHD has on one's ability to feign the disorder, which is a particularly important area for future research. This will inform the extent to which clinicians should be concerned about increased accessibility of information about the diagnosis to the public. Research endeavors should also focus on designing and testing detection strategies specific to this diagnosis, as it has been suggested that SVTs work best when they appear to be congruent with the symptoms the person is likely trying to exhibit (Harrison & Armstrong, 2016; Rogers, 2008b) and the vast majority of current stand-alone SVTs appear to focus on memory rather than sustained attention. Future research can also build on the studies that have assessed what strategies malingerers use during an assessment (Frazier et al., 2008; Harrison et. al., 2007; Quinn, 2003) to potentially develop measures that assess for the most commonly used strategies.

Finally, the current study and previous literature together indicated potential routes for future research into the utility of individual measures. When literature is reviewed together, continuous performance tests/vigilance tests have begun to stand out amongst other types of measures as providing objective information about effort and validity in addition to serving diagnostic purposes, although noteworthy variability exists within the results of the studies (Fuermaier et al., 2018; Musso & Gouvier, 2014). This suggests the need for further research, including replication studies, to clarify these findings. In order to increase clinical relevance, more research should be conducted using the Conners CPT, as this is currently one of the most widely used versions of this task for diagnostic purposes and therefore the findings about its potential use in validity testing have a high level of clinical relevance. Additionally, although the findings regarding the scores on the Wisconsin Card Sorting Test were limited, this study did show individuals with ADHD made significantly more perseverative errors than uncoached malingerers. This test's score's potential utility in validity testing should not yet be ruled out at

this time, due to the body of literature behind it in validity testing with other clinical populations and the limitations of this study which may mask important differences between groups.

There has been a strong research consensus that symptom self-report measures can be easily feigned, even those with validity indices built in them (Musso & Gouvier, 2014). As self-report measures are a quick, convenient, and preferred tool for diagnosis used by many clinicians, it is important to work towards improving their validity. Recent lines of research have pursued alterations and additions to popular self-report measures to reduce their susceptibility to feigned or exaggerated conditions (Harrison & Armstrong, 2016; Suhr et al., 2011). Although results have been mixed, such studies are creating excellent foundations on which to build. Findings have also suggested validity scales within the MMPI-2 and MMPI-2-RF have been useful for detecting feigned or exaggerated ADHD, and further research should focus on establishing which scales are useful and to what degree, and replicating and expanding on former studies (Harp, Jasinski, Shandera-Ochsner, Mason, & Berry, 2011; Young & Gross, 2011). Beyond validity scales embedded in or being added onto existing diagnostic scales, a recent attempt has been made to design and establish a stand-alone measure of symptom validity directly for ADHD diagnostic evaluations. Ramachandran and colleagues created the Subtle ADHD Malingering Screener (SAMS), and in their initial validation study, the measures had high sensitivity and specificity rates (90.3% and 80.1% respectively). Although the research is still nascent, this scale presents a promising option for clinicians moving forward (Ramachandran et al., 2018). Lastly, as it is important to assess degree of impairment alongside symptom checklists, future research could focus on creating a measure to assess for degree of disability and impairment, as well as with the ability to assess the validity of these claims (Suhr, Cook, & Morgan, 2017).

Taken together, there are many avenues for future researchers to pursue that would contribute to this body of literature in a meaningful way. Most importantly, research in this area needs to continue being conducted as the clinical implications of diagnosis and validity testing are significant. There is a large clinical need at this time regarding the assessment of ADHD and ensuring clinicians have all the tools they need to be as accurate as possible in both their diagnosis and recommendations.

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Appendix A

Slick, Sherman, and Iverson (1999) Criteria

Diagnostic Categories for Malingering Neurocognitive Dysfunction (MND) (Slick, Sherman, & Iverson 1999)

Definite MND

This is indicated by the presence of clear and compelling evidence of volitional exaggeration or fabrication of cognitive dysfunction and the absence of plausible alternative explanations. The specific diagnostic criteria necessary for Definite MND are listed below:

1. Presence of a substantial external incentive [criterion A]
2. Definite negative response bias [criterion B1]
3. Behaviors meeting necessary criteria from group B are not fully accounted for by Psychiatric, Neurological or Developmental Factors [Criterion D]

Probable MND

This is indicated by the presence of evidence strongly suggesting volitional exaggeration or fabrication of cognitive dysfunction and the absence of plausible alternative explanations. The specific diagnostic criteria necessary for Probable MND are listed below:

1. Presence of a substantial external incentive [Criterion A]
2. Two or more types of evidence from neuropsychological testing, excluding definite negative response bias [two or more of Criteria B2-B6]

Or

One type of evidence from neuropsychological testing, excluding definite negative response bias, and one or more types of evidence from Self-Report [one of Criteria B2-B6 and one or more of Criteria C1-C5]

3. Behaviors meeting necessary criteria from groups B and C are not fully accounted for by Psychiatric, Neurological, or Developmental Factors [Criterion D]

Possible MND

This is indicated by the presence of evidence suggesting volitional exaggeration or fabrication of cognitive dysfunction and the absence of plausible alternative explanations. Alternatively, possible MND is indicated by the presence of criteria necessary for Definite or Probable MND except that other primary etiologies cannot be ruled out. The specific diagnostic criteria necessary for Possible MND are listed below:

1. Presence of a substantial external incentive [Criterion A]
2. Evidence from Self-Report [one or more of Criteria C1-C5]
3. Behaviors meeting necessary criteria from group C are not fully accounted for by Psychiatric, Neurological, or Developmental Factors [Criterion D]

Or

Criteria for Definite or Probable MND are met except for Criterion D (i.e., primary psychiatric, neurological, or developmental etiologies cannot be ruled out). In such cases, the alternate etiologies that cannot be ruled out should be specified

Explanation of Criteria

Criteria A: Presence of a substantial external incentive

At least one clearly identifiable and substantial external incentive for exaggeration or fabrication of symptoms (see definition) is present at the time of examination (e.g. personal injury settlement, disability pension, evasion of criminal prosecution, or release from military service).

Criteria B: Evidence from neuropsychological testing

Evidence of exaggeration or fabrication of cognitive dysfunction on neuropsychological tests, as demonstrated by at least one of the following

1. *Definite negative response bias.* Below chance performance ($p < .05$) on one of more forced-choice measures of cognitive function
2. *Probable response bias.* Performance on one or more *well-validated* psychometric tests or indices designed to measure exaggeration or fabrication of cognitive deficits is consistent with feigning.
3. *Discrepancy between test data and known patterns of brain functioning.* A pattern of neuropsychological test performance that is markedly discrepant from currently accepted models of normal and abnormal central nervous system (CNS) function. The discrepancy must be consistent with an attempt to exaggerate or fabricate neuropsychological dysfunction (e.g., a patient performance in the severely impaired range on verbal attention measures but in the average range on memory testing; a patient misses items on recognition testing that were consistently provided on previous free recall trials, or misses many easy items when significantly harder items from the same test are passed).
4. *Discrepancy between test data and observed behavior.* Performance on two or more neuropsychological tests within a domain are discrepant with observed level of cognitive function in a way that suggests exaggeration or fabrication of dysfunction (e.g., a well-educated patient who presents with no significant visual-perceptual deficits or language disturbance in conversational speech performance in the severely impaired range on the verbal fluency and confrontation naming tests).
5. *Discrepancy between test data and reliable collateral reports.* Performance on two or more neuropsychological tests with a domain are discrepant with day-to-day level of cognitive function described by at least one reliable collateral informant in a way that suggests exaggeration or fabrication of dysfunction (e.g., a patient handles all family finances but is unable to perform simple math problems in testing).
6. *Discrepancy between test data and documented background history.* Improbably poor performance on two or more standardized tests of cognitive function within a specific domain (e.g., memory) that is inconsistent with documented neurological or psychiatric history (e.g., a patient with no documented LOC or PTA, multiple negative neurological investigations, and no other history of CNS trauma or disease consistently obtains verbal memory scores in the severely impaired range after a motor vehicle accident).

Criteria C: Evidence from Self-Report

The following behaviors are indicators of possible malingering of cognitive deficits, but their presence is not sufficient for the diagnosis. However, presence of one or more of these criteria provides additional evidence on support of a diagnosis of malinger. These criteria involve significant inconsistencies or discrepancies in the patient's self-reported symptoms that suggest a deliberate attempt to exaggerate or fabricate cognitive deficits.

1. *Self-reported history is discrepant with documented history.* Reported history is markedly discrepant with documented medical or psychosocial history and suggests attempts to exaggerate injury severity or deny premorbid neuropsychological dysfunction (e.g., exaggerate severity of physical injury or length of LOC/PTA; exaggerated premorbid educational or occupational achievement; denial of previous head injury or previous psychiatric history).
2. *Self-reported symptoms are discrepant with known patterns of brain functioning.* Reported or endorsed symptoms are improbable in number, pattern, or severity; or markedly inconsistent with expectations for the type or severity of documented injury or pathology (e.g., claims of extended retrograde amnesia without loss of memory for the accident, or claims of loss of autobiographical information after mild head trauma without LOC).
3. *Self-reported symptoms are discrepant with behavioral observations.* Reported symptoms are markedly inconsistent with observed behavior (e.g., a patient complains of severe episodic memory deficits yet has little difficulty remembering names, events, or appointments; a patient complains of severe cognitive deficits yet has little difficulty driving independently and arrives on time for an appointment in an unfamiliar area; a patient complains of severely slowed mentation and concentration problems yet easily follows complex conversations).
4. *Self-reported symptoms are discrepant with information obtained from collateral informants.* Reported symptoms, history, or observed behavior is inconsistent with information obtained from other informants judged to be adequately reliable. The discrepancy must be consistent with an attempt to exaggerate injury severity or deny premorbid neuropsychological dysfunction (e.g., a patient reports severe memory impairment and/or behaves as if severely memory-impaired, but their spouse reports that the patient has minimal memory dysfunction at home).
5. *Evidence of exaggerated or fabricated psychological dysfunction.* Self-reported symptoms of psychological dysfunction are substantially contradicted by behavioral observations and/or reliable collateral information. *Well-validated* validity scales or indices on self-report measures of psychological adjustment (e.g., MMPI-2) are strongly suggestive of exaggerated or fabricated distress or dysfunction.

Criteria D: Behaviors meeting necessary criteria from groups B or C are not fully accounted for by Psychiatric, Neurological, or Developmental Factors

Behaviors meeting necessary criteria from groups B and C are the product of an informed, rational, and volitional effort aimed at least in part towards acquiring or achieving external incentives as defined in Criteria A. As such, behaviors meeting criterion from groups B or C cannot be fully accounted for by psychiatric, developmental, or neurological disorders, that result in significantly diminished capacity to appreciate laws or mores against malingering, or inability to conform behavior to such standards (e.g., psychological need to “play the sick role”, or in response to command hallucinations).

Appendix B

Summary of Variables

Test	Use	Dependent Variables	Form	Cutoffs and Ranges
North American Adult Reading Test	Intelligence estimate	Raw Score	Continuous	Raw Score 0-62
		IQ Estimate	Continuous	Score 80.22 -127.02
Word Choice	Effort Measure	Raw Score	Continuous	Raw Score 0-50
		Pass or Fail Score	Dichotomous	Score of ≤ 45 vs. >45)
Digit Span	Working Memory/ Effort test	Reliable Digit Span	Continuous	Score 0-17
		Pass of Fail Score	Dichotomous	Raw score of ≤ 7 vs. >7)
Conner's Adult ADHD Rating Scale	Self Report Measure – ADHD symptoms	Inattention/Memory Problems Scale	Continuous	T scores ≤ 20 to ≥ 120
		Hyperactivity/Restlessness Scale	Continuous	T scores ≤ 20 to ≥ 120
		Impulsivity/Emotional Lability	Continuous	T scores ≤ 20 to ≥ 120
		Problems with Self-Concept	Continuous	T scores ≤ 20 to ≥ 120
		ADHD Index	Continuous	T scores ≤ 20 to ≥ 120
		CAARS scales with T-score >80	Discrete	0-5
Wisconsin Card Sorting Test	Executive Functioning Assessment	Total Errors	Continuous	Raw Score (1-64)
		Total Correct	Continuous	Raw Score (1-64)
		Perseverative Errors	Continuous	Raw Score (1-64)
		Percent Perseverative Errors	Continuous	0-100%
		Perseverative Responses	Continuous	Raw Score (1-64)
		Percent Perseverative Responses	Continuous	0-100%
		Non perseverative Errors	Continuous	Raw Score (1-64)
		Number of categories completed	Continuous	Raw Score (1-6)
		Failure to Maintain Set	Categorical	Raw Score of 0-1 or ≥ 1
		Trials to Complete First Category	Continuous	Raw Score (1-64)
		Conceptual level responses	Continuous	Raw Score (1-64)
		Percent Conceptual Level Responses	Continuous	0-100%
Continuous Performance Task	Attention Assessment	Absolute Percentage Correct – Part X	Continuous	0-100%
		Absolute Percentage Correct – Part AX	Continuous	0-100%
		Relative Percentage Correct – Part X	Continuous	0-100%
		Relative Percentage Correct – Part AX	Continuous	0-100%
		Total Omissions	Continuous	
		Total Commission	Continuous	

Appendix C

Consent Form

INFORMED CONSENT

You are invited to participate in a research study examining college student's performance on neuropsychological measures. I am conducting this study in partial completion of the requirements as a doctoral student at Indiana University of Pennsylvania.

Your involvement in the study

Your participation should take around 1.5 hours and will consist of completing cognitive tasks face-to-face with an examiner as well as on a computer. You will also be asked to complete a fill-in-the-bubble style questionnaire. You will receive 1.5 research credits for your participation in today research.

Confidentiality

All information pertaining to your participation in this research will be kept confidential. This consent form will be stored in a secure location and will not be linked to the data collected during the course of the research. You will be assigned a participant identification number that will be used to link the data collected during the cognitive tests together. This number will be linked to your demographic information, including your age and gender, but will not be linked to your name or identifying information. The deidentified data will be stored by the primary investigator for use in data analysis.

Possible Benefits of the study

At the conclusion of the study, you may choose to be entered to win a gift card valued at \$50. The winner of this card will be contacted via phone and/or email to arrange claiming the prize. Beyond this and the research credits, you may find the experience interesting or informative in an academic sense.

Possible Risks of the study

It is possible during the course of the study you may experience fatigue or boredom. Some individuals may experience stress or anxiety when undergoing testing. Please feel free to inform the research assistant if you require a break during testing, you wish to end your participation, or have any questions or concerns that arise during the course of participation.

Voluntary Nature of Participation

Your participation in the study is voluntary. You may choose to end your participation at any time and seek your course credit completion through another study or completion of the for-credit assignments. Any decision to leave the study before the end will not adversely affect your relationship with IUP, the psychology department, the principle investigator, or the faculty supervisor of this project. Should you choose to withdraw from the study at any time, inform the

examiner you are working with of your request. Upon your request to withdraw, all information pertaining to you will be destroyed.

If you have any questions regarding your participation, please do not hesitate to contact me:

Primary Investigator: Karen Eash, M.A.
Position: Doctoral Student/Therapist Trainee
Department Affiliation: Clinical Psychology
Phone: 262 370 5153
IUP email: k.m.eash@iup.edu

Faculty Sponsor: David J. LaPorte, Ph.D.
Rank/Position: Professor, Director of Doctoral Studies
Department Affiliation: Clinical Psychology
Campus Address: Uhler 201A
Phone: 724-357-4524

I have read and understand the information on the form and I voluntarily consent to participate as a subject in this study. I understand all data regarding me will be completely confidential and deidentified for use in data analysis and dissemination of the findings. I have received an unsigned copy of this informed consent form to keep in my possession. I have been provided the opportunity to ask questions and have had my questions answered to my satisfaction.

Name (Please Print): _____

Participant Signature: _____

Date: _____

Investigator Signature: _____

THIS PROJECT HAS BEEN APPROVED BY THE INDIANA UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS (PHONE 724.357.7730).

Appendix D

Researcher Scripts

Initial Instructions for Control/ADHD Participants: “Thank you for participating in today’s study. For the first portion of the study, you will be completing a few short tasks with me. Following that, you will be completing a few tests with another researcher. Some of the tasks today may be easy for you, and some may be difficult. No one is expected to get everything correct, but it is important you try your best on all of the tasks. Do you have any questions?”
(*administer NAART and filler task*)

Second Instructions for Control/ADHD Participants: “Now that you have completed the tasks with me, I will go get the second researcher and you will do a few more activities with them. Please keep doing your best work on the next tasks.” *ADHD only:* “When you are working with the second researcher today, please do not tell them about your diagnosis of ADHD.”

Initial Instructions for uncoached malingerers: “Thank you for participating in today’s study. The first thing we will be doing is a few short tasks. Please do your best on these activities.”
(*administer NAART and filler task*)

Second Instructions for uncoached malingerers: “For the next part of the study, you are going to be completing a series of short tasks, like the one you just did with me, with another researcher. Here is the catch: I am going to ask you to complete all of the following tasks with the new person as if you were pretending to have ADHD. I would like you to read this story, and pretend that this is you.” (*administer vignette for uncoached malingerers*)

“Do you have any questions about what you just read? Your goal today is to convince the next researcher that you have ADHD, without being so obvious that they can tell that you are lying. Just do the best you can. Any questions?”

Initial Instructions for coached malingerers: “Thank you for participating in today’s study. The first thing we will be doing is a short reading task” (*administer NAART*)

Second Instructions for coached malingerers: “For the next part of the study, you are going to be completing a series of short tasks, like the one you just did with me, with another researcher. Here is the catch: I am going to ask you to complete all of the following tasks with the new person as if you were pretending to have ADHD. I would like you to read this story, and pretend that this is you.” (*administer coached malingerer vignette and additional information*)

“Do you have any questions about what you just read? Your goal today is to convince the next researcher that you have ADHD, without being so obvious that they can tell that you are lying. Just do the best you can. Any questions?”

Appendix E

Vignettes

Vignettes:

For coached and uncoached malingerers: You are a college student at IUP, and recently, you have been having trouble keeping up with your coursework. Between school, your job, and keeping up with your social life, your grades have rapidly declined and you have been placed on academic probation. You are at risk of losing your scholarship and fear what will happen if you cannot stay at IUP.

You live in a suite with a few other roommates; one of whom you know has been diagnosed with ADHD. In talking to him, he tells you that he gets extra time on his exams whenever he asks for it, and has been allowed to take them in a room all by himself to prevent distractions. Additionally, he tells you about how his medication makes him feel focused and get his work done much more easily.

You start to think that these benefits sound really helpful, and you start looking into how hard it would be to get them. You find out that there's a place on campus that does evaluations for conditions like ADHD, and schedule yourself an appointment. You decide to attend the appointment and convince the doctor that you have the symptoms of ADHD, in order to get all of the benefits your roommate has. But you know you have to do it well, because if you get caught, you are afraid of getting suspended, or expelled.

Continued for coached malingerers only: In order to make your performance more convincing, you decide to do some research into ADHD and what it looks like before attending your appointment. In your Google searches, you come across the following sites. You review the following information to help you be as convincing as possible:

Appendix F

Information Provided to Coached Malingerers

ADHD Symptom Snapshot

There are 3 core symptoms of ADHD: inattention, impulsivity, and hyperactivity. The following are examples of how ADHD symptoms may appear in adults.

Only a doctor or other health care professional can diagnose ADHD.

ONLY A DOCTOR OR OTHER HEALTH CARE PROFESSIONAL CAN DIAGNOSE ADHD

Symptoms of Inattention

- **Often makes careless mistakes and lacks attention to details**
(Examples: overlooking or missing details or handing in work that is inaccurate)
- **Often has difficulty paying attention to tasks**
(Example: difficulty remaining focused during lectures, conversations, or lengthy readings)
- **Often seems to not listen when spoken to directly**
(Example: mind seems elsewhere, even in the absence of obvious distraction)
- **Often fails to follow through on instructions, chores, or duties in the workplace**
(Example: starts tasks but quickly loses focus and is easily sidetracked)
- **Often has difficulty organizing tasks and activities**
(Examples: messy, disorganized work; poor time management; fails to meet deadlines)
- **Often avoids, dislikes, or is reluctant to participate in tasks requiring sustained mental effort, like preparing reports, completing forms, or reviewing lengthy papers**
- **Often loses things like tools, wallets, keys, paperwork, eyeglasses, and mobile phones**
- **Often easily distracted by other things, including unrelated thoughts**
- **Often forgetful in daily activities, such as running errands, returning calls, paying bills, and keeping appointments**

Symptoms of Hyperactivity and Impulsivity

- **Often fidgets with or taps hands and feet or squirms in seat**
- **Often leaves seat when remaining seated is expected**
(Example: leaves their place in the office or other workplace setting or in other situations that require remaining seated)
- **Often runs or climbs where it is inappropriate or feels restless (in adults, may be limited to feeling restless)**
- **Often unable to participate in leisure activities quietly**
- **Often acts as if "on the go" or "driven by a motor"**
(Example: is unable to be or uncomfortable being still for an extended time, as in meetings or restaurants)
- **Often talks excessively**
- **Often blurts out an answer before a question has been fully asked**
(Examples: completes people's sentences; cannot wait for next turn in conversation)
- **Often has difficulty waiting his or her turn, for example, while waiting in line**
- **Often interrupts or intrudes on others**
(Examples: butts into conversations, games, or activities; may start using other people's things without asking or receiving permission; may intrude into or take over what others are doing)

EXILE CLASSIC / JUNE, 2006

ADDERALL TIPS: HOW TO CONVINCING YOUR SHRINK YOU HAVE ADD/ADHD

By Abram M.

The beauty of ADD lies in the fact that there is no standardized clinical test to diagnose the disorder. No one knows what causes it. The only thing the medical professionals know is that amphetamine delivered in small continuous doses relieves most of ADD's symptoms. So the trick is to convince your shrink that you have ADD. And what's nice is that anyone can fool the system, as long as they know what to say and how to act. It's all very simple, really, all it takes is a bit of memorization.

I recently went undercover in America to find out just how to successfully trick a shrink into believing you are one of the 4% of the American adult population that's suffering from ADD. And although my session didn't go over too smoothly, I did reach my primary objective. I scored a month's supply of Adderall XR and boy is everyone thankful. Here is my guide and tips to scoring Adderall, so that you can be as happy and hard-working as I am. The main thing is to not overdo it with the shrink. You might feel the urge to act the part of a spastic ADD'd out freak, but no matter how strong the urge, avoid it at all costs.

Recognizing the Signs and Symptoms of Adult ADHD and What You Can Do About It

Life can be a balancing act for any adult, but if you find yourself constantly late, disorganized, forgetful, and overwhelmed by your responsibilities, you may have ADHD or ADD. Attention deficit disorder affects many adults, and its wide variety of frustrating symptoms can hinder everything from your relationships to your career.

Signs and symptoms of ADHD in adults

The following categories highlight common symptoms of adult ADHD.

Trouble concentrating and staying focused

Adults with ADHD often have difficulty staying focused and attending to daily, mundane tasks. For example, you may be easily distracted by irrelevant sights and sounds, quickly bounce from one activity to another, or become bored quickly. Symptoms in this category are sometimes overlooked because they are less outwardly disruptive than the ADHD symptoms of hyperactivity and impulsivity—but they can be every bit as troublesome.

Disorganization and forgetfulness

When you have adult ADHD, life often seems chaotic and out of control. Staying organized and on top of things can be extremely challenging—as is sorting out what information is relevant for the task at hand, prioritizing the things you need to do, keeping track of tasks and responsibilities, and managing your time. Common symptoms of disorganization and forgetfulness include:

Impulsivity

If you suffer from symptoms in this category, you may have trouble inhibiting your behaviors, comments, and responses. You might act before thinking, or react without considering consequences. You may find yourself interrupting others, blurting out comments, and rushing through tasks without reading instructions. If you have impulse problems, being patient is extremely difficult. For better or for worse, you may go headlong into situations and find yourself in potentially risky circumstances. Symptoms include:

Hyperactivity or restlessness

You don't have to be hyperactive to have ADHD

Adults with ADHD are much less likely to be hyperactive than their younger counterparts. Only a small slice of adults with ADHD, in fact, suffer from prominent symptoms of hyperactivity. Remember that names can be deceiving and you may very well have ADHD if you have one or more of the symptoms above—even if you lack hyperactivity.

Appendix G

Debriefing Form

Thank you for participating in today's research.

The purpose of today's study was to identify the influence of a client's Internet research on a clinician's ability to detect clients feigning a diagnosis of ADHD. Additionally, this study seeks to identify potential new ways for clinicians to detect such feigning behavior. Clients may be motivated to feign or exaggerate symptoms of this disorder to gain access to stimulant medications or accommodations in the workplace or academic environment. Therefore, searching for new and more effective ways to detect feigners is useful for clinicians, and expanding the knowledge in the field of the influence of technology on feigner's ability to deceive clinicians is an important contribution to the field.

This study is building on a body of research that has been growing over the past few decades. For interested students, a list of some similar studies exploring this topic are listed below:

Bigler, E. D. (2012). Symptom validity testing, effort, and neuropsychological assessment. *Journal of the International Neuropsychological Society*, 18(4), 632-640.

Booksh, L. R., Pella, R. D., Singh, A. N., & Drew Gouvier, W. (2010). Ability of college students to simulate ADHD on objective measures of attention. *Journal of Attention Disorders*, 13(4), 325-338.

Sollman, M. J., Ranseen, J. D., & Berry, D. T. (2010). Detection of feigned ADHD in college students. *Psychological assessment*, 22(2), 325.

Quinn, C. A. (2003). Detection of malingering in assessment of adult ADHD. *Archives of Clinical Neuropsychology*, 18(4), 379-395.

For more information or with questions about today's research, please feel free to contact the primary researcher Karen Eash, M.A. (k.m.eash@iup.edu) or the faculty supervisor Dr. David J. LaPorte (laporte@iup.edu).

Mental health services are available to students at IUP. Should participation in this research have raised any concerns about your mental health for you, either in regards to Attention-Deficit Hyperactivity Disorder (ADHD) or any other concerns, the contact information for the on-campus resources are provided below:

Center for Applied Psychology
Uhler Hall, Rm. 238
1020 Oakland Avenue
Indiana, PA 15705
Phone: 724-357-6228
Fax: 724-357-7817

The Counseling Center
Suites on Maple East, G31
901 Maple Street
Indiana, PA 15705
Phone: 724-357-2621
Fax: 724-357-7728