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The Construction of a Multidimensional ADHD Self-Report Measure: A Pilot Study

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Abstract

Recent research on adult onset Attention Deficit/Hyperactivity Disorder (ADHD) has led to an increase in evaluations of college students and adults suspected of the disorder, as well as increased concern that some may feign or malinger ADHD characteristics in order to obtain a diagnosis and associated incentives (e.g., stimulant medications and academic accommodations). Faking ADHD is especially easy when the diagnosis is based on self-report, symptoms-only rating scales. Diagnostic accuracy improves with the assessment of symptoms, impairment, and symptom validity, but this type of comprehensive self-report measure is currently not available. The aim of this study was to examine the effectiveness of a newly constructed Multidimensional ADHD Rating Scale (MARS) comprised of ADHD symptom, functional impairment, and symptom validity indexes. The MARS self-report items were completed by three groups of college-aged students. Participants with ADHD (n=39) and non-ADHD controls (n=62) completed the MARS honestly. A group of non-ADHD participants (n=56) were instructed to malinger ADHD. Results indicated that malingerers reported more symptoms and impairment than ADHD participants, and both groups reported more symptoms and impairment than controls. The symptom validity index was able to differentiate malingerers from ADHD participants with high sensitivity and specificity. These preliminary results suggest that measures that combine symptoms, impairment, and symptom validity could be useful additions to ADHD rating scales.

Keywords: ADHD, assessment, impairment, malingering, symptom validity

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ADHD (Attention Deficit/Hyperactivity Disorder) is a neurodevelopmental disorder commonly referred to mental health professionals for both diagnosis and treatment. ADHD is currently diagnosed in 11% of children (CDC, 2014). Although exact prevalence rates are unknown, ADHD is estimated to occur in 5% of the college-aged population (DuPaul, Weyandt, O'Dell, & Varejao, 2009; Harrison, 2004). Due to the high prevalence rate, it is not surprising that ADHD accounts for one of the largest disability groups on college campuses (Weyandt & DuPaul, 2006). In addition, college-aged self-referrals for evaluations have risen, related in part to an increase in public awareness about adult ADHD (Barkley, Murphy, Fischer, 2008). University health clinics as well as community mental health practitioners are often the gatekeepers to an adult ADHD diagnosis and access to treatment (Barkley, Murphy, Fischer, 2008). Treatments such as stimulant medication (e.g., Ritalin, Adderall) and access to academic accommodations (e.g., extended time on tests) potentially incentivize students to seek an ADHD diagnosis.

Clinicians report using rating scales and clinical interviews to make a diagnosis of ADHD in adults (Musso & Gouvier, 2014; Nelson, Whipple, Lindstrom & Foels, 2014). These methods have been shown to be highly subjective and susceptible to diagnostic errors (e.g., Musso & Gouvier, 2014; Marshall et al., 2016). To begin, ADHD symptoms are non-specific, as they are frequently reported within the general population (Murphy & Barkley, 1996) and with other disorders (e.g., learning disabilities, anxiety disorder, conduct disorder, autism spectrum disorder; Barkley, 2014). Second, some individuals may perceive themselves as having relative weaknesses compared to their peer group and unintentionally over-report symptoms (Barkley, 2014). Finally, ADHD is susceptible to malingering, or conscious over-reporting or feigning

performance to obtain external incentives (e.g., Quinn, 2003). The incentives to an ADHD diagnosis (e.g., medications, academic accommodations) increase the chances of malingering among college-aged self-referrals for ADHD (Musso & Gouvier, 2014). Although exact rates of malingering are unknown, noncredible psychological test performance has been reported to be as high as 30% (Suhr, Hammers, Dobbins-Buckland, Zimak, & Hughes, 2008) to 47% (Sullivan, May, & Galbally, 2007) of college self-referrals for ADHD. Lastly, college students without ADHD have demonstrated that they can report ADHD symptoms on rating scales to obtain the diagnosis (e.g., Jachimowicz & Geiselman, 2004; Quinn, 2003). In contrast, some individuals with ADHD have been known to under-report symptoms and impairment (e.g., Prevatt et al., 2012; Sibley et al., 2012). Because many evaluations focus on elevated symptom presentation to diagnose ADHD, both under and over-reporting of symptoms could lead to inaccurate diagnostic decisions, which results in increased public and private costs (Aldridge, Kroutil, Cowell, Reeves, & Van Brunt, 2011; Chafetz & Underhill, 2013).

One method to improve detection of malingering is the use of a symptom validity test as part of an assessment. In self-report measures, these validity scales are designed to measure respondent honesty, consistency, minimization of impairment (i.e., fake good), and maximization of impairment (i.e., fake bad). Valid responding on these scales increases confidence in making accurate diagnostic decisions. Test developers have incorporated validity scales into various personality (e.g., Personality Assessment Inventory; Morey, 1991) and behavioral rating measures (e.g., Behavior Assessment System for Children-2nd edition; Reynolds & Kamphaus, 2004). However, despite the recognized need for validity tests, few ADHD rating measures contain a validity scale.

One ADHD self-report measure with a validity test is The Clinical Assessment of Attention Deficit-Adult (CAT-A; Bracken & Boatwright, 2005). The CAT-A utilizes an infrequency validity scale, which contains items that are not highly endorsed within the ADHD population. High endorsement on these infrequency items indicates possible over-reporting of symptoms and probable malingering. The CAT-A validity scale has better psychometric abilities to detect malingering than any other existing ADHD rating scale, although the sensitivity (58%) rate falls short of what is recommended to make confident diagnostic decisions (Marshall et al., 2010).

The Conners' Adult ADHD Rating Scale (CAARS; Conners, Erhardt, & Sparrow, 1998) is a commonly used adult ADHD rating measure that has validity scales that are unreliable measures of malingered ADHD (e.g., Suhr et al., 2008). To improve malingering detection on the CAARS, Suhr, Buelow, and Riddle (2011) created a 12-item Infrequency scale using the scale's current ADHD symptom items. Although initial results for this scale were promising, subsequent research found low sensitivity (32%) and specificity (65%) rates (Fuermaier et al., 2016). The infrequency scale drew items directly from the ADHD symptom items, and these items would presumably be endorsed by both individuals with ADHD and those malingering ADHD. In order to increase discriminative abilities of a scale to detect malingering, items need to be specifically designed to be infrequently endorsed by those with ADHD yet endorsed frequently by malingerers. The CAARS Infrequency scale did not accomplish this.

As Wakefield (2010) and others have noted, clinicians are at-risk for false positive ADHD diagnoses when their assessment focuses on symptoms-only, and does not account for current or past functional impairment (e.g., Bird et al., 1988; DuPaul, Reid, Anastopoulos, & Power, 2014). If clinicians rely heavily on self-reported rating scales to make ADHD diagnoses,

then they need rating scales with sound psychometric properties that include a validity component, as well as a method of jointly assessing both symptoms and functional impairment. This type of multidimensional ADHD measure is not available, yet could be a valuable tool for making more accurate diagnostic decisions..

The purpose of this study was to construct and pilot test a multidimensional rating scale to assess ADHD and detect malingering in the college age population. This multidimensional rating scale included three components that should be considered collectively when making a diagnosis of ADHD. Two of these components—ADHD symptoms and functional impairment—are needed to identify cases of ADHD. The third component involves an exploratory symptom validity index intended to validate self-report and to detect malingered ADHD.

This preliminary study included three aims. First, this study created a symptom validity index comprised of items that individuals with ADHD infrequently endorsed (i.e., exaggerated symptoms that do not reflect known ADHD symptoms), but were endorsed by college students coached to malinger ADHD. Second, this study analyzed whether there would be response differences between ADHD, malingered ADHD, and controls on the ADHD symptom, functional impairment, and symptom validity indexes. Lastly, this study conducted preliminary analyses of the classification accuracy of each index to identify true cases of ADHD from those that are malingering ADHD.

Attention Deficit / Hyperactivity Disorder

DSM-5 Diagnostic Criteria. Attention Deficit / Hyperactivity Disorder (ADHD) is defined in the *Diagnostic and Statistical Manual for Mental Disorders-Fifth Edition* (*DSM-5*; American Psychiatric Association, 2013b) as a neurodevelopmental disorder characterized by

symptoms of inattention and hyperactivity that begins prior to the age of 12. The *DSM-5* diagnostic criteria are as follows:

A. A persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development, as characterized by symptoms within (1) and/or (2):

    1. Inattention: Six (or more) of the following symptoms have persisted for at least 6 months to a degree that is inconsistent with developmental level and that negatively impacts directly on social and academic/occupation activities. Note: For older adolescents and adults (age 17 and older), at least five symptoms are required:

        - Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
        - Often has difficulty sustaining attention in tasks or play activities.
        - Often does not seem to listen when spoken to directly.
        - Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.
        - Often has trouble organizing tasks and activities.
        - Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time.
        - Often loses things necessary for tasks and activities.
        - Is often easily distracted by extraneous stimuli.
        - Is often forgetful in daily activities.

    2. Hyperactivity and Impulsivity: Six or more symptoms of the following symptoms that have persisted for at least 6 months to a degree that is inconsistent with

developmental level and that negatively impacts directly on social and academic/occupational activities. Note: For older adolescents and adults (age 17 and older), at least five symptoms are required:

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

B. Several inattentive or hyperactive-impulsive symptoms were present prior to the age 12 years.

C. Several inattentive or hyperactive-impulsive symptoms are present in two or more settings (e.g., home, school or work, with friends or relatives).

D. There is clear evidence that symptoms interfere with, or reduces quality of life of social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder and are not better explained by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, personality disorder, substance intoxication or withdrawal) (American Psychiatric Association, 2013, pg. 59-65).

Based on the 18 symptoms listed above, three types (presentations) of ADHD can occur. The Combined Presentation requires that symptoms of both inattention (A1) and hyperactivity-impulsivity (A2) criteria are met for the past 6 months. The Predominantly Inattentive Presentation is if Criterion A1 (inattention) is met, but not Criterion A2 (hyperactivity-impulsivity), for the past six months. The last specifier is the Predominantly Hyperactive-Impulsive Presentation, which occurs if Criterion A2 (hyperactivity-impulsivity) is met, but symptoms do not meet Criterion A1 (inattention), for the past six months (American Psychiatric Association, 2013).

In addition to the denoted *DSM-5* symptoms of inattention and hyperactivity-impulsivity, ADHD is often associated with global deficits in executive functioning skills. These can include difficulties with planning, organizing, working memory, cognitive flexibility, set shifting, and inhibitory control (Barkley, Murphy, Fischer, 2008). The *DSM 5* symptoms and associated executive function deficits should be manifested across time (including childhood) and settings (Criteria B and C respectively). Most importantly, the symptoms and other associated deficits must interfere with or reduce one's quality of functioning (Criterion D).

The Legal Definition of Disability. The assessment of impairment is a significant eligibility criterion for any disability as defined under *The Americans with Disabilities Act Amendments Act* (*ADAAA,* 2008). The *ADAAA* is federal legislation that provides individuals with disabilities reasonable accommodations and/or modifications designed to equalize access to employment, education, and other public services. To qualify as an individual with a disability under the *ADAAA*, there must be evidence of a disability (i.e., physical or mental impairment) that substantially limits an individual in at least one major life activity (e.g., bathing, reading, thinking, concentrating). In other words, a diagnosis may not be sufficient to warrant a legal

definition of disability. To qualify for academic accommodations, for example, individuals must provide adequate documentation, proving his/her impairments limit a major life activity and restrict access to educational and/or occupational opportunities (*ADAAA*, 2008). It is therefore possible that a person could receive a diagnosis of ADHD yet not meet the *ADAAA* definition of disability. For example, without a substantial limitation in reading, writing, or concentrating, a person with an ADHD diagnosis might be considered not qualified or eligible for accommodations. In summary, the *DSM 5* requires that symptoms interfere with functioning, and the *ADAAA* requires documentation of impairment to establish eligibility. Therefore, it is important that a comprehensive evaluation include the assessment of both symptoms and associated impairment**.**

The Importance of Assessing Symptoms and Functional Impairment

The joint assessment of symptoms and impairment satisfies the *DSM-5* criteria for a diagnosis, as well as helps to provide documentation towards establishing a substantial limitation for the *ADAAA* requirement. Symptoms and impairment are two important, but different constructs. Barkley and colleagues (2006) distinguish between symptoms and impairment by defining the former as "the behavioral expressions associated with the disorder" and the latter as "the consequences that ensue for the individual as a result of these behaviors" (Barkley et al., 2006, p. 2). Despite this distinction, it seems that many clinicians treat these two factors as one, and prefer to rely on symptom rating scales in an assessment (Musso & Gouvier, 2014; Nelson et al., 2014). However, the practice of a symptoms-only assessment and presumption of impairment can be problematic and may increase the chance of making a false positive diagnosis (Wakefield, 2010).

It is accurate to say that there is a positive linear relationship between ADHD symptoms

and impairment (e.g., Gathje, Lewandowski, & Gordon, 2008). However, the strength of this association is dependent upon the measures and the population being studied. For example, Fabiano and colleagues (2006) found higher correlations (r = .58 - .93) in a child clinical population in comparison to a general elementary school sample (r = .17 - .53). Gordon and colleagues (2006) examined several datasets involving children referred for ADHD assessments and found moderate correlations (r = ~.30) between symptoms and various measures of impairment. Barkley (2006) on the other hand, found higher correlations (r = .43 - .88) when impairment was assessed across multiple domains of functioning. It appears that the relationship between symptoms and impairment is stronger when impairment is measured across multiple domains, as opposed to one or two specific domain areas. Additionally within the adult population, correlations between symptoms and impairment were higher for same source ratings (e.g., self-report) as opposed to two different sources (e.g., self-report and parent report) (Barkley, Murphy, Fischer, 2007). Overall, the research indicates that there is a relationship between symptoms and impairment; however, the degree of the relationship is dependent upon various factors. ADHD symptoms alone do not completely account for impairment levels, thus both warrant independent measurement and consideration in the diagnosis of ADHD.

With the knowledge that symptoms and impairment are two distinct yet related factors, it is not surprising that joint assessment can reduce false positive rates. For example, one study (Bird et al., 1988) found that 49.5% of children in the general population met the symptom criteria for ADHD. However, only 17% also met the functional impairment criterion needed for a true diagnosis of ADHD. Shaffer and colleagues (1996) found that 4.5% of the study's sample met ADHD symptoms criterion, yet only 2.8% met both the symptoms and functional impairment criteria (Shaffer et al, 1996). In a recent national study, DuPaul and colleagues

(2014) asked 1,070 teachers to rate symptoms and functional impairments for two randomly selected students in his/her 6^{th}-12^{th}-grade classroom. From the total sample, 18.9% of students met the symptom count and 31.4% met the functional impairment count. However, the sample rate reduced to 7.3% when both symptoms and functional impairment count were considered jointly, which is closer to accepted epidemiological base rates (DuPaul, Reid, Anastopoulos, & Power, 2014).

The above research, coupled with the *DSM-5* and *ADAAA* guidance for disability diagnosis, strongly suggest that clinicians should consider both symptoms and impairment in their diagnostic determinations. Not only does this practice improve diagnostic accuracy (Barkley et al., 2006; Gordon et al., 2006), but it is impairment in daily life activities that leads individuals to seek treatment (Barkley, Murphy, & Fischer, 2007). Additionally, although medications can be helpful, not everyone with ADHD will respond to stimulants, and some individuals will continue to report persistent and significant difficulties in impairment in daily activities after stimulant treatment (Lerner, 2010). Although medication can help to reduce symptom severity (e.g., excessive movement), it is not always the solution to difficulties in daily life functioning (Lewandowski, Lovett, & Gordon, 2009). For example, one study found that over 50% of adults with ADHD still experienced difficulties in major life activities, despite having a reduction in symptom severity with medication (Safren, Sprich, Cooper-Vince, Knouse, & Lerner, 2010). This suggests that intervention programs should target both symptom and impairment levels. This also indicates that both symptoms and impairment are needed to truly monitor treatment efficacy and effectiveness over time (Gordon et al., 2006). Overall, the assessment of both symptoms and impairment, as recommended by *DSM* and *ADAAA*, should lead to more accurate diagnoses and more effective treatment plans.

Weaknesses of Current ADHD Rating Scales

Although diagnostic criteria and legislation recommend the joint assessment of symptoms and impairment, it appears as if impairment is not being assessed routinely in clinical practice. Recently, Nelson and colleagues (2014) examined psychological reports submitted as documentation from college students claiming to have ADHD and seeking test accommodations. This study found that all cases relied upon rating scales, with 84% documenting current symptom severity. Some form of current impairment was documented in 59% of the reports, but this was based primarily on the results of academic achievement tests, as opposed to any specific impairment rating measure. Yet, only 28% of cases reported both symptoms and impairment. The authors noted that only 1% of the psychological reports documented that students met all *DSM-5* criteria for ADHD (i.e., current and childhood symptoms and impairment), yet 87% of the reports recommended at least one test accommodation. These findings indicate that the documentation to support the ADHD diagnosis may be largely inadequate. Documentation of ADHD should involve objective data from records and testing, measures of symptoms and impairment, as well as the assessment of symptom validity (e.g., American Academy of Pediatrics, 2011). Currently there is no multidimensional assessment tool that assesses ADHD symptom presentation, symptom validity, and functional impairment.

Unfortunately, the diagnostic reliance on symptoms-only rating scales is prone to error that can threaten the validity of diagnosis. As alluded to in the aforementioned studies (Bird et al., 1988; DuPaul et al., 2014; Shaffer et al., 1996), ADHD symptoms are common in the general population of children and adults. For example, Murphy and Barkley (1996a) surveyed 720 adults from the general population who were renewing driver's licenses. Consistent with prevalence estimates, 4.6% of these individuals within the general population met the *DSM-IV*

symptom criterion of six or more symptoms. However, subthreshold ADHD symptoms were reported in 22% of the symptom reports and in 56% of childhood retrospective symptom reports. Similarly, Lewandowski and colleagues (2008) found subthreshold ADHD symptoms within the general college population. On average, the non-ADHD group endorsed "often/always" for 4.5 out of the 18 ADHD symptoms (Lewandowski, Lovett, Codding, & Gordon, 2008). Overall, these studies suggest that a sizeable minority of the non-ADHD adult population report subthreshold ADHD symptoms on ADHD rating scales.

Given the frequency of subthreshold ADHD symptoms in the general population, it is important that rating scales utilize an adequate response scale cutpoint to minimize the chance of identifying these subthreshold levels. In a study of 314 children referred to an outpatient psychiatry clinic in central New York, 81% met a liberal threshold (one standard deviation above the mean) for diagnosis based on maternal report of ADHD symptoms alone. At a threshold of 1.5 standard deviations, diagnostic rates reduced to 60% using a symptoms-only approach. The rates declined further (19%) when both symptoms and impairment were jointly assessed. When an even more stringent criterion on the impairment measure (two standard deviations) was required, the classification rate dropped to less than 1% (Gathje, Lewandowski, & Gordon, 2008). This study demonstrates that one should not only jointly assess symptoms and impairment, but a well-validated response scale cutpoint is needed to prevent over- or under-diagnosis.

Across all types of rating scales, there are concerns that items are subjective and respondents may misinterpret or erroneously report symptom severity. Rating scales responses are impacted more by one's current emotional state rather than an objective viewpoint (Miller et al., 2013). Additionally, to meet the *DSM-5* criteria, ADHD symptoms should be present before

the age of 12 (American Psychiatric Association, 2013). This information is frequently obtained in a clinical interview with the adult recounting childhood ADHD symptoms. However, research has demonstrated that adults are not reliable in reporting retrospective memories of childhood symptoms (Barkley, Fischer, Smallish, & Fletcher, 2002; Barkley, Knouse, & Murphy, 2011). Therefore, both current and retrospective reports of symptoms may be prone to the same subjectivity and bias, and therefore, could easily lead to false positive ADHD diagnoses.

There are also concerns that some individuals with ADHD may under-report symptoms and impairment compared to parent and other collateral reports (e.g., Dvorsky, Langberg, Molitor, & Bourchtein, 2016; Sibley et al., 2012). In other words, true positives could be missed in an assessment based only on symptom report. This has been ascribed to the positive illusory bias, or cases in which individuals self-report higher levels of competence compared to his/her actual performance. The positive illusory bias is considered a strategy that frequently occurs in both disability and non-disability populations (Owens et al., 2007). However, the positive illusory bias can become maladaptive when an individual is unaware of his/her failures and thus unable to correct them. This positive bias occurs frequently in children with ADHD (Owens et al., 2007). Prevatt and colleagues (2012) found that these overly positive self-views may extend into the college years. Although college students with ADHD reported higher impairment levels compared to college students without ADHD, there was evidence of the positive illusory bias on an individual level. On the individual self-reports, those with ADHD reported overly positive global domains of functioning (e.g., driving) in comparison to self-reported impairment on the specific behaviors within those domains (Prevatt et al., 2012). This suggests that the positive illusory bias is present in college students. In fact, due to biased responding found among college students with ADHD, some have recently argued for the need to collect collateral reports

(e.g., parents) to validate self-reported symptom and impairment (Dvorsky et al., 2016; Sibley et al., 2012). In general, clinicians should be aware that individuals with ADHD may under-report both symptoms and impairment compared to their actual performances, especially if they are only asked about global domains of functioning.

In summary, although rating scales are important in the diagnostic process, they are fallible. Clinicians are susceptible to false positive and negative diagnoses when relying upon these measures exclusively, especially when impairment is overlooked in the assessment (DuPaul et al., 2014). Not only are rating scales generally susceptible to error when an individual is honestly responding, they also are easy to fake or exaggerate to obtain a diagnosis. Unfortunately, as will be discussed, ADHD scales are no different and are easily deceived by those consciously faking ADHD (e.g., Quinn 2003). There are potential incentives conferred by an ADHD diagnosis, including stimulant medication, academic resources, test accommodations, as well as *ADAAA* rights and protections (Musso & Gouvier, 2014). These incentives may increase the risk of biased responding, and further support the need for clinicians to validate responding and assess for malingering in ADHD evaluations.

Malingered ADHD

Definitions of Malingering. As discussed, subjective ratings of one's own symptoms can be easily biased. In some cases, they are exaggerated due to the presence of internal and external incentives. An individual may be internally motivated to obtain a diagnosis in order to help explain his/her difficulties or to confirm a pre-determined self-diagnosis of ADHD (Barkley, Murphy, Fischer, 2008; Barkley, 2014). In addition, individuals can be motivated by external incentives (e.g., medication, academic accommodations) to consciously exaggerate symptoms. In the *DSM 5,* malingering is used as a differential diagnosis or V-code in the *DSM*

for other disorders. It is defined as the intentional and conscious choice by an individual to erroneously provide false information in order to obtain external incentives (American Psychiatric Association, 2013). Although unconscious and conscious attempts to falsify information can impact the diagnostic process in any setting, malingered ADHD on college campuses has been the focus of recent research.

To further operationalize the *DSM-5* definition, Iverson (2006) defines malingering as the conscious use of poor effort and/or exaggeration during the assessment. Poor effort is described as suboptimal effort, nonoptimal effort, incomplete effort, biased responding, and/or negative response bias on performance-based tests. Exaggeration, either over- or under-reporting, is described as faking, feigning, simulating, dissimulating, magnifying, and amplifying of thoughts, feelings, and/or behaviors on rating scales or in the clinical interview. There is overlap between poor effort and exaggeration strategies, however, it is believed that a malingerer will select the most appropriate faking strategy depending upon the assessment. For example, the easiest and most effective malingering strategy for a symptoms-only assessment would be to exaggerate symptom complaints on a rating scale, as opposed to displaying poor effort to complete a performance measure.

Validity tests are used to assess both poor effort and symptom exaggeration. Symptom validity tests (SVT) assess for exaggerated responses on rating scales. One example of a SVT is an embedded validity scale within a rating measure (e.g., infrequency scale). Performance validity tests (PVT) assess for poor effort or ability to perform a task. For example, these can include standalone performance-based assessments (e.g., Word Memory Test), or cutoffs within existing cognitive measures (e.g., Reliable Digit Span). Both are used as screening measures to alert a clinician to suspected cases of malingering. As they are used for screening purposes,

SVTs and PVTs should demonstrate excellent specificity (~90%) to reduce false positive malingering classifications (Larrabee, 2012). PVTs and SVTs with high face validity for the diagnosis have the highest probabilities for detecting malingering (Jasinski et al., 2011). It is currently recommended that PVTs and/or SVTs be included in ADHD evaluations as they have been shown to be superior at identifying malingering in comparison to clinical judgment and rating scales alone (Booksh et al., 2010; Marshall et al., 2016).

Malingered ADHD in the College Population. In the field of neuropsychology, malingering has often been associated with financial incentives (e.g., workers' compensation, Social Security Benefits). However, the pursuit of an ADHD diagnosis might be influenced by other incentives, such as medications and academic accommodations. There has been a rise in rates of stimulant misuse on college campuses, with a recent meta-analysis estimating prevalence rates at 17% on college campuses (Benson, Flory, Humphreys, & Lee, 2015). In addition, the literature indicates that a high percentage of college students positively associate stimulant medication with the ability to increase focus for academic tasks (Hartung et al., 2013; Lookatch, Dunne, & Katz, 2012). Some college students report using stimulant medications for recreational purposes, and others sell the medication illegally (Lookatch et al., 2012; McCabe et al., 2005). Contingencies such as medication serve as positive reinforcement that motivates some individuals to malinger. Although exact numbers are unknown, malingering has been estimated to occur in as many as 22% to 47% of college-aged ADHD referrals (Marshall et al., 2010; Sullivan et al., 2007). A number of studies have investigated college students' ability to malinger, the strategies that malingers use, and the ability of the current validity indicators to detect malingering.

One of the first studies on malingered ADHD in college students was conducted by Quinn (2003) who investigated the ability of college students to fake symptoms on a commonly used rating scale—the ADHD Behavior Checklist (Murphy & Barkley, 1996b). Data were collected from three groups. The clinical ADHD group consisted of college students with a clinical diagnosis of ADHD. The non-ADHD control and malingering groups consisted of college students without a history of disability. The ADHD group and non-ADHD control group were both instructed to respond and perform honestly across all measures. College students in the malingering group were instructed to fake symptoms after reading a role-playing scenario in which they struggle academically and instructed to believe that medications/accommodations will help them. The results revealed no discernible differences between the ADHD and malingering group on both Current and Retrospective self-report of Inattention and Hyperactivity (Quinn, 2003). Overall, this study was the first to demonstrate that college students could easily fake ADHD symptoms with minimal preparation.

Jachimowicz and Geiselman (2004) expanded the previous work of Quinn (2003) by examining college students' ability to malinger ADHD on four different rating scales—the Wender Utah Rating Scale (WURS; Ward et al., 1993), the Conners' Adult ADHD Rating Scale (CAARS; Conners, Erhardt, & Sparrow, 1998), the Brown Adult ADHD Scale (BAAS; Brown, 1996), and the ADHD Rating Scale (ARS; DuPaul, Power, Anastopoulos, & Reid, 1998). They randomly assigned 80 non-ADHD participants to fake ADHD on one of the four rating scales after studying the *DSM-IV* criteria for ADHD. Corroborating previous findings, these college students without ADHD were successful in meeting the ADHD symptom threshold on all four measures. Interestingly, malingering was largely associated with over-reporting hyperactivity-impulsivity symptoms. There was a higher likelihood of obtaining an ADHD diagnosis (false

positive rates) on the two measures that place a greater amount of emphasis on hyperactivity items (BAAS and CAARS). In contrast, the WURS and the ARS place less emphasis on hyperactivity items and had lower false positive rates.

Building upon previous research, Harrison, Edwards, and Parker (2007) investigated college students' ability to malinger ADHD on the CAARS—a rating scale that was previously found to have a high risk for false positives (Jachimowicz & Geiselman, 2004). This time, the researchers compared the responses from control and malingering groups to archival data of college students with ADHD. This study found that college students instructed to malinger ADHD (malingering group) reported slightly higher symptom endorsement rates compared to the clinical ADHD group on the CAARS Inattentive, Hyperactivity, and ADHD Total scales. However, this higher endorsement rate was not at levels sufficient to significantly distinguish the malingering group from the clinical ADHD group. This slight over-reporting relative to the clinical ADHD group has been confirmed in other studies (e.g., Harrison & Edwards, 2010). The findings suggest that given minimal information about ADHD, college students without disabilities can mimic symptom reports on rating scales that align with true ADHD symptom presentation. Yet, the tendency for malingerers to slightly over-report symptoms creates the unanswered question of whether malingerers may also endorse exaggerated or unrealistic symptom items that are not frequently endorsed by those with ADHD.

Several other studies have since confirmed the aforementioned findings that college students can deceive various ADHD rating scales with little to no preparation (Booksh, Pella, Sing, & Gouvier, 2010; Fisher & Watkins, 2008; Marshall et al., 2010). Across studies, malingerers report slightly higher endorsements on ADHD symptom items, but again, these rates are not statistically different from those with true ADHD. These studies also indicate that

malingerers exaggerate more on hyperactivity-impulsivity items in comparison to those with ADHD (Harrison et al., 2007; Harrison & Edwards, 2010; Jachimowicz & Geiselman, 2004) as well as those with ADHD with co-morbid diagnoses (Williamson et al., 2014). Although the reason for malingerers to favor hyperactivity-impulsivity items is largely unknown, they are more observable than internalizing symptoms (i.e., inattention). In fact, the general population has a tendency to implicate hyperactivity-impulsivity symptoms with an ADHD diagnosis (McLeod et al., 2007). Thus, exaggerated hyperactive-impulsive items (e.g., run around the house), that would not be endorsed by true ADHD individuals, might be endorsed by malingerers.

In addition to the hallmark symptoms of inattention and hyperactivity, ADHD is associated with functional impairment and executive functioning deficits (Barkley, Murphy, & Fischer, 2008). Unfortunately, like ADHD symptom rating scales, functional impairment and executive functioning rating scales are also easily deceived by adults' malingering ADHD. For example, Marshall and colleagues (2016) reviewed archival data of adults with ADHD aged 17-55, with approximately 80% of the sample between the ages of 17-30 and referred from a university mental health clinic. They divided the sample into ADHD and suspected malingering groups identified using the Slick (1999) criteria, which are two or more PVT failures, or one PVT failure and one SVT failure. Overall, the ADHD and suspected malingering groups had statistically similar responses on ADHD symptoms, executive functioning, and functional impairment rating scales. Consistent with previous research, this study also suggested that suspected malingerers slightly over-report symptoms. In addition, the malingering group also slightly over-reported executive functioning difficulties in comparison to the ADHD group. Due to this tendency to over-report, the malingering group was more likely to exceed the manual's

cut score reflecting impairment in this domain compared to the ADHD group. Both groups reported similar levels of impairment, yet, more individuals in the ADHD group (41%) ultimately met the functional impairment criterion in comparison to the malingering group (31%). These results suggest that assessments of ADHD symptoms, executive functioning, and impairment can be faked by individuals who are intentionally seeking an ADHD diagnosis.

Sollman, Ranseen, and Berry (2010) also investigated malingered ADHD in a college sample. They asked the additional question of whether the use of monetary incentives would impact college students' motivation and ability to malinger symptoms on various ADHD assessments, a topic that had only been considered by two previous studies (Booksh et al., 2010; Fisher & Watkins, 2008). To increase motivation to fake ADHD, the malingering group in the Sollman et al. study was informed that they would receive an additional incentive if they successfully obtained an ADHD diagnosis. Similar to previous studies, the researchers found small differences between the ADHD group and the malingering group on both rating scales. Yet contrary to previous research that did not use incentives (e.g., Quinn, 2003), this study found that malingerers were just as successful in faking ADHD on performance validity tests, commonly viewed as a gold standard for accurate ADHD diagnosis (Sollman, Ranseen, & Berry, 2010). This research highlights the power of incentives in motivating college students to malinger ADHD, and supports the inclusion of an incentive in the current project, along with future malingering simulation studies.

Overall, research has shown that college-aged students are able to feign ADHD symptoms on a symptom rating scale, and they achieved greater success when provided with a monetary incentive in simulation studies. In addition, these studies suggest that malingerers tend to over-report ADHD symptoms, particularly hyperactivity symptoms. Because clinicians rely

heavily on elevated symptom endorsement to determine presence of ADHD, clinicians cannot easily detect malingerers who report only slightly higher symptom endorsement to those with true ADHD. Thus, there is a clear need to include symptom validity tests within symptom rating scales to detect valid and invalid performance.

Assessment of Malingered ADHD. Research has demonstrated that current symptom rating scales are susceptible to false positives and are successfully feigned by college students. Although the added use of PVTs can improve ADHD diagnostic accuracy over clinical judgment and rating scales alone (Booksh et al., 2010; Marshall et al., 2016), some clinicians view PVTs as merely supplemental to rating scales and others do not use them at all (Musso & Gouvier, 2014; Nelson et al., 2014). Another way to validate responding is to embed an SVT within a rating scale, and some researchers have stressed the need for such validity indicators in ADHD evaluations (Musso & Gouvier, 2014; Tucha, Fuermaier, Koerts, Groen, Thome, 2015). Currently, there are few SVTs embedded in ADHD rating scales, and unfortunately, even fewer that have any capability to detect malingered ADHD.

The CAARS is one ADHD rating scale that utilizes embedded validity scales. One of these validity scales is the Inconsistency Index, which is used to determine whether a respondent answered similar items in a consistent manner. For example, two items on impulsive behavior would be expected to be answered the same by a consistent rater. To investigate the use of the CAARS Inconsistency Index to detect malingered ADHD, Suhr and colleagues (2008) examined archival data of individuals with ADHD and those who gave noncredible performance on a PVT (suspected malingering group). This study found that the CAARS Inconsistency scale had inadequate specificity to detect the suspected malingering group. Results indicated that suspected malingers reported high rates of ADHD behaviors on the majority of ADHD items, but

were not "inconsistent" in their responses on target (consistency) items (Suhr et al., 2008). For example, a suspected malingerer who reported a high endorsement rate on one impulsivity item was more likely to report a similar high endorsement on another impulsivity item. Therefore, the CAARS Inconsistency Index is an ineffective measure of malingering.

In addition, the CAARS manual advises that a T-score above 80 on the Hyperactivity and/or Inattention Scales could indicate symptom exaggeration. Yet, Suhr and colleagues (2008) found this method also to be insensitive to detect the suspected malingering group. In this study, over 50% of individuals across all three groups (ADHD, noncredible performance, and psychological control) received a T-score of 80 or above on the CAARS Inattention scale. Although a greater percentage of the malingering group had elevated T-scores >80 on the Hyperactivity Index, this was not at levels to effectively distinguish differences from the ADHD and psychological control groups. Overall, this study demonstrated that these two CAARS validity scales are not reliable detectors of malingered ADHD (Suhr et al., 2008).

The study by Suhr and colleagues (2008) supported the finding that malingerers tend to exaggerate more on hyperactivity items than individuals with ADHD (e.g., Jachimowicz & Geiselman, 2004). In contrast, Barkley, Murphy, and Fischer (2008) indicated that inattention symptoms are more often endorsed by adults with ADHD. Following this finding, Marshall and colleagues (2010) examined whether a significant discrepancy between self-report on the inattention items and a clinician's behavioral observations could detect malingered ADHD. This discrepancy strategy was applied to archival records of 268 ADHD assessments and demonstrated 86% specificity to rule-out true cases of ADHD, yet it only had 35% sensitivity to detect malingering (Marshall et al., 2010). Therefore, it appears that inconsistencies between

clinical observations and reported ADHD symptoms are not able to separate true ADHD from malingered ADHD.

Because ADHD symptoms alone are ineffective at separating true ADHD from cases of malingering, a better strategy might be to embed symptom validity items within self-report measures. The Clinical Assessment of Attention Deficit-Adult (CAT-A; Bracken & Boatwright, 2005) is an ADHD rating scale that includes an embedded validity scale designed to detect malingering, called the Infrequency scale. The CAT-A Infrequency scale consists of 10 items that appear to be ADHD symptoms, but are only endorsed by 1 - 6% of the ADHD population. For example, one infrequency item used in this scale is "I work more energetically than most people." The CAT-A manual suggests that high endorsement on three or more of the Infrequency scale items indicate possible noncredible report (Marshall et al., 2010).
It should be noted that the CAT-A was standardized on a relatively small sample ($N = 369$; ADHD $n = 67$), and lacks psychometric support for the Infrequency scale. Marshall and colleagues (2010) found that by using the manual cutoff of three items on the Infrequency scale, this scale detected malingering with sensitivity of 58.33% at optimal specificity of 89.39%. Using a cutoff score of four or more items decreased malingering sensitivity rates to 36.11%, but improved the specificity to 96.97%. Although, this infrequency scale only demonstrated moderate success rates to detect malingered ADHD, it is better than the other available validity scales (Marshall et al, 2010). These findings provide some evidence for the use of an infrequency scale similar to the one on the CAT-A. Nevertheless, more work is needed to develop a symptom validity test to detect malingering versus true ADHD with high sensitivity and specificity.

A pilot study by Suhr, Buelow, and Riddle (2011) examined an infrequency validity scale based on 12 items from the CAARS. They used archival data and identified those with a score of 20 or less on 12 CAARS items that were endorsed infrequently (<10%) by individuals with ADHD, other psychological disorders, and general controls. Overall, the authors reported that the created CAARS Infrequency Index (CII) could accurately classify suspected malingerers with 67% to 92% accuracy. The CII demonstrated the best detection abilities for identifying over-report on the CAARS Hyperactivity Scale (T score >80), with 80% sensitivity at 93% specificity. Yet, at excellent specificity levels (100%), the CII only had the sensitivity to detect 30% of individuals who over-reported on the CAARS Inattentive scale. Additionally, the CII lacked the ability to identify suboptimal performance on a PVT (24%) at 95% specificity levels.

Although the CII demonstrated some promise in detecting malingering, the Suhr et al. (2011) study did have certain limitations. The study was based on archival records with group assignment to ADHD and malingering groups based upon PVT performance. Therefore, it is unknown whether suboptimal performances on the PVT were actual cases of malingering. Also, this index only displayed adequate detection of over-report on ADHD Hyperactivity index, which is not a reliable malingered ADHD measure (e.g., Suhr et al., 2008). To reexamine the utility of the CII, Fuermaier and colleagues (2016) conducted a simulation study in which college students were instructed to malinger ADHD. They compared CII scores of the simulated malingerers to those of students with ADHD. They found that the CII had only modest ability to detect the malingering group, with sensitivity of 32% at a modest 65% specificity level (Fuermaier et al., 2016). Although these rates are better than clinical judgment and the use of rating scales alone, the findings from this study do not support the CII as a reliable indicator of malingered ADHD.

Outside of ADHD assessment, there are well-established validity scales that have demonstrated the ability to detect malingered psychopathology with high sensitivity and specificity rates. One common assessment tool is The Personality Assessment Inventory (PAI; Morey, 1991) that includes several negative distortion validity scales. The Negative Impression Management (NIM), Malingering Index (MAL), and the Rogers Discriminant Function (RDF) have demonstrated high sensitivity and specificity to detect feigned psychopathology using a cutoff T-score of 70 or above (Morey, 1991). Several studies have analyzed the use of PAI validity scales to detect malingered ADHD. Unfortunately, the research does not fully support the clinical utility of these scales to detect malingered ADHD. To begin, two studies (Pella et al., 2012; Sullivan et al., 2007) using archival data found that those suspected of malingering rarely (<22%) exceeded the cutoff on the PAI validity indicators that would raise alarm to potential malingering. Two simulation studies demonstrated greater detection rates for the RDF, an infrequency scale, but with only moderate specificity levels (Musso, Hill, Barker, Pella, & Gouvier, 2014; Rios & Morey, 2013). The increased accuracy rates with the RDF provide evidence to support the use of an infrequency validity scale. But the unreliable detection accuracy with the PAI validity indicators precludes its use to detect malingered ADHD.

Recently, Harrison and Armstrong (2016) created an ADHD infrequency scale from the 17 "pathological" items of the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986), plus one additional item about academic functioning. They reported that the DES items are related to inattention, but are infrequently endorsed by the general population. These items were embedded into the CAARS and administered to undergraduate students seeking treatment (clinical archival data) and those not seeking treatment (simulation design). This allowed for the comparison of two malingering groups (clinical Suspected Malingering and non-clinical

Simulated Malingering), two control groups (clinical Controls, and non-clinical Controls), and a clinical ADHD group.

The results revealed that both Suspected and Simulated Malingering groups had a higher total score on these 18 items compared to the ADHD, and two Control groups. While the total sum of these items was able to accurately classify Honest reporting groups (85.3%), a significant proportion (75.3%) of Suspected/Simulated malingerers were also misclassified as Honest. ANOVA analyses revealed five candidate items from the DES with the largest response differences between the ADHD and malingering groups. To increase detection accuracy, the researchers created an Exaggeration Index comprised of eight validity indicators—the five best DES items, sum of the 18 DES items, and over-report (T score >80) on the CAARS Inattention and Hyperactivity Indexes. On this created Exaggeration Index, failure on one or more of the validity indictors revealed moderate sensitivity (51%) at optimal specificity levels (88%; Harrison & Armstrong, 2016). These results are mildly encouraging, but validation studies are needed prior to clinical application on this validity test.

In conclusion, various validity scales have been examined as potential methods to determine who has ADHD and who is feigning the disorder. The research provides some evidence for the use of an infrequency scale (i.e., CAT-A Infrequency scale; PAI RDF). Unfortunately, the available validity scales require further validation (e.g., CAT-A) or fall short of adequate sensitivity and specificity levels to detect malingered ADHD (i.e., CAARS Inattention, CAARS Hyperactivity, CII, PAI negative validity scales). A successful infrequency scale would include items that seem to describe ADHD-type behaviors, yet are infrequently endorsed by those with ADHD, and frequently endorsed by those faking ADHD (Jasinski et al., 2011; Tucha et al., 2015). To date, no ADHD validity scale has accomplished this level of

detection. Because the currently available scales are either ineffective, unreliable, or not validated malingering detectors, additional research is needed to pilot test validity items that are intentionally designed to obtain over-endorsement by malingered ADHD, but not for individuals with true ADHD.

Purpose of the Present Study

Over the past 15 years there has been an increase in both public awareness about ADHD and referrals for adult ADHD evaluations (Barkley, Murphy, Fischer, 2008). It appears that incentives such as medication, academic support, and test accommodations might be generating some of this increased interest in obtaining an ADHD diagnosis. In addition, these incentives are suspected to promote increased rates of faking through symptom exaggeration and noncredible performance on psychological tests. It is also known that college students have a positive view towards the incentives that stem from an ADHD diagnosis (Lookatch et al, 2012; McCabe et al, 2005). This creates an atmosphere that increases the likelihood that a portion of self-referred college students will malinger ADHD symptoms to obtain these incentives (Musso & Gouvier, 2014).

Diagnosis of ADHD is based largely on symptom self-reports and clinical judgment (Musso & Gouvier, 2014; Nelson et al., 2014). However, rating scales are subjective and easy to manipulate to obtain an ADHD diagnosis (Harrison et al., 2007; Jachimowicz & Geiselman, 2004; Quinn, 2003; Sollman et al., 2010). Unfortunately, clinicians often do not measure or account for functional impairment in the diagnostic process (Nelson et al., 2014). As a result, clinicians may be susceptible to make false positive diagnoses, especially when they see themselves as advocates for the students.

There is a need for better measures and methods to diagnose ADHD accurately (Musso & Gouvier, 2014; Tucha et al., 2015). Most ADHD rating scales include only a list of symptoms that are easily learned and often endorsed by non-ADHD individuals. There are measures of functional impairment, but most are not specific to ADHD, are not included in ADHD symptom rating scales, and are not incorporated by clinicians in their evaluations. In addition, the available validity scales lack adequate sensitivity and specificity to detect malingered ADHD. The literature suggests a need for a multidimensional measure that assesses for ADHD symptoms, functional impairment, and a validity indicator to detect malingered ADHD.

The purpose of this study was to pilot test the effectiveness of a Multidimensional ADHD Rating Scale (MARS) designed to identify ADHD and detect malingering. This measure included three groups of items: ADHD symptoms, functional impairment, and symptom validity. The ADHD items were based on the 18 ADHD symptoms from the *DSM-5*. Functional impairment items were created and based from various impairment rating scales. Symptom validity items were created to reflect exaggerated ADHD symptoms, yet could be infrequently endorsed by individuals with ADHD. The goal of this new measure was to assist with the diagnosis of ADHD in adults by examining the presence and severity of ADHD symptoms, extent of functional impairment associated with the symptoms, and to provide a method to detect suspected cases of malingering (symptom validity). The self-report measure was constructed to yield five indexes that could be used to make diagnostic determinations: ADHD Total symptom index, ADHD Inattention index, ADHD Hyperactivity-Impulsivity index, Functional Impairment index, and Symptom Validity index.

In order to assess the diagnostic efficacy of the pilot instrument, the study formed

three groups of college students (those with an ADHD diagnosis, non-ADHD controls, and non-ADHD students instructed to malinger). First, the symptom validity items were subjected to a multi-step analysis to identify the candidate items for a pilot symptom validity index. Next, group comparisons were examined for all index scores. Lastly, this study conducted analyses to determine the classification accuracy for each index.

Group Comparison Hypotheses. An aim of this study was to determine between-group comparisons for the primary MARS indexes: ADHD Inattention index, ADHD Hyperactivity-Impulsivity index, ADHD Total index, Functional Impairment index, and the Symptom Validity index.

ADHD Symptom Indexes. The first set of group comparison hypotheses surrounds the three ADHD symptom indexes. For the Hyperactivity-Impulsivity index (H-index), it was predicted that the Malingering group would report a significantly higher score compared to the ADHD group. It was hypothesized that both Malingering and ADHD groups would have significantly higher total H-index score compared to the Control group. For the Inattention index (I-index) and ADHD Total index, it was expected that there would be no significant differences between the Malingering and ADHD groups. Yet, it was expected that the Malingering and ADHD groups would be significantly higher on both ADHD Total index and I-index scores compared to the Control group.

Functional Impairment Index. It was predicted that the Malingering group would report a significantly higher Functional Impairment index (FI-index) score compared to the ADHD group. It was hypothesized that both the Malingering and the ADHD groups would have a significantly higher FI-index score compared to the Control group.

Symptom Validity Index. It was hypothesized that the Malingering group would have a significantly higher Symptom Validity index (SV-index) score compared to the ADHD group and Control group. It was predicted that the ADHD group would have a significantly higher SV-index score than the Control group.

Classification Accuracy Hypotheses. The final aim of this study was to conduct preliminary analyses on the classification accuracy of the five indexes. It was predicted that the SV-index would have sensitivity greater than 58% to detect the Malingering group and specificity rates greater than 89% to not identify the ADHD and Control groups. These rates were derived from the best available ADHD validity indicator found in the CAT-A (Marshall et al., 2010). It was also predicted that this pilot SV-index would have superior accuracy, predictive power, sensitivity, and specificity to detect malingering compared to the four ADHD indexes' ability to diagnose true ADHD.

Method

Participants

This study recruited participants with and without ADHD between the ages of 18-26. G*Power was used to calculate an a priori sample size for the between-group comparisons for small effect sizes (.25-.30). With this effect size range, an estimated total sample size of 111-159 was needed to achieve a power of .80.

ADHD group. The ADHD group was recruited by invitation letters and publically posted flyers (Appendix A and B). The eligibility criteria were that participants have a professional diagnosis of ADHD and be between the ages of 18-26 (i.e., "college-aged"). Between October 2014 and March 2015, the Syracuse University's Psychological Services Center (PSC) was used as the sole recruitment site. However due to low referral number from

the PSC (*n*=4), recruitment was expanded to other sites and professional contacts. Between March 2015 and May 2016, 77 individuals initiated contact for more study information as a result of the study flyer/letter. Of those contacts, 43 elected to complete the phone screening. Participants reported the following recruitments sites: Syracuse University (*n*= 32), professional contacts (*n*=7), Virginia Department of Rehabilitative Services (*n* =2), and SUNY Cortland (*n* =2). From the phone screening, 37 individuals were found eligible to participate in the study. The reasons for ineligibility were: No diagnosis of ADHD (*n*=4), no evidence of impairment (*n*=2), and a complicated medical/diagnostic history (*n*=1). Two participants who were found eligible did not complete the online survey.

Of those found eligible (*n* = 41), 39 participants completed the online study materials. This included 17 males (43.6%) and 22 females (56.4%) with an average age of 20.74 (*SD*=2.62) years. The range was 18-27 for this group. The 27-year-old participant was retained as she was recruited at the age of 26. All participants self-reported a primary diagnosis of ADHD. Nineteen (48.7%) reported at least one comorbid disorder. The co-morbid diagnoses included learning disability (*n*=5, 12.8%), depression (*n*=7, 17.9%), anxiety (*n*=11, 28.2%), and bipolar disorder (*n*=1, 2.6%).

Non-ADHD Groups. The two non-ADHD groups were comprised of undergraduate students in an introductory psychology class. In total, 147 participants were assigned to the Control (*n*=74) and Malingering (*n*=73) groups. Of the 73 participants in the Malingering group, 17 were removed from the analyses for the following reasons: Self-reported ADHD diagnosis on the demographic survey (*n*=6), missing data (*n*=4), admission of poor study effort (*n*=2), and extreme outliers on the ADHD indexes (*n* =5). The Malingering group (*n*=56) included 26 males (46.4%) and 30 females (53.6%), with an average age of 18.79 (*SD*=1.00) years. Five

participants self-disclosed disabilities: Learning disability (*n*=1, 1.8%), hearing impairment (*n*=1, 1.8%), depression (*n*=1, 1.8%), anxiety (*n*=1, 1.8%), and depression/bipolar disorder (*n*=1, 1.8%).

Of the 73 Control participants, 11 were removed for the following reasons: Incomplete data (*n*=1), not meeting study age criteria (*n*=1), self-reported ADHD diagnosis (*n*=1), no response to effort question on the exit survey (*n*=1), failing at least one "catch" item (*n*=6), and identified as extreme outlier on the ADHD indexes (*n*=1). The Control group (*n*=62) included 31 males (50.0%) and 31 females (50.0%) with an average age of 19.05 (*SD*=1.03). Four students reported the following disorders: Depression, anxiety, depression and anxiety, and bipolar disorder. Additional group demographic information, including ADHD symptom presentations at two different cutpoints, is summarized in Table 1.

Group characteristic analyses. Chi-square tests were used to explore whether the three groups exhibited significant differences on the demographic categories of sex, ethnicity, year in school, and reported first language (English/other). There was no significant difference between the groups on sex, $\chi^2(2, n = 157) = .41$, $p = .81$. There was a significant difference between the groups on year in school, $\chi^2(10, n = 157) = 45.16$, $p < .001$, and first language $\chi^2(2, n = 157) = 10.28$, $p = .006$. A one-way analysis of variance also revealed a significant difference between groups on age, $F(2, 136) = 18.19$, $p < .001$.

Due to the significant differences in year in school, age, and language between the three groups, additional analyses were used to explore whether there were significant differences between the two non-ADHD groups (Control and Malingering) on these and other variables (i.e., disorder status, school problems, medication use, and stimulant use). A Bonferroni correction was implemented and resulted in an alpha of .05/6 = .008. The chi-square test revealed no

significant difference between the non-ADHD groups on year in school $\chi^2(3, n = 118) = 2.61, p = .46$. There also was no significant age difference between the Control and Malingering groups, $F(1, 98) = 1.61, p = .21$. These analyses revealed that the ADHD group had a larger proportion of older, more educated students in comparison to the non-ADHD groups. It is suspected that the use of different recruitment methods for the ADHD (i.e., professional contacts) and non-ADHD groups (i.e., undergraduate psychology course) contributed to these group differences between age and year in school.

There was a significant difference between the non-ADHD groups on first language learned $\chi^2(1, n = 118) = 9.27, p =. 002$, with a higher percentage of other first languages reported in the Control group (19.4%) in comparison to Malingering group (1.8%). Additional chi-square analyses revealed no significant differences between these two non-ADHD groups on sex $\chi^2(1, n = 118) = .15, p =.70$, disability status $\chi^2(6, n = 106) = 3.49, p = .75$, school problems $\chi^2(1, n = 117) = .28, p = .60$, medication $\chi^2(1, n =118) = .035, p = .85$, or stimulant use $\chi^2(1, n =118) = .01, p = .92$. Subsequent analyses revealed that age and year in school were not significant covariates on the majority of MARS indexes. However, as discussed in the results section, language was found to be a significant covariate on the FI-index.

Materials

Multidimensional ADHD Rating Scale (MARS). The MARS is divided into three components:18 ADHD symptom items listed in the *DSM-5*, 104 pilot symptom validity items, and 22 functional impairment items. A team of ADHD professionals generated the symptom validity items. The items were based upon exaggerated examples of *DSM-5* ADHD symptoms. The MARS also contained three "catch" items (e.g., "respond 3 if you are still reading this survey") embedded in the scale to assess for effort and attention to the survey. Section one

contains the 18 ADHD symptoms (#1-18) and the pilot symptom validity items. Section two contains the functional impairment index. These 147 items (plus additional Sluggish Cognitive Tempo items not included in this study) are located in Appendix C.

All items used a 9-point Likert response scale. This is based upon research that indicated optimal validity, reliability, and discriminative power is attained using >5 response choices on a scale (Preston & Colman, 2000). For all MARS items, five response labels were equally spaced on a 0-8 numeric scale. The first section with the ADHD symptoms, SV-items, and Sluggish Cognitive Tempo items (not included in the present study) used a frequency scale, with the labels 0=*Never*, 2=*Rarely,* 4=*Sometimes*, 6=*Often*, and 8=*Very Often*. The functional impairment index used a severity scale, with the labels 0=*Not at All,* 2=*Somewhat*, 4=*Mild*, 6=*Moderate*, and 8=*Severe*.

Five index scores were formed from the MARS items. The ADHD Inattention index (I-index) was composed of the total score of nine ADHD inattention symptom items, with a maximum total score of 72. The ADHD Hyperactivity-Impulsivity index (H-index) was composed of the total score of nine ADHD H-items, with a maximum total score of 72. The ADHD Total index was the sum of all 18 ADHD symptom items, with maximum total score of 144. The Functional Impairment index (FI-index) was composed of the total score of the 22 functional impairment items, with maximum total score of 176. The final SV-index consisted of seven items, with a maximum total score of 56.

To provide additional characteristics of the sample, the three *DSM 5* ADHD presentations were determined using the ADHD inattention and hyperactivity-impulsivity items at two different cutpoints. First as the midpoint is traditionally used to signify elevated responses on commonly used ADHD rating scales (e.g., BAARS, CAARS), elevated responses were defined

as a response higher than the response scale midpoint (≥ 4). Second, because *DSM-5* indicates that ADHD symptoms must occur "often," scores ≥ 6 (*Often*) were used as another cutpoint. To meet the Inattentive presentation symptom criterion, an individual needed to have elevated scores above each cutpoint on at least five ADHD inattention items. An elevated score above each cutpoint on at least five ADHD hyperactivity-impulsivity items qualified for Hyperactive-Impulsive presentation symptom criterion. The Combined presentation occurred when an individual met the symptom criteria for both Inattentive and Hyperactive-Impulsive presentations.

ADHD Screening Form. A screening form was used to verify ADHD diagnosis and study eligibility for individuals recruited outside the PSC. The focus of the screening questions was to verify ADHD diagnosis, symptoms, and impairment (Appendix D). Individuals met study eligibility if they a) had a diagnosis of ADHD, b) received the diagnosis from a qualified professional (e.g., psychologist, counselor), c) symptoms occurred before the age of 12, d) they currently experience symptoms, and e) reported impairment in at least one area (i.e., academic, occupational, or social). Additional information was collected, including age of diagnosis, but this was not used as a factor to determine study eligibility.

Demographic Questionnaire. Individuals completed a brief demographic questionnaire. Questions asked a) age, b) gender, c) ethnicity d) year in college, e) GPA, f) diagnosis, g) accommodations in college, h) medication, i) use of stimulant medication and j) school problems (Appendix E).

Exit Survey. Individuals completed an exit survey inquiring about his/her experience completing the self-report measure. All participants answered questions about previous ADHD knowledge. In addition, all participants were asked about effort and whether they adhered to the

assigned study protocol (honest or malinger). The ADHD and Control exit survey can be found in Appendix F. The Malingering group responded to additional items about strategies that they used during the self-report measure to successfully fake ADHD (Appendix G).

Debriefing Letter. In order to increase effort, the Malingering group was informed at the beginning of the study that they needed to successfully fake ADHD to receive an incentive ($100 Visa gift card raffle drawing). The debriefing letter provided at the end of the study informed them that all participants who completed the study, regardless of effort, would be entered into the raffle drawing (Appendix H).

Procedures

ADHD Group. All data were collected via an online survey system. The online system presented the ADHD symptom and symptom validity items in random order. Eligible individuals with ADHD independently completed the online survey sent via email. After reviewing and signing the electronic informed consent (Appendix I), individuals completed the demographic questionnaire. Prior to completing the MARS, the ADHD group received written instructions to complete the MARS honestly, and additional instructions for those receiving treatment (e.g., medication) to answer items as if they were not receiving treatment. They then proceeded to complete the two sections of the MARS, followed by the exit survey. They were instructed during the phone screening to contact the researcher after completing the study to verify mailing address and to ensure timely receipt of the cash compensation.

Non-ADHD Groups. To reinforce adherence to group procedures, non-ADHD participants were administered the study via in-person group sessions. Both groups began by reviewing the informed consent (Appendices J and K) and the purpose of the study. After electronic consent was obtained, both groups completed the demographic questionnaire. Next,

participants were provided with the verbal and written instructions based upon his/her group assignment. The Control group received instructions to respond honestly on the MARS self-report measure. The Malingering group received instructions to complete the MARS by faking the symptoms and diagnosis of ADHD. Additionally, they were informed that those who faked ADHD would be entered into a raffle drawing for a $100 gift card. To assist them, this group was provided with an instructional packet with a short case scenario adapted from Sollman and colleagues (2010) that described why an individual would want to malinger ADHD. The remainder of the Malingering instructional packet contained information about the symptoms and long-term prognosis of ADHD. This information was adapted from WebMD ADD & ADHD Health Center website (Appendix L). Participants were provided 5 minutes to review the malingering instructional study packet. After time had elapsed, the Malingering group returned the study materials to the researcher and completed the MARS. Next, all participants completed the appropriate exit survey. After completing the exit survey, the Malingering group participants were provided with the debriefing letter.

Incentives. Incentives were offered to each participant to assist with study recruitment as well as increase motivation and effort. The Control and Malingering group received 1 credit hour through Sona Systems towards his/her psychology coursework requirement. The ADHD group received $20 cash or 1 credit hour through Sona Systems for completing all study materials. Both of these incentives were allocated on a continual basis. All three conditions were also entered into a raffle drawing of $100 Visa gift card for completing the study materials. The raffle occurred in May 2016.

Procedural Integrity. Researcher adherence to the Control and Malingering condition protocols was verified with the procedural script (Appendices M and N). The primary researcher

checked off the boxes after each step was completed. A research assistant was present to assist with procedural integrity and administration of the protocol in 8 of 22 (36%) sessions. The procedural integrity for these eight sessions was 100%.

Research Design and Statistical Analyses

Similar to previous studies, the current study used a three-group research design. To reduce the quantity of symptom validity items, possible items were subjected to infrequency and mean difference analyses. This methodology (described fully below) resulted in a small set of SV items that had the most potential to distinguish ADHD from Malingering cases. The next set of analyses involved between-group comparisons on the five total index scores. The dependent variables were the total raw score for each of the five indexes. Five separate omnibus tests analyzed the between-group differences for each index. Across omnibus and post-hoc procedures, Bonferroni corrections were utilized to control for the effect of repeated contrasts, resulting in an alpha of .01. Omega squared (ω^2) was calculated to provide a less biased and more conservative effect size estimate.

Next, receiver operating characteristic (ROC) analyses were conducted to determine each of the five index's ability to predict two criterion variables. Five separate ROC analyses were used to predict cases of ADHD between ADHD and Controls. Five ROC analyses were used to identify cases of malingering between ADHD and Malingering groups. For all ROC analyses, the predictor test was one of the five index scores.

The ROC analyses included Area Under the Curve (AUC) and graphical plots of sensitivity and (1-specificity) at each cutpoint. An AUC of 1.0 is considered a perfect test, while an AUC of .50 is no better than chance (50%). Although there are several different ways to establish cutpoints (Youngstrom, 2013), this study identified two thresholds of optimal

sensitivity (~90%) and optimal specificity (~90%). These optimal thresholds provide two important data points about the instrument's ability to classify true positives and true negatives. For three self-report symptom indexes and one impairment index, the goal was to detect as many true ADHD positives (sensitivity) that may warrant additional assessments. For the symptom validity index, the goal was to correctly identify cases of suspected malingering, but not classify true ADHD (specificity; true negatives for malingering). From both optimal sensitivity and specificity cutpoints, correct classification rates were computed to present the proportion of true positive and true negative cases compared to the whole sample. Furthermore, positive predictive power (PPP) and negative predictive power (NPP) were calculated to provide information on the probability that the test outcomes are accurate. In other words, whether an individual truly has the diagnosis with a positive test result (PPP), and does not have the diagnosis with a negative test result (NPP). However, as NPP and PPP are dependent upon base rate, NPP and PPP were calculated with the study's base rate of malingering (58.9%) and ADHD (38.6%), along with the estimated population base rate of adult ADHD (5%; DuPaul et al., 2004), and a median malingering base rate estimate (30%; Suhr et al., 2008) obtained from research.

Results

Data Preparation

Data input and consistency checks. The primary researcher was responsible for downloading the online information. Initially, the data were downloaded into a Microsoft Excel spreadsheet, organized, and then transferred to SPSS for data analysis. All information was examined to verify quality of the data. As previously reported, data were analyzed to verify age eligibility, group membership (e.g., ADHD diagnosis), failure to complete the study, response bias and catch item failures. Additionally, extreme outliers in the Control (n=1) and Malingering

groups (n=5) on the ADHD symptom indexes and FI index were removed from the data set. Twenty-four participants had one occurrence of a missing value within one of the indexes. As these missing values would depreciate the dependent variable (index total score), missing values were replaced with the mean for the given participant's index (Kantardzic, 2003).

Assessing Assumptions. In preparation for the omnibus tests, data were assessed for covariates, outliers, skewness, kurtosis, and homogeneity of variance. First, the MARS indexes were re-examined for outliers. A 90% Winsorization method was used on the seven outliers remaining in the three groups on the ADHD I-index, ADHD H-index, FI-index, and the final SV-index (Howell, 2010). The ADHD Total index was calculated with the sum of the winsorized ADHD I-index and ADHD H-index. Afterward, normality for each index was assessed by examining Q-Q plots, histograms, skewness, and kurtosis. All indexes were found to have skewness and kurtosis <1.0. Next, covariates were investigated for the five indexes. Age, sex, and language were not found to be significant covariates on the ADHD symptom indexes and SV-index. Therefore, one-way analyses of variance (ANOVA) were used on the ADHD symptom indexes and the SV-index. Levene's F test revealed the assumption of homogeneity of variance was violated for these analyses. As a result, the Welch (1951) adjusted F ratio is reported for these ANOVA analyses.

Although sex and age were not significant covariates on the FI-index, language was found to be a significant covariate, F (1, 152) = 4.08, p = .045. This was related to a significant relationship between impairment levels and first language in the Control group only (ρ = .32, p = .011). To further investigate the nature of this covariate, the FI-index was subjected to multiple analyses with similar findings. Two separate ANOVAs with and without other first language speakers both indicated significant differences between the groups. An ANCOVA determined

that language differences had a small effect (η^2 = .03) on FI-Index score. Because of the similar findings and negligible effects of language, only the ANOVA group comparisons with all language speakers are reported. Due to the multiple comparisons, including the multiple FI-index comparisons, a Bonferroni correction was applied (α. = .05/8 =.006).

Creation of the Symptom Validity Index

Prior to conducting group comparison analyses, the first aim of this study was to compose a Symptom Validity index (SV-index). The original 104-item pool was developed via an expert consensus meeting. This item pool was then reduced to those items that would best discriminate malingerers from true ADHD cases. To do this, the SV-items were subjected to infrequency and mean difference analyses. First, SV-item means were analyzed to identify those items that were infrequently endorsed (≤ 2) in the ADHD and Control group yet frequently (≥ 5) endorsed in the Malingering group. This reduced the item pool from 104 items (Table 2) to 11 items (Table 3). Next, the remaining 11 SV-items were analyzed to identify the items with mean differences ≥ 3.5 between the ADHD and Malingering groups. The final SV-index was comprised of the remaining seven items that were identified through both infrequency and mean difference analyses (Table 4).

Index Characteristics

Internal consistency was analyzed for all five indexes. Cronbach's alpha revealed excellent internal consistency for three indexes, I-index (α = .92), ADHD Total index (α = .93), and FI-index (α = .95). The internal consistency reliability for the H-index (α = .87) and the SV-index (α = .84) were lower, but remained within the acceptable range. As expected in an ADHD rating scale, index intercorrelations were high (*r* = .82 to .92) between the I-Index, H-index, and FI-index. Additionally, ADHD-Total was highly correlated with the FI-index (*r* =

.87). Lastly, the SV-index had high intercorrrelations (r = .80 to .91) with the ADHD symptom and FI-index.

Group Comparison Analyses

The mean scores for each index were compared across the three groups. The five index mean scores and standard deviations for each group are presented in Tables 4-8. In summary, the three ADHD symptom indexes, FI index, and SV-index analyses revealed statistically significant main effects; ADHD Total Index *Welch's F*(2, 86.06) = 271.21, $p < .001$; ADHD I-Index *Welch's F*(2, 86.69) = 194.93, $p < .001$; ADHD H-Index *Welch's F*(2, 84.35) = 229.90, $p < .001$; FI-Index *Welch's F*(2, 86.96) = 88.71, $p < .001$, and the SV-index *Welch's F*(2, 77.44) = 184.14, $p < .001$. Although it was predicted that significant differences would only be obtained on select indexes, post-hoc analyses (Games-Howell) found significant differences between all three groups across the five indexes. Consistent across the five indexes, the Malingering group had a significantly higher mean score in comparison to the ADHD and Control groups. Additionally, the ADHD group had a significantly higher mean score in comparison to the Control groups across all five indexes.

To present less biased and more conservative effect sizes, omega squared (ω^2) was calculated for each main effect and is presented in Table 8. For the main effects, there were large effect sizes for all five indexes, ranging from ω^2 = .52 - .73. Larger effect sizes were obtained for the ADHD Total index and SV-index. The smallest effect size was obtained on the FI-Index.

Classification Accuracy Analyses and Calculations

A major aim of the study was to determine the classification accuracy for all five indexes to predict cases of ADHD and cases of malingering using ROC analyses and probability

calculations. All five index scores were subjected to ROC analyses. First, five ROC analyses, one for each index score, were conducted to identify cases of ADHD between ADHD and Control groups. Next, five separate ROC analyses were conducted to discriminate malingerers between ADHD and Malingering groups. Tables 9-13 present the sensitivity and (1-specificity) at each cutpoint of the five MAR indexes to identify cases of ADHD. Table 14-18 presents the sensitivity and (1-specificity) at each cutpoint on the five indexes discriminating cases of malingering. From the ROC analyses, cutpoints were identified at two different thresholds—optimal sensitivity (~90%) and optimal specificity (~90%). Tables 21-22 present additional calculations of the five indexes at these optimal thresholds. This also includes correct classification rate, and calculations of positive predictive power (PPP) and negative predictive power (NPP) at two different base rates (current sample and estimated population base rates for ADHD and malingering).

The accuracy of the index (AUC), standard error, and confidence intervals for each index discriminating cases of ADHD are presented in Table 19, and for cases of Malingering are presented in Table 20. Tables 21-22 contain the classification accuracy calculations at optimal sensitivity and specificity cutpoints for identifying ADHD and Malingering, respectively. As expected, two of the ADHD symptom indexes (Total and I-index) both had the highest AUC (.84), showing high levels of accuracy to identify cases of ADHD from Controls. However, although self-report measures traditionally rely upon sensitivity rates, the highest correct classification rate was obtained at the optimal specificity cutpoints on the ADHD H-index (80.2%) and ADHD Total index (80.2%). Yet, this was predominantly correct classification of Controls, and at least a third of the ADHD group failed to exceed this higher threshold.

As predicted, the ROC analyses identified the SV-index as the best discriminator for cases of malingering (AUC = .95), including a classification rate of 88.4% at the optimal sensitivity cutpoint. The remaining indexes also fell within good (>.80) to excellent (.90) AUC ranges for identifying significant over-report of malingerers. Contrary to predictions, the classification accuracy calculations suggest that over-report on ADHD-H and/or ADHD Total index could be used as additional validity detectors for malingered ADHD.

Additional Post Hoc Analyses

Catch Item Failure. The MARS three embedded "catch" items were identified as potential indicators to detect malingered ADHD. The three catch items (i.e., "respond 3 if you are still reading this question") were included to monitor effort and attention throughout the rating scale. Interestingly, of the 56 Malingering participants, there was a significant percentage of failure on these items. While no one in the ADHD group and only six Controls (9.7%) failed one catch item, well over one-third (39.3%) of the Malingering group failed at least one of these items. In fact, 15 participants (26.8%) failed all three catch items. In order to check for response differences, independent samples *t* tests were conducted between Malingerers who passed (*n*=34) and Malingerers who failed at least one catch item (*n*=22). This revealed no significant differences between these two groups on any of the five primary indexes, ADHD Total index $t(54) = -.73$, $p = .47$, ADHD I-index $t(54) = -.81$, $p = -.42$, ADHD H-index $t(54) = -.53$, $p = .60$, FI-index $t(54) = -.25$, $p = .80$, and SV-index $t(54) = .44$, $p = .66$. As there were no significant response differences between those who passed and failed the catch items, and none of these participants disclosed poor effort on the exit survey, it is suspected that this was an intentional "faking bad" or "carelessness" strategy to mimic the diagnosis of ADHD.

Discussion

The purpose of this study was to examine the characteristics of a newly constructed multidimensional ADHD self-report measure to jointly assess ADHD symptoms, functional impairment, and symptom validity. The aim of the new measure was to accurately classify true cases of ADHD and detect cases of malingering. The three ADHD symptom indexes were based on the 18 ADHD symptoms in the *DSM 5*. The Functional Impairment index (FI-index) consisted of newly constructed set of 22 impairment items. The Symptom Validity index (SV-index) consisted of seven items identified from a pool of 104 exploratory symptom validity items. Reliability analyses revealed all three ADHD symptom indexes, the Functional Impairment index, and Symptom Validity index had adequate internal consistency. The analyses indicated that all items could be retained to maintain this internal consistency. Although this is an expected finding for the *DSM 5*-based ADHD symptom indexes, this is an important finding in support of the new items contained within the created FI-index and SV-index.

Although it was predicted that malingerers would respond at statistically higher levels on only three indexes, the results indicated that across each of the five indexes, they endorsed items at significantly greater levels than those with ADHD and Controls. As predicted, both the ADHD and Malingering groups endorsed more symptoms and impairment than controls. Yet, even though malingerers endorsed more problem severity than those with ADHD, the traditional use of a lower cutpoint to detect clinical ADHD would also misclassify cases of malingering as "true" ADHD. In other words, malingerers were rather successful at exceeding the symptom and impairment threshold that was needed to discriminate ADHD from controls. This supports the need for a validity test to detect the exaggerated responding associated with malingering. The findings provide support for the newly created SV-index, which demonstrated better

classification than the best available validity indicator (i.e., CAT-A). Additional ROC analyses and associated diagnostic accuracy calculations demonstrated that a higher cutpoint on the ADHD symptom indexes could also provide an additional tool to detect cases of ADHD from controls and malingerers.

Detection of ADHD

Traditional ADHD self-report measures place an emphasis on sensitivity rates, or the ability to accurately identify potential cases of ADHD for further assessment. Yet aligning with previous research (DuPaul et al., 2014), this study found high rates of ADHD symptom endorsement in the Control group. This high endorsement rate led to a significant proportion of Controls (46.8%-61.3%) misclassified on the ADHD symptom indexes. The classification accuracy calculations indicated that higher correct classification rates occurred at optimal specificity levels, yet not sensitivity levels. However, the correct classification was primarily of controls, with over one third of ADHD participants misclassified with the higher specificity cutpoint. Therefore, the overall results align with recommendations to adopt a cutpoint that maximizes sensitivity to detect ADHD symptoms on self-report rating measures. This also underscores that a symptoms-only assessment results in false positive ADHD diagnoses (e.g., DuPaul et al., 2014). To increase diagnostic accuracy, evaluators should consider all *DSM 5* diagnostic criteria for ADHD, including impairment and differential diagnoses (e.g., Gathje, Lewandowski, & Lovett, 2008).

Research strongly supports the joint assessment of symptoms and impairment (e.g., American Academy of Pediatrics, 2011; DuPaul et al., 2014). However, the pilot FI-index was not an effective discriminator of clinical ADHD from Controls. Similar to the ADHD symptom indexes, a significant proportion of the study's Control group (66%) exceeded the study derived

impairment cutpoint. But this low cutpoint was established because the ADHD group reported few domains of impairment. This low endorsement of impairment could be attributed to the characteristics of the study's small clinical sample, comprised of older, more educated individuals compared to controls. Additionally, low self-reported impairment report could reflect the positive illusory bias found in this clinical population (Prevatt et al., 2012). As this is a pilot study on a newly created measure, more research is needed on larger and more diverse samples (e.g., non-university populations) to determine effective ADHD symptom and impairment thresholds. Therefore, it is recommended that clinicians still follow best practice guidelines to assess both symptoms and impairment. Additional considerations of differential explanations (e.g., year in school, culture, malingering) are also recommended in order to effectively diagnose ADHD.

Ease of Malingering

In general, the results support the research that college students fake ADHD by over-reporting on ADHD symptom and impairment items (e.g., Harrison et al., 2007; Marshall et al., 2016; Quinn, 2003). Whereas prior research typically reported non-significant differences between the groups, this study found that malingerers over-reported symptoms and impairment at significantly higher levels than students with ADHD. To explain the different outcomes of this study, the MARS scale has an expanded 9-point response scale. As previous malingering research relied upon ADHD rating scales with only 3-5 response choices, this may have created a restriction-of-range effect, which reduced the magnitude of group differences (Booksh et al., 2010; Preston & Colman, 2000). Thus, it is possible that the MARS scale was able to detect group differences because it used a more sensitive scaling approach. The results of this study

provide support for the use of expanded response scales to achieve optimal reliability, validity, and discriminative abilities with rating measures (Preston & Colman, 2000).

The study's findings also support the need for a symptom validity test to detect malingered ADHD. The Malingering group significantly over-reported symptom and impairment levels in comparison to the ADHD group. As a result, all Malingering participants exceeded the sensitivity cutpoints of all ADHD symptom indexes and FI-index that were identified to detect clinical ADHD. This confirms prior research (e.g., Marshall et al., 2016, Quinn, 2003) demonstrating that college students can easily simulate ADHD symptoms and impairment on rating scales. With suspected malingering base rates as high as 22-47% on college campuses (Marshall et al., 2010; Sullivan et al., 2007), there is a clear need to have a symptom validity index able to detect this population.

Detecting Malingering

Symptom Validity Index. The SV index was comprised of seven items that maximally separated the ADHD and Malingering groups. ROC analyses on this index led to good classification accuracy (83.2% and 88.4%) at identifying the malingerers at optimal levels of sensitivity and specificity, respectively. This SV-index demonstrated better classification rates than any available validity scale, including the CAT-A Infrequency index (Marshall et al., 2010) and the new Exaggeration Index (Harrison & Armstrong, 2016). Research (e.g., Tucha et al., 2015) has suggested that available scales are not very effective at detecting malingering, because they either utilize actual ADHD symptoms, lack face validity, or do not measure feigned ADHD well. The present study deliberately created items that have face validity via an expert consensus meeting. That is, the items could be logically associated with other ADHD behaviors yet be

infrequently endorsed by those with ADHD. This process seemed to result in a more reliable and discriminating validity scale.

Of the seven SV-items, all are based on externalizing behaviors of ADHD. Perhaps these behaviors are more easily observed and recognized, and thus more readily endorsed by non-ADHD malingerers. Or, these items may be more easily associated with a stereotype of ADHD, or the public's conceptualization of what characterizes ADHD. The general population is not well informed about ADHD, with many relying upon television and popular media as their primary sources of information (Bussing et al., 2012; McLeod et al., 2007). If this is the case, malingerers could be generalizing from things they hear that then lead to misconceptions or stereotypes about ADHD, and so they over-endorse items that they think are symptoms of ADHD.

All seven items in the final SV-index are related to symptoms of hyperactivity-impulsivity. This is in line with prior research that demonstrates malingerers tend to over-endorse hyperactivity items when trying to feign ADHD (e.g., Marshall et al., 2010; Suhr et al., 2008). Research has indicated that the general population has a tendency to associate hyperactivity-impulsivity behaviors with ADHD (McLeod et al., 2007). Yet, this public perception that ADHD is more closely related to hyperactivity is counter to the actual symptom endorsement of adults with ADHD, which tends to favor inattentive symptoms. In the current study, the clinical ADHD group had higher endorsement of inattention symptoms compared to hyperactivity items. In fact, the ADHD group's mean was 10 points higher on the Inattention index in comparison to the Hyperactivity-Impulsivity index. This, however, could be related to sample characteristics of the ADHD group. Yet, prior research has found that adults with ADHD report more elevated inattention symptoms compared to hyperactivity items (Barkley,

Murphy, Fischer, 2008). The tendency of ADHD malingerers to over-endorse hyperactivity-type items is certainly an issue worth pursuing in further research.

Interestingly, two of the SV items involved socially inappropriate behaviors of running (i.e., SV29 and SV60). Anecdotally, this is an activity that one sometimes sees with children, but very rarely with adults, including adults with ADHD. Therefore it is possible that behavioral observations of ADHD children have led malingerers to believe that these behaviors also occur in adulthood. Yet these assumptions are based upon observational evidence. At this point, it is unclear why malingerers endorse behaviors that reflect over-activity.

Interestingly, one of the six SV items involves driving abilities. Apparently, some malingerers have the perception that those with ADHD are inattentive and impulsive drivers. Research has found that individuals with ADHD demonstrate inattentive and impulsive driving behaviors that increase their risk for traffic violations and vehicular crashes (see Barkley & Cox, 2007). Therefore, the malingering group may have some knowledge or experience that created the notion that individuals with ADHD are poor drivers. In contrast, the students with ADHD in this study had a relatively low mean score on the FI index with regard to driving performance. So it appears that malingerers believe people with ADHD are poor drivers, whereas individuals with ADHD do not see themselves that way. Interestingly, this tendency to under-report general driving impairment is documented in another study, and could be attributed to the positive illusory bias (Prevatt et al., 2012). It appears that individuals with ADHD tend to report less significant driving problems than the general population actually perceives, and subsequently malingerers may use these perceptions to fake the symptoms of ADHD.

One SV item includes a target word ("fidget") that is listed among the *DSM 5* symptom criteria. It is possible that malingerers tended to endorse this item because the word cued the

individual's memory for the specific *DSM 5* symptom. In fact, the Malingering group also highly endorsed another pilot SV-item that included the word "fidget" (see Table 3). As has been discussed, the best malingering indicators have high face validity with behaviors that are associated with a target population, in this case ADHD (Jasinski et al., 2011). This suggests that the use of *DSM 5* specific words may increase face validity of the symptom validity items, and ultimately may increase the ability to detect cases of malingering.

In regards to the other two SV items (i.e., SV32 and SV56), it is not clear as to why these specific items were retained in the SV index. It is suspected that malingerers in this study endorsed these items because they fit the stereotype of people who cannot inhibit their movements. In fact, the central theme of the SV-items seems to be lack of control of some motor behavior. It would seem that such behaviors (and test items) warrant special attention in any research on the detection of malingered ADHD.

Symptom Over-report Indexes. The higher rates of symptom endorsement by the Malingering group compared to the ADHD group suggest that over-report on these indexes could be used as an additional validity indicator. Specifically, the H-index and ADHD Total-index were effective discriminators of both Malingering and ADHD. Although this aligns with research that malingered ADHD tends to over-report hyperactivity symptoms (e.g., Jachimowicz & Geiselman, 2004), the findings are in opposite to research demonstrating the unreliable use of over-report cutscores on the CAARS symptom indexes (e.g., Suhr et al., 2011). It is possible that the expanded Likert scale improved the discriminative abilities to accurately detect exaggerated response style of malingering (Preston & Colman, 2000). This could also be a unique finding of this study. Additional replication studies will help to validate the discriminative ability of the expanded Likert scale to detect malingered ADHD.

Catch Index. An unexpected finding of this study was not just the malingering group's responses on ADHD and symptom validity items, but also its high proportion of failures on the catch items. Over a third (33.9%) of students instructed to malinger ADHD failed at least one catch item, and over one quarter of the group failed all three items. These items were initially embedded to validate that an individual was paying attention to the study (i.e., reading the items), and they were not designed to be included as a part of a specific MARS index. Yet, it appears as if a portion of malingerers believed these catch items to be genuine ADHD items that they should carelessly miss because they were "faking" the symptoms of ADHD (i.e., inattention). But in actuality, no one in the ADHD group failed these items. So the catch items "caught" malingerers trying to fake, while those with ADHD attended to them. This unexpected finding could be of use in ADHD rating scales as a supplemental indicator of malingering. Although these preliminary findings need to be validated, this offers some potential use for catch items as embedded indicators of malingered ADHD.

In conclusion, the results indicate that malingerers easily over-endorse ADHD symptom, impairment, and symptom validity items. To detect cases of ADHD from controls, the use of the ADHD symptom indexes demonstrated higher classification accuracy in comparison to the remaining indexes. As predicted, the SV-index demonstrated excellent classification accuracy to detect malingered ADHD. The findings indicate the SV-index performs better at detecting malingered ADHD than any available validity measure. The study findings suggest the utility of symptom over-report and "catch" items as additional validity indicators. Impairment may slightly help differentiate ADHD from Control students, as well as malingerers from true ADHD. Overall, the findings support the use of symptom, impairment, and symptom validity indexes to effectively detect ADHD (true positives) and malingering (true negatives).

Limitations

This is an analogue study that inherently has limitations. The main limitation is the use of a simulation design. In comparison to archival studies, a simulation study has improved internal validity with experimental control of the malingering group assignment. Unfortunately, this is a contrived situation that reduces a study's external validity. A simulation study cannot adequately recreate the real life incentives and motivations for people to malinger a diagnosis (Rogers & Gillard, 2011). For example, there are actual incentives for some individuals to effectively malinger ADHD in order to receive test accommodations on a high stakes exam (e.g., Law School Admissions Test). The relative strengths and weaknesses of simulation designs must be considered in forming inferences from the findings.

This simulation study is potentially limited by the simulation coaching instructions. This study utilized a broad prompt for the malingering group to complete the MARS "faking the symptoms and diagnosis of ADHD," and those who "deceive the clinician by faking ADHD" on the self-report measure were eligible for the incentive. This was followed by 5-minutes of study with ADHD symptom information. Recent research published after the inception of this study suggests that a simulation group is able to produce more "believable" ADHD symptom reports when coached on both symptoms and general ADHD assessment information (Fuermaier et al., 2016). As clinicians should expect actual malingerers to be well-prepared for the evaluation (Rogers & Gillard, 2011), future replication of this pilot study would benefit from additional coaching instructions to improve external validity of the findings.

This study is also limited by the use of self-reported diagnoses of ADHD to comprise the ADHD group. Although efforts were made to recruit participants with a verifiable diagnosis of ADHD, ultimately recruitment needed to expand to include those with a self-reported ADHD

diagnosis. A phone screening was implemented to screen out false positive cases,, nevertheless, it is possible that a portion of the ADHD sample included individual's that would not meet stringent criteria for the diagnosis. As a result, the ADHD group may not be reflective of adult ADHD in the general population. Therefore, these findings may not generalize to all persons with ADHD. Additional research is needed to replicate these findings on a more precisely defined ADHD group, perhaps by expanding the study to additional clinics or junior and community college samples.

Another limitation that affects the external validity of the findings involves the sample selection. This was a convenient sample comprised of students and from a private university in the Northeast. The Control group had a disproportionate number of students with English as a second language. Further, the study did not collect information on intelligence, socioeconomic status, or pre-existing knowledge of ADHD. These factors limit the generalizability of findings. Additional research with larger and more diverse samples is needed to replicate and extend the current work on this pilot measure.

Additional Directions for Analyses and Research

This is an exploratory study of a newly constructed ADHD rating scale (MARS). The findings and limitations offer avenues for further research on ADHD and Malingering classification. If nothing else, further research is needed to replicate the results from the MARS and examine its applicability in clinical settings.

This study provides introductory support for the face validity and discriminative validity of this multidimensional self-report measure. However, these preliminary findings would benefit from replication that could substantiate, clarify, and better explain the findings. Additionally, as this is a test construction project, this measure is in need of ongoing reliability and validity

testing. For example, regression analyses should be conducted to examine the extent to which the index scores (and catch items) individually and collectively predict the presence of ADHD, as well as the detection of malingering. Furthermore, factor analysis is needed to determine the actual structure of the multidimensional scale, and whether there is support for the five indexes of the measure (i.e., inattention, hyperactivity, ADHD total symptom, functional impairment, and symptom validity). Research is also needed to conduct additional validity (e.g., convergent validity) and reliability (e.g., test-retest reliability) analyses necessary to determine the psychometric adequacy of the MARS. Overall, the promising findings of this study indicate that additional data collection and analyses are warranted to continue to build confidence and support for the five indexes included in the MARS.

The current study only performed an item reduction analysis on the symptom validity items. Although reliability analyses suggested all items of the FI-index could be retained, there was no additional attempt in this study to find an optimum set of impairment items to comprise that scale. It is best practices for ADHD evaluations to assess impairment (e.g., American Academy of Pediatrics, 2011), and a FI-index was constructed and included. As many of these items were created for this pilot study, it is possible that the FI-index in this present study used extraneous items that depreciated the index's diagnostic capabilities. More research would need to be done to field test impairment items and determine the best set of items for assessing impairment in ADHD adults. Future research needs to examine the efficacy of a diagnostic rating scale for ADHD that combines symptom and impairment measurement

The seven-item SV-index demonstrated excellent sensitivity and specificity in this simulation study design. It is unknown whether these items will remain effective at detecting malingering across various clinical samples. As one should expect malingerers to be well-

prepared for the evaluation (Rogers & Gillard, 2011), future extensions of this study would benefit from coaching the simulated malingering group on the ADHD diagnosis and evaluation process (e.g., Fuermaier et al., 2015). The additional coaching may better prepare the non-ADHD group to simulate malingering and improve external validity of the findings. Additionally, the MARS would benefit from cross-validation in a clinical sample with archival data. Simulation studies have strong internal validity, while archival studies have increased external validity. The strengths of both research methodologies helps to provide the best support for creating a validity test to detect true cases of malingering (Rogers & Gilbert, 2011).

Although the current study resulted in an SV-index of seven items, it certainly is plausible that other types of items could add to the classification accuracy and improve the scale. For example, the Malingering group over-reported on functional impairment items in comparison to those with ADHD. This suggests the possibility that specific exaggerated functional impairment items could be added to the SV-index, or could form a separate symptom validity scale. With this in mind, it is recommended that additional functional impairment items be created and pilot tested to determine their contribution as potential malingering indicators.

Surprisingly, the catch items also emerged as an idea worth considering in an ADHD self-report measure. In this study, the catch items demonstrated some ability to discriminate true from malingered ADHD. Yet, it is unknown whether the catch items would yield similar diagnostic results with different simulation group instructions, different samples, and a much shorter rating scale (97 items were eventually eliminated from the MARS). Future research will help to determine whether some form of catch items can assist in the detection of ADHD malingering.

Additional analyses should explore the combined use of the MARS SV-index, Symptom Over-report cutpoints, and catch items to detect malingered ADHD. Similar to the Exaggeration Index (Harrison & Armstrong, 2016), a weighted validity index could provide an additive ability to detect malingered ADHD. Alternatively, future analyses should examine whether other formulations of the MARS items could detect this population. For example, discriminant function analyses can be used to identify response patterns that are inconsistent with the clinical population (e.g., Rogers & Gillard, 2011). These validity indexes are effective methods to detect other feigned populations (e.g., feigned psychopathology) and may be an effective strategy to identify malingered ADHD.

In clinical settings, the identification of suspected malingering requires the use of multiple validity indicators (Larrabee, 2012; Rogers & Gillard, 2011). Future research should investigate the MARS validity indicators along with other available SVTs (e.g., CAT-A) and PVTs (e.g., WMT). This will help to establish convergent validity of the MARS validity indexes. Additionally, this will reveal the combined contribution of these indicators towards detecting feigned ADHD. Specifically, one can chain the likelihood ratios of multiple validity failures to determine the posttest odds of malingering (see Larrabee, 2012). Ultimately, increased odds of malingering detection improve clinician confidence in accurate diagnostic determinations.

Conclusion

This study provides preliminary evidence in support of a multidimensional ADHD self-report measure that utilizes a symptom validity index to detect noncredible responding. The results contribute to the literature that college students instructed to malinger ADHD can easily fake the symptom and impairment profile associated with ADHD. The findings support the use

of an embedded symptom validity index to detect suspected cases of malingering, while other indexes identify true cases of ADHD. This measure appears to be reliable, able to elicit symptom and impairment reports from ADHD college students, and able to detect malingered ADHD with high sensitivity and specificity.

Additionally, the use of the expanded Likert scale appears to help detect symptom over-report of simulated malingerers. These preliminary findings suggest that the MARS warrants additional exploration to examine its psychometric characteristics and diagnostic properties. If future research supports the study's promising findings, this type of multidimensional measure could prove to be a valuable tool to help clinicians correctly and confidently identify both ADHD and malingering in adult diagnostic evaluations.

Table 1

Demographic Characteristics of the Sample

Characteristic	ADHD (*n*=39)		Malingering (*n*=56)		Control (*n*=62)	
	n	%	*n*	%	*n*	%
Ethnicity[a]						
Caucasian/White	31	79.5	36	64.3	28	45.2
African American/Black	0	0.0	5	8.9	9	14.5
Hispanic	4	10.3	4	7.1	7	11.3
Asian	4	10.3	11	19.6	17	27.4
Native American	0	0.0	0	0.0	1	1.6
Year in School[b]						
Freshman	11	28.2	42	75.0	39	62.9
Sophomore	7	17.9	8	14.3	15	24.2
Junior	7	17.9	2	3.6	4	6.5
Senior	5	12.8	4	7.1	4	6.5
Graduate	6	15.4	0	0.0	0	0.0
Other	3	7.7	0	0.0	0	0.0
First Language[c]						
English	36	92.3	55	98.2	50	80.6
Other	3	7.7	1	1.8	12	19.4
School Problems[b]						
No	17	43.6	47	83.9	55	88.7
Yes	22	56.4	8	14.3	7	11.3
Medication[b]						
No	9	23.1	52	92.9	57	91.9
Yes	30	76.9	4	7.1	5	8.1
Regular Stimulant Use[b]						
No	17	43.6	54	96.4	60	96.8
Yes	22	56.4	2	3.6	2	3.2
ADHD Symptom Presentation ≥4[c]						
Inattentive Presentation	11	28.2	2	3.6	9	14.5
Hyperactive-Impulsive Presentation	2	5.1	1	1.8	2	3.2
Combined Presentation	19	48.7	53	94.6	3	4.8
ADHD Symptom Presentation ≥6[d]						
Inattentive Presentation	9	23.1	9	16.1	1	1.6
Hyperactive-Impulsive Presentation	0	0.0	2	3.6	0	0.0
Combined Presentation	6	15.4	40	71.4	0	0.0

Note. Significant between group differences ($p < .006$) on variables have the following notations: *a*) no differences between groups, *b*) ADHD different from Controls/Malingering, c) Controls different from ADHD/Malingering, and *d*) differences between all groups

Table 2

Means and Standard Deviations of 104 Symptom Validity Items

	ADHD (*n*=39)		Malingering (*n*=56)		Control (*n*=62)	
Symptom Validity Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
SV1.	1.90	2.13	4.34	2.35	.76	1.34
SV2.	3.33	2.75	6.35	1.64	1.98	2.00
SV3.	4.23	2.24	6.24	1.71	2.44	1.90
SV4.	3.13	2.34	5.66	1.89	2.23	2.26
SV5.	1.49	2.21	5.13	2.05	.48	1.23
SV6.	4.67	2.37	6.61	1.56	3.24	2.27
SV7.	1.77	2.39	4.80	2.68	.82	1.73
SV8.	2.87	2.45	5.78	1.90	1.89	1.90
SV9.	3.31	2.15	5.21	2.34	2.56	2.01
SV10.	.23	0.74	3.02	2.66	.11	0.45
SV11.	1.79	1.81	4.02	2.52	1.08	1.64
SV12.	4.05	2.36	6.36	1.59	2.31	1.62
SV13.	3.64	2.97	5.64	2.08	1.68	1.85
SV14.	3.10	2.39	4.98	2.10	2.16	1.80
SV15.	3.36	2.66	5.75	1.75	1.34	1.51
SV16.	5.21	1.85	6.29	1.60	3.32	1.76
SV17.	2.95	2.24	5.86	1.60	1.16	1.36
SV18	3.18	2.65	6.18	1.48	1.66	1.63
SV19.	2.05	2.42	5.05	2.04	.85	1.52
SV20.	2.21	2.17	5.57	2.04	1.69	1.70
SV21.	2.74	2.22	5.25	1.96	.84	1.52
SV22.	.13	0.41	2.69	2.52	.05	0.22
SV23.	2.00	2.66	3.95	2.59	.74	1.24
SV24.	4.41	2.36	6.16	1.55	1.98	2.18
SV25.	1.00	1.25	4.52	2.22	.58	1.14
SV26.	3.74	2.53	5.38	2.09	2.50	2.13
SV27.	3.51	2.28	5.56	2.21	1.97	2.24
SV28.	1.90	1.70	5.70	1.97	.84	1.45
SV29.	1.77	2.62	5.34	2.10	1.11	1.57
SV30.	4.44	2.21	5.93	1.79	3.61	2.09
SV31.	3.67	2.45	6.02	1.64	1.97	2.01
SV32.	1.46	2.11	5.00	2.36	1.19	1.75
SV33.	2.08	2.42	5.62	1.92	.81	1.37
SV34.	2.51	2.68	5.54	2.09	1.50	1.86
SV35	2.92	2.06	6.13	1.66	1.79	2.14
SV36.	3.03	1.90	4.16	2.71	1.79	1.70
SV37.	2.67	2.24	5.79	1.78	0.79	1.28
SV38.	2.15	2.17	4.63	2.28	2.23	2.12
SV39.	4.21	2.07	5.88	1.73	2.89	1.89
SV40.	2.41	2.20	5.30	2.37	1.24	1.55

Table 2 continued

Symptom Validity Item	ADHD		Malingering		Control	
	M	*SD*	*M*	*SD*	*M*	*SD*
SV41.	2.13	2.17	5.36	2.10	0.85	1.39
SV42.	2.10	2.22	5.91	1.80	1.98	1.94
SV43.	2.31	2.86	5.25	2.07	2.71	2.58
SV44.	3.00	2.40	6.54	1.39	2.29	1.99
SV45.	2.36	2.64	4.89	2.35	1.05	1.81
SV46.	2.08	2.30	5.84	1.71	1.76	2.02
SV47.	4.67	2.40	6.49	1.76	3.30	2.12
SV48.	2.23	2.19	5.50	1.84	1.44	1.92
SV49.	2.31	2.28	4.38	2.45	1.32	1.90
SV50.	2.41	2.29	5.95	1.80	1.66	1.90
SV51.	2.21	2.40	5.47	2.18	1.49	1.70
SV52.	2.18	2.06	5.84	1.82	0.89	1.31
SV53.	2.08	2.07	5.22	2.35	1.23	1.44
SV54.	1.69	2.07	5.05	1.67	1.03	1.57
SV55.	2.56	2.44	5.84	1.79	1.98	2.06
SV56.	1.38	2.03	5.02	2.07	0.61	1.19
SV57.	2.54	2.35	5.91	2.06	1.53	1.66
SV58.	1.44	2.19	4.68	2.57	1.18	1.70
SV59.	2.62	2.32	6.09	1.76	1.44	1.75
SV60.	1.62	2.17	5.43	1.97	1.10	1.49
SV61.	1.85	2.31	4.71	2.40	0.89	1.48
SV62.	2.41	2.80	5.24	2.45	1.24	1.90
SV63.	3.15	2.28	5.73	1.75	2.55	2.05
SV64.	2.45	2.18	5.25	2.25	1.02	1.49
SV65.	1.97	2.24	5.25	2.06	0.81	1.32
SV66.	2.54	2.00	5.73	1.71	1.42	1.74
SV67	1.38	1.66	5.09	2.13	0.68	1.07
SV68.	2.28	1.93	5.76	1.85	1.37	1.69
SV69.	2.38	2.51	5.38	2.18	1.55	2.02
SV70.	2.51	2.59	5.47	1.77	1.87	2.16
SV71.	1.92	2.02	5.09	2.17	1.05	1.32
SV72.	2.10	2.11	6.07	1.73	1.55	1.81
SV73.	2.77	2.33	5.82	1.74	1.31	1.69
SV74.	3.26	2.53	5.63	1.65	1.35	1.65
SV75.	3.72	2.46	6.25	1.73	2.26	2.03
SV76.	0.82	1.41	4.00	2.70	0.63	1.12
SV77.	3.95	2.91	6.21	2.06	1.89	2.36
SV78.	3.23	2.35	5.36	2.18	1.61	2.04
SV79.	3.41	2.45	5.52	2.09	1.81	1.99
SV80.	3.23	2.36	5.84	1.79	2.32	2.30
SV81.	3.15	2.42	5.66	1.71	1.69	2.15
SV82	1.44	1.89	4.39	2.48	.77	1.41

Table 2 continued

	ADHD		Malingering		Control	
Symptom Validity Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
SV83.	3.62	1.96	5.75	1.92	3.02	1.96
SV84.	3.77	2.68	6.23	1.58	2.24	2.23
SV85.	2.59	2.46	5.79	1.95	1.69	2.08
SV86.	3.00	2.72	6.63	1.30	2.21	1.98
SV87.	3.46	1.83	6.07	2.13	3.81	2.00
SV88.	4.41	2.09	6.15	1.88	2.82	2.00
SV89.	3.41	2.85	5.09	1.98	2.61	2.29
SV90.	1.56	1.71	4.91	2.15	.68	1.07
SV91.	2.00	2.25	5.41	2.33	1.97	2.27
SV92.	3.97	2.07	5.41	2.15	2.10	1.54
SV93.	3.77	2.19	6.48	1.66	3.05	2.16
SV94.	2.56	2.06	5.73	1.76	1.40	1.69
SV95.	1.92	2.16	4.52	2.41	0.95	1.15
SV96.	2.15	2.36	4.93	1.75	1.26	1.62
SV97.	3.51	2.35	5.16	2.15	2.29	1.99
SV98.	2.21	2.17	4.57	2.30	2.11	1.89
SV99.	4.38	2.30	6.46	1.56	3.11	1.85
SV100.	3.36	2.61	5.64	2.14	2.89	2.09
SV101.	4.67	2.32	6.52	1.39	2.95	1.92
SV102.	2.62	2.29	5.20	1.91	1.24	1.58
SV103.	1.90	1.77	4.11	2.53	1.52	1.82
SV104.	2.62	2.15	5.27	2.18	1.63	1.87

Note. Malingering > ADHD > Control for all items. Item names removed to maintain test security.

Table 3

Means and Standard Deviations of 11 Symptom Validity Items ≤2 in ADHD and Control Groups and ≥5 in Malingering Group

	ADHD		Malingering		Control	
Symptom Validity Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
SV5.	1.49	2.21	5.13	2.05	.48	1.23
SV28.	1.90	1.70	5.70	1.97	.84	1.45
SV29.	1.77	2.62	5.34	2.10	1.11	1.57
SV32.	1.46	2.11	5.00	2.36	1.19	1.75
SV54.	1.69	2.07	5.05	1.67	1.03	1.57
SV56.	1.38	2.03	5.02	2.07	0.61	1.19
SV60.	1.62	2.17	5.43	1.97	1.10	1.49
SV65.	1.97	2.24	5.25	2.06	0.81	1.32
SV67.	1.38	1.66	5.09	2.13	0.68	1.07
SV71.	1.92	2.02	5.09	2.17	1.05	1.32
SV91.	2.00	2.25	5.41	2.33	1.97	2.27

Note. Malingering > ADHD > Control for all items. Item names removed to maintain test security.

Table 4

Final 7-Item Symptom Validity Index

	ADHD		Malingering		
Symptom Validity Item	*M*	*SD*	*M*	*SD*	*M* Difference
SV5.	1.49	2.21	5.13	2.05	3.64
SV28.	1.90	1.70	5.70	1.97	3.80
SV29.	1.77	2.62	5.34	2.10	3.57
SV32.	1.46	2.11	5.00	2.36	3.54
SV56.	1.38	2.03	5.02	2.07	3.64
SV60.	1.62	2.17	5.43	1.97	3.81
SV67.	1.38	1.66	5.09	2.13	3.71

Note. Malingering > ADHD for all items. Item names removed to maintain test security.

Table 5

Means and Standard Deviations of ADHD Inattention Symptom Items

	ADHD (*n*=39)		Malingering (*n*=56)		Control (*n*=62)	
Inattention Symptom Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
Fail to give close attention to details or make careless mistakes in my work	4.77	2.40	6.48	1.64	2.40	1.44
Difficulty sustaining attention in tasks or play activities	4.28	1.86	6.41	1.40	2.00	1.64
Do not listen when spoken to directly (mind seems elsewhere)	4.21	2.31	6.21	1.68	2.34	1.76
Do not follow through with instructions and fail to finish schoolwork, chores, or work duties	4.28	2.38	6.57	1.55	1.87	1.73
Difficulty organizing tasks and activities	4.38	1.98	6.38	1.75	2.11	1.96
Avoid, dislike, or reluctant to engage in tasks that require sustained mental effort	4.28	2.25	6.27	1.70	2.26	1.77
Lose things necessary for tasks or activities	3.90	2.49	6.20	1.39	2.21	1.82
Easily distracted by extraneous stimuli or irrelevant thoughts	5.69	1.87	6.98	1.12	3.31	2.01
Forgetful in daily activities	4.13	2.35	6.36	1.72	2.26	1.77

Note. Malingering > ADHD > Control for all items.

Table 6

Means and Standard Deviations of ADHD Hyperactivity-Impulsivity Symptom Items

	ADHD (*n*=39)		Malingering (*n*=56)		Control (*n*=62)	
Hyperactivity Symptom Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
Fidget in seat by squirming, tapping my hands and/or my feet	5.08	2.48	6.86	1.47	2.53	2.53
Leave my seat when remaining seated is expected	2.13	2.02	5.79	1.83	0.90	1.18
Run about or climb in situations where it is inappropriate	1.97	2.22	5.52	1.91	1.06	1.57
Unable to play or engage in leisure activities quietly	2.74	2.02	6.14	1.52	1.65	1.63
Constantly on the go/driven by motor	4.41	2.11	6.20	2.00	2.63	1.99
Talk excessively	4.31	2.38	6.39	1.55	2.45	2.05
Blurt out an answer before a question has been completed	2.95	2.36	6.07	1.78	2.19	1.71
Have difficulty waiting for my turn	3.49	2.35	6.59	1.22	1.90	1.74
Interrupt or intrude on others (butt into conversations or activities without permission)	3.08	2.31	6.11	1.66	1.92	1.76

Note. Malingering > ADHD > Control for all items.

Table 7

Means and Standard Deviations of Functional Impairment Items

	ADHD (*n*=38)		Malingering (*n*=56)		Control (*n*=62)	
Functional Impairment Item	*M*	*SD*	*M*	*SD*	*M*	*SD*
In home life with immediate family	3.32	2.57	4.80	2.28	1.45	1.72
In getting household chores completed	4.18	2.72	6.09	1.90	1.94	1.77
In managing daily activities	4.03	2.15	6.20	1.91	1.74	1.73
In my social interactions with strangers	3.00	2.18	5.52	2.53	2.00	2.14
In my work/job	3.05	2.49	5.91	2.50	1.56	1.74
In budgeting my money, bills, and/or debt	3.97	2.56	6.41	1.59	3.03	2.35
In operating a motor vehicle	1.47	2.05	4.43	2.78	.69	1.28
In my relationships with friends	2.74	2.46	4.95	2.42	1.90	2.04
In my marital, or partner, or dating relationships	2.32	2.49	5.20	2.36	1.79	2.28
In my educational classes (e.g., attendance)	3.39	2.70	6.63	1.90	2.92	2.22
In my performance on educational tests/assignments	3.61	2.73	6.70	1.89	2.97	2.36
In controlling my behavior at work, home, or school	2.95	2.45	5.91	2.20	1.19	1.82
In my decision making at work, home, or school	3.82	2.30	6.20	1.77	1.94	2.01
In maintaining hygiene (dressing, showing)	2.18	2.39	4.21	2.73	.89	1.47
In self-care (e.g., sleeping, eating)	3.58	2.54	5.16	2.22	2.37	2.14
In social activities	3.13	2.28	5.13	2.36	2.26	2.25
In community-based activities (e.g., church, clubs, organizations)	1.87	2.12	5.48	2.20	1.32	2.05
In maintaining my health (e.g., nutrition, exercise)	3.42	2.48	4.88	2.38	2.60	2.36
In time management	4.71	2.37	7.09	1.33	3.34	2.52
In meeting deadlines	4.13	2.46	6.57	2.15	2.34	2.53
With controlling my anger	2.45	2.35	5.14	2.45	1.37	1.65
With my memory for daily activities	4.47	2.66	6.09	2.18	2.00	2.20

Note. Malingering > ADHD > Control for all items.

Table 8

Means and Standard Deviations of the Five Indexes

	ADHD		Malingering		Control		
Index	*M*	*SD*	*M*	*SD*	*M*	*SD*	ω^2
ADHD Inattention Index	39.92	14.46	58.12	9.09	20.76	11.38	.66
ADHD Hyperactivity-Impulsivity Index	30.15	14.78	55.88	10.41	17.24	8.96	.70
ADHD Total Index	70.08	26.06	114.00	17.69	38.00	17.59	.73
Functional Impairment Index	71.79	37.46	124.68	36.39	43.20	28.92	.52
Symptom Validity Index	10.74	10.12	36.70	10.93	5.68	5.32	.71

Note. Malingering > ADHD > Control for all indexes.

Table 9

Coordinates of the ROC Curve for the ADHD Inattention Index Classifying ADHD between the ADHD and Control groups

Cutpoint ≥	Sensitivity	1 - Specificity
1.0	1.00	0.98
3.0	1.00	0.97
4.5	1.00	0.95
5.5	1.00	0.94
6.5	1.00	0.89
7.5	1.00	0.87
8.5	0.97	0.87
9.5	0.97	0.86
10.5	0.95	0.84
11.5	0.95	0.77
12.5	0.95	0.76
13.5	0.95	0.74
15.0	0.90	0.69
16.5	0.90	0.66
17.5	0.90	0.63
18.5	0.90	0.53
20.0	**0.90**	**0.47**
21.5	0.87	0.42
22.5	0.87	0.31
23.5	0.85	0.31
25.0	0.85	0.29
26.5	0.82	0.26
27.5	0.82	0.24
28.5	0.74	0.21
29.5	0.74	0.19
30.5	0.72	0.18
32.5	0.72	0.15
34.5	0.72	0.13
35.5	0.69	0.11
36.5	0.62	0.11
37.5	0.59	0.11
38.5	**0.56**	**0.10**
39.5	0.54	0.08

Table 9 continued

Cutpoint ≥	Sensitivity	1 - Specificity
41.0	0.51	0.08
43.0	0.49	0.07
45.0	0.49	0.05
46.5	0.41	0.05
47.5	0.39	0.02
48.5	0.36	0.00
49.5	0.33	0.00
50.5	0.26	0.00
51.5	0.23	0.00
52.5	0.18	0.00
53.5	0.15	0.00
54.5	0.13	0.00
57.5	0.08	0.00
60.5	0.05	0.00
62.0	0.03	0.00
64.0	0.00	0.00

Table 10

Coordinates of the ROC Curve for the ADHD Hyperactivity Index Classifying ADHD between the ADHD and Control groups

Cutpoint ≥	Sensitivity	1 - Specificity
1.0	1.00	1.00
3.0	1.00	0.95
4.5	1.00	0.92
5.5	1.00	0.89
6.5	0.95	0.87
7.5	0.92	0.81
9.0	0.92	0.79
10.5	0.87	0.76
11.5	0.87	0.73
12.5	**0.87**	**0.66**
13.5	0.82	0.63
14.5	0.82	0.57
15.5	0.82	0.53
16.5	0.82	0.50
17.5	0.80	0.48
18.5	0.74	0.48
19.5	0.74	0.44
20.5	0.69	0.42
21.5	0.67	0.40
22.5	0.67	0.29
24.0	0.64	0.24
25.5	0.62	0.21
26.5	0.62	0.15
27.5	**0.62**	**0.08**
28.5	0.56	0.08
29.5	0.54	0.07
30.5	0.49	0.07
31.5	0.41	0.07
32.5	0.41	0.05
33.5	0.39	0.05
34.5	0.36	0.02
35.5	0.33	0.02
37.0	0.31	0.02
39.0	0.28	0.02
41.0	0.26	0.00
42.5	0.23	0.00
44.5	0.18	0.00
46.5	0.15	0.00

Table 10 continued

Cutpoint ≥	Sensitivity	1 - Specificity
48.0	0.13	0.00
51.5	0.10	0.00
55.5	0.05	0.00
58.5	0.03	0.00
61.0	0.00	0.00

Table 11

Coordinates of the ROC Curve for the ADHD Total Index Classifying ADHD from ADHD and Control groups

Cutpoint ≥	Sensitivity	1 - Specificity
5.00	1.00	1.00
6.50	1.00	0.98
7.50	1.00	0.95
10.00	1.00	0.94
12.50	1.00	0.92
14.50	1.00	0.90
16.50	1.00	0.86
17.50	1.00	0.84
19.00	1.00	0.82
20.50	0.97	0.82
21.50	0.92	0.82
22.50	0.92	0.81
23.50	0.92	0.79
24.50	0.92	0.74
26.00	0.92	0.73
27.50	0.90	0.69
28.50	0.90	0.66
31.00	0.90	0.63
33.50	**0.90**	**0.61**
34.50	0.87	0.57
35.50	0.87	0.55
36.50	0.87	0.52
37.50	0.87	0.50
39.50	0.87	0.47
41.50	0.85	0.44
43.00	0.85	0.40
45.00	0.85	0.37
46.50	0.82	0.34
47.50	0.82	0.32
48.50	0.82	0.31
49.50	0.82	0.29
50.50	0.82	0.27
51.50	0.80	0.26
52.50	0.80	0.24
53.50	0.77	0.23
54.50	0.72	0.19
55.50	0.69	0.18
56.50	0.69	0.15
57.50	0.67	0.13
58.50	0.67	0.11

Table 11 continued

Cutpoint ≥	Sensitivity	1 - Specificity
60.00	0.64	0.11
62.00	**0.64**	**0.10**
63.50	0.64	0.08
64.50	0.59	0.07
65.50	0.56	0.07
66.50	0.54	0.07
68.50	0.54	0.05
70.50	0.54	0.03
71.50	0.54	0.02
72.50	0.49	0.02
75.00	0.49	0.00
77.50	0.44	0.00
78.50	0.36	0.00
81.00	0.33	0.00
83.50	0.31	0.00
85.00	0.28	0.00
87.00	0.26	0.00
89.50	0.23	0.00
92.00	0.21	0.00
95.50	0.15	0.00
99.00	0.13	0.00
104.50	0.10	0.00
109.50	0.08	0.00
112.50	0.05	0.00
117.50	0.03	0.00
121.00	0.00	0.00

Table 12

Coordinates of the Curve for the Functional Impairment Index Classifying ADHD between ADHD and Control groups

Cutpoint ≥	Sensitivity	1 - Specificity
1.00	0.97	1.00
6.00	0.97	0.97
10.50	0.97	0.92
11.50	0.97	0.90
13.50	0.97	0.89
15.50	0.95	0.87
16.50	0.95	0.81
17.50	0.95	0.77
18.50	0.92	0.74
20.50	0.92	0.73
22.50	0.92	0.69
24.50	0.90	0.68
27.50	**0.90**	**0.66**
29.50	0.87	0.66
30.50	0.84	0.65
31.50	0.84	0.61
32.50	0.84	0.58
33.50	0.82	0.58
34.50	0.82	0.57
35.50	0.82	0.53
37.00	0.82	0.48
39.00	0.79	0.45
40.50	0.79	0.44
41.50	0.76	0.42
43.00	0.76	0.40
45.00	0.76	0.39
46.50	0.76	0.36
48.00	0.76	0.34
49.50	0.76	0.32
50.50	0.74	0.32
51.50	0.71	0.31
52.50	0.68	0.29
54.00	0.68	0.27
55.50	0.66	0.27
57.50	0.66	0.24
60.00	0.63	0.23
62.00	0.61	0.21
63.50	0.55	0.21
64.50	0.53	0.21
65.50	0.50	0.21

Table 12 continued

Cutpoint ≥	Sensitivity	1 - Specificity
67.50	0.47	0.21
69.50	0.45	0.19
70.50	0.42	0.18
71.50	0.40	0.18
75.00	0.40	0.16
79.00	0.37	0.13
81.00	0.34	0.13
85.00	0.32	0.13
91.00	0.29	0.13
95.50	**0.24**	**0.11**
98.50	0.21	0.08
102.00	0.21	0.07
104.43	0.18	0.05
104.93	0.18	0.02
114.00	0.18	0.00
124.50	0.16	0.00
126.50	0.13	0.00
129.00	0.11	0.00
134.50	0.08	0.00
138.50	0.05	0.00
140.00	0.03	0.00
142.00	0.00	0.00

Table 13

Coordinates of the Curve for the Symptom Validity Index Classifying ADHD between ADHD and Control groups

Cutpoint ≥	Sensitivity	1 - Specificity
0.50	0.95	0.81
1.50	**0.90**	**0.76**
2.50	0.80	0.61
3.50	0.64	0.57
4.50	0.62	0.48
5.50	0.54	0.42
6.50	0.49	0.37
7.50	0.44	0.27
8.50	0.41	0.24
9.50	0.41	0.23
10.50	0.39	0.21
11.50	0.39	0.16
12.50	0.31	0.15
13.50	0.31	0.13
14.50	0.28	0.11
15.50	**0.28**	**0.10**
16.50	0.28	0.07
17.50	0.28	0.00
19.50	0.23	0.00
22.50	0.21	0.00
25.50	0.13	0.00
28.50	0.10	0.00
30.50	0.05	0.00
32.00	0.00	0.00

Table 14

Coordinates of the Curve for the ADHD Inattention Index Classifying Malingering between the ADHD and Malingering Groups

Cutpoint ≥	Sensitivity	1 - Specificity
7.00	1.00	1.00
9.00	1.00	0.97
12.00	1.00	0.95
17.50	1.00	0.90
22.00	1.00	0.87
24.50	1.00	0.85
27.00	1.00	0.82
29.00	1.00	0.74
32.50	1.00	0.72
35.50	1.00	0.69
36.50	1.00	0.62
37.50	1.00	0.59
38.50	1.00	0.56
39.50	1.00	0.54
40.43	0.98	0.51
40.93	0.96	0.51
41.50	0.95	0.51
42.50	0.95	0.49
43.50	**0.91**	**0.49**
45.00	0.88	0.49
46.50	0.88	0.41
47.50	0.86	0.39
48.50	0.82	0.36
49.50	0.82	0.33
50.50	0.79	0.26
51.50	0.77	0.23
52.50	0.73	0.18
53.50	0.70	0.15
54.50	0.66	0.13
55.50	**0.63**	**0.08**
56.50	0.57	0.08
57.50	0.52	0.08
58.50	0.50	0.08
59.50	0.48	0.08
60.50	0.45	0.05

Table 14 continued

Cutpoint ≥	Sensitivity	1 - Specificity
61.50	0.41	0.03
62.50	0.36	0.03
64.00	0.32	0.00
65.50	0.25	0.00
66.50	0.20	0.00
67.50	0.16	0.00
68.50	0.14	0.00
69.50	0.11	0.00
70.50	0.09	0.00
71.50	0.07	0.00
73.00	0.00	0.00
61.50	0.41	0.03
62.50	0.36	0.03
64.00	0.32	0.00
65.50	0.25	0.00
66.50	0.20	0.00
67.50	0.16	0.00
68.50	0.14	0.00
69.50	0.11	0.00
70.50	0.09	0.00
71.50	0.07	0.00
73.00	0.00	0.00

Table 15

Coordinates of the Curve for the ADHD Hyperactivity Index Classifying Malingering between the ADHD and Malingering Groups

Cutpoint ≥	Sensitivity	1 - Specificity
5.00	1.00	1.00
6.50	1.00	0.95
8.50	1.00	0.92
11.50	1.00	0.87
15.00	1.00	0.82
17.50	1.00	0.80
19.00	1.00	0.74
20.50	1.00	0.69
22.00	1.00	0.67
24.00	1.00	0.64
26.50	1.00	0.62
28.50	1.00	0.56
29.50	1.00	0.54
30.50	0.98	0.49
32.00	0.98	0.41
33.50	0.98	0.39
34.50	0.98	0.36
35.05	0.98	0.33
35.55	0.96	0.33
37.00	0.95	0.31
38.50	0.93	0.28
39.50	0.91	0.28
41.00	0.91	0.26
42.50	**0.89**	**0.23**
43.50	0.89	0.18
44.50	0.88	0.18
45.50	0.86	0.18
46.50	0.82	0.15
47.50	0.79	0.13
48.50	0.77	0.13
49.50	**0.75**	**0.10**
50.50	0.71	0.10
51.50	0.61	0.10
53.00	0.57	0.10
55.50	0.50	0.05
58.00	0.46	0.03
59.50	0.45	0.03
60.50	0.41	0.00
61.50	0.38	0.00

Table 15 continued

Cutpoint ≥	Sensitivity	1 - Specificity
62.50	0.32	0.00
63.50	0.27	0.00
64.50	0.25	0.00
65.50	0.23	0.00
66.50	0.18	0.00
67.50	0.14	0.00
68.50	0.11	0.00
69.50	0.07	0.00
71.00	0.05	0.00
73.00	0.00	0.00

Table 16

Coordinates of the curve for the ADHD Total Index Classifying Malingering between the ADHD and Malingering Groups

Cutpoint ≥	Sensitivity	1 - Specificity
19.00	1.00	1.00
20.50	1.00	0.97
24.00	1.00	0.92
30.50	1.00	0.90
37.50	1.00	0.87
43.50	1.00	0.85
48.50	1.00	0.82
52.00	1.00	0.80
53.50	1.00	0.77
54.50	1.00	0.72
56.00	1.00	0.69
58.00	1.00	0.67
61.50	1.00	0.64
64.50	1.00	0.59
65.50	1.00	0.56
68.43	1.00	0.54
71.43	0.98	0.54
74.00	0.98	0.49
76.50	0.96	0.49
77.50	0.96	0.44
78.50	0.96	0.36
81.00	0.96	0.33
83.50	0.95	0.31
85.00	0.95	0.28
86.50	0.95	0.26
87.50	0.93	0.26
89.50	0.93	0.23
92.00	0.93	0.21
93.50	0.93	0.15
94.50	**0.88**	**0.15**
95.50	0.84	0.15
96.05	0.82	0.15
97.05	0.80	0.15
99.00	0.79	0.13
100.50	**0.79**	**0.10**
101.50	0.77	0.10
103.00	0.75	0.10
104.50	0.71	0.10
105.50	0.70	0.10
106.50	0.66	0.10

Table 16 continued

Cutpoint ≥	Sensitivity	1 - Specificity
107.50	0.64	0.10
108.50	0.59	0.10
109.50	0.57	0.08
110.50	0.55	0.05
111.50	0.50	0.05
112.50	0.48	0.05
113.50	0.46	0.05
114.50	0.45	0.05
116.50	0.43	0.03
119.00	0.39	0.03
120.50	0.38	0.00
121.50	0.36	0.00
122.50	0.34	0.00
124.50	0.30	0.00
126.50	0.27	0.00
127.50	0.25	0.00
130.00	0.23	0.00
133.00	0.18	0.00
135.00	0.16	0.00
136.50	0.13	0.00
137.50	0.11	0.00
138.50	0.09	0.00
139.50	0.07	0.00
142.00	0.05	0.00
145.00	0.00	0.00

Table 17

Coordinates of the curve for the Functional Impairment Index Classifying Malingering between the ADHD and Malingering Groups

Cutpoint ≥	Sensitivity	1 - Specificity
7.50	1.00	0.97
16.50	1.00	0.95
20.50	1.00	0.92
26.00	1.00	0.90
29.50	1.00	0.87
31.50	1.00	0.84
35.00	1.00	0.82
37.50	0.98	0.82
39.50	0.98	0.79
45.50	0.96	0.76
50.50	0.96	0.74
51.50	0.96	0.71
53.50	0.96	0.68
55.50	0.96	0.66
56.50	0.95	0.66
58.00	0.93	0.66
60.00	0.93	0.63
62.00	0.93	0.61
63.50	0.93	0.55
64.50	0.93	0.53
65.50	0.91	0.50
67.50	0.91	0.47
69.50	0.89	0.45
70.50	0.89	0.42
72.00	**0.89**	**0.40**
74.00	0.88	0.40
75.50	0.86	0.40
77.00	0.82	0.40
79.00	0.82	0.37
80.50	0.82	0.34
81.50	0.80	0.34
85.00	0.80	0.32
91.00	0.80	0.29
95.00	0.80	0.24
96.50	0.79	0.24
100.50	0.77	0.21
104.50	0.75	0.18
106.50	0.73	0.18
109.00	0.71	0.18
112.00	0.70	0.18

Table 17 continued

Cutpoint ≥	Sensitivity	1 - Specificity
115.00	0.68	0.18
117.50	0.66	0.18
121.00	0.64	0.18
123.50	0.63	0.16
125.00	0.61	0.16
126.50	0.59	0.13
127.50	**0.57**	**0.11**
129.00	0.55	0.11
130.50	0.54	0.11
132.00	0.50	0.08
133.50	0.48	0.08
134.50	0.46	0.08
136.00	0.45	0.08
137.50	0.41	0.08
138.50	0.41	0.05
140.00	0.39	0.03
142.00	0.39	0.00
144.50	0.36	0.00
146.50	0.34	0.00
149.00	0.30	0.00
151.50	0.29	0.00
152.50	0.27	0.00
153.50	0.25	0.00
154.50	0.23	0.00
155.50	0.21	0.00
158.00	0.16	0.00
160.50	0.14	0.00
162.50	0.13	0.00
165.00	0.11	0.00
167.50	0.07	0.00
172.00	0.05	0.00
175.50	0.04	0.00
177.00	0.00	0.00

Table 18

Coordinates of the curve for the Symptom Validity Index Classifying Malingering between the ADHD and Malingering Groups

Cutpoint ≥	Sensitivity	1 - Specificity
0.50	1.00	0.95
1.50	1.00	0.90
2.50	1.00	0.80
3.50	1.00	0.64
4.50	1.00	0.62
5.50	1.00	0.54
6.50	1.00	0.49
7.50	0.98	0.44
9.00	0.98	0.41
10.50	0.98	0.39
11.50	0.96	0.39
13.00	0.95	0.31
16.00	0.95	0.28
18.50	0.95	0.23
20.00	0.93	0.23
21.50	0.93	0.21
23.00	0.91	0.21
24.50	**0.89**	**0.13**
25.50	0.84	0.13
26.50	0.82	0.13
28.00	**0.79**	**0.10**
29.50	0.73	0.10
30.50	0.71	0.05
31.50	0.71	0.00
32.50	0.68	0.00
33.50	0.66	0.00
35.00	0.64	0.00
36.50	0.61	0.00
38.00	0.48	0.00
39.50	0.43	0.00
40.50	0.39	0.00
41.50	0.36	0.00
42.50	0.32	0.00

Table 18 continued

Cutpoint ≥	Sensitivity	1 - Specificity
43.50	0.30	0.00
44.50	0.23	0.00
45.50	0.20	0.00
46.50	0.18	0.00
47.50	0.13	0.00
49.00	0.11	0.00
50.50	0.07	0.00
53.50	0.05	0.00
57.00	0.00	0.00

Table 19

Area under the Curve from Receiver Operating Characteristic Analyses for the Five Indexes Classifying ADHD between ADHD and Control Groups

				Confidence Interval	
Index	AUC	Standard Error	*p* value	Lower	Upper
ADHD Inattention Index	0.84	0.04	0.00	0.76	0.93
ADHD Hyperactivity-Impulsivity Index	0.76	0.05	0.00	0.66	0.86
ADHD Total Index	0.84	0.04	0.00	0.75	0.93
Functional Impairment Index	0.73	0.05	0.00	0.63	0.83
Symptom Validity Index	0.64	0.06	0.02	0.53	0.75

Table 20

Area Under the Curve from Receiver Operating Characteristic Analyses for the Five Indexes Classifying Malingering between ADHD and Malingering Groups

				Confidence Interval	
Index	AUC	Standard Error	*p* value	Lower	Upper
ADHD Inattention Index	0.86	0.04	0.00	0.79	0.94
ADHD Hyperactivity-Impulsivity Index	0.92	0.03	0.00	0.86	0.97
ADHD Total Index	0.92	0.03	0.00	0.86	0.98
Functional Impairment Index	0.84	0.04	0.00	0.76	0.92
Symptom Validity Index	0.95	0.02	0.00	0.91	0.99

Table 21

Optimal Sensitivity and Specificity Thresholds and Associated Psychometric Properties for the MARS Indexes Predicting ADHD between ADHD and Controls

			38.6% Base Rate (Current Study)				5% Base Rate	
Index	Cut Score	Correct Classification	Sensitivity	Specificity	PPP	NPP	PPP	NPP
ADHD Inattentive Index								
Optimal Sensitivity	20.0	67.3	89.7	53.2	54.7	89.2	9.2	99.0
Optimal Specificity	38.5	77.2	56.4	90.3	78.6	76.7	23.4	97.5
ADHD Hyperactivity-Impulsivity Index								
Optimal Sensitivity	12.5	54.5	87.2	33.9	45.3	80.8	6.5	98.1
Optimal Specificity	27.5	80.2	61.5	91.9	82.8	79.2	28.6	97.8
ADHD Total Index								
Optimal Sensitivity	33.5	58.4	89.7	38.7	48.0	85.7	7.2	98.6
Optimal Specificity	62.0	80.2	64.1	90.3	80.7	80.0	25.8	98.0
Functional Impairment Index								
Optimal Sensitivity	27.5	55.0	89.5	33.9	45.3	84.0	6.7	98.4
Optimal Specificity	95.5	64.0	23.7	88.7	56.3	65.5	9.9	95.7
Symptom Validity Index								
Optimal Sensitivity	1.5	49.5	89.7	24.2	42.7	79.0	5.9	97.8
Optimal Specificity	15.5	66.3	28.2	90.3	64.7	66.7	13.3	96.0

Table 22

Optimal Sensitivity and Specificity Thresholds and Associated Psychometric Properties for the MARS Indexes Predicting Malingering between ADHD and Malingering groups

			58.9% Base Rate (Current Study)				30% Base Rate	
Index	Cut Score	Correct Classification	Sensitivity	Specificity	PPP	NPP	PPP	NPP
ADHD Inattentive Index								
Optimal Sensitivity	43.5	74.7	91.1	51.3	72.9	80.0	44.5	93.1
Optimal Specificity	55.5	74.7	62.5	92.3	92.1	63.2	77.7	85.2
ADHD Hyperactivity-Impulsivity Index								
Optimal Sensitivity	42.5	84.2	89.3	76.9	84.8	83.3	62.4	94.4
Optimal Specificity	49.5	81.1	75.0	89.7	91.3	71.4	75.7	89.3
ADHD Total Index								
Optimal Sensitivity	94.5	86.3	87.5	84.6	89.1	82.5	70.9	94.0
Optimal Specificity	100.5	83.2	78.6	89.7	91.7	74.5	76.6	90.7
Functional Impairment Index								
Optimal Sensitivity	72.0	77.7	89.3	60.5	76.9	79.3	49.2	93.0
Optimal Specificity	127.5	70.2	57.1	89.5	88.9	58.6	70.0	83.0
Symptom Validity Index								
Optimal Sensitivity	24.5	88.4	89.3	87.2	90.9	85.0	74.9	95.0
Optimal Specificity	28.0	83.2	78.6	89.7	91.7	74.5	76.6	90.7

Appendix A

Study Invitation Letter

SYRACUSE UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
430 HUNTINGTON HALL
SYRACUSE, NY 13244

Invitation Letter to Participate in Research Study

My name is Heather Potts and I am a Graduate Student at Syracuse University. I am conducting research as part of my graduate studies and I am inviting you to participate in this study.

I am interested in learning more about accurately diagnosing ADHD in college students. For this part of the study, we are recruiting individuals a) between the ages of 18-26 and b) those who have a diagnosis of ADHD. If you decide to participate, you will be emailed the link to complete the online materials. First, you will be asked to complete a brief demographic questionnaire so we can collect some background information about you. The next form is a list of questions on a self-report measure for ADHD. We ask that you complete each item honestly as they pertain to you. The final measure will be a brief exit survey about your experience and effort during the study. The entire study will take approximately 45 minutes of your time.

All information will be kept *confidential.* This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way. Your ScreeningID/name will only be connected to reimbursement. In addition, all of your information will be used for research purposes only. We also believe that this study should involve minimal risk to you.

Taking part in this research study is optional and your decision and you have the right to both participate, and the option to opt-out at any time.

In compensation for your time, participants who complete the study will receive $20 cash and be entered into a raffle drawing for a $100 Visa gift card. The researchers will notify the winner of the raffle directly after the completion of the study.

I am happy to answer any questions that you may have. Please contact me, Heather Potts at hepotts@syr.edu if you have questions, concerns, or are interested in participating.

Thank you for your time and consideration.

Sincerely,

Heather Potts

Appendix B

Study Flyer

ONLINE RESEARCH STUDY FOR

ADULTS WITH ADHD
BETWEEN THE AGES OF 18-26

What is the study?

- Online Pilot ADHD Self-Report Measure
- Takes less than 45 minutes
- All information is kept confidential

Where can I complete the study?

- Anywhere with Internet access

What is the compensation?

- $20 cash
- Entered into a $100 Visa Gift Card Raffle drawing

For more information and
to complete the eligibility screening please contact:
Heather Potts
hepotts@syr.edu

HD Study:
ather Potts
potts@syr.edu

Appendix C

Multidimensional ADHD Rating Scale

Multidimensional ADHD Rating Scale

Instructions: This self-report measure contains TWO Sections. Please read each Section Header carefully with directions on the rating scale for those items.

Section 1:

Please indicate by circling the number associated with the response that best describes your behavior **OVER THE PAST 6 MONTHS**, from **Never, Rarely, Sometimes, Often, to Very Often**

DSM-5 ADHD Symptom Items									
1. Fail to give close attention to details or make careless mistakes in my work	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
2. Lose things necessary for tasks or activities	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
3. Forgetful in daily activities	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
4. Difficulty organizing tasks and activities	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
5. Easily distracted by extraneous stimuli or irrelevant thoughts	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
6. Difficulty sustaining attention in tasks or play activities	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
7. Do not listen when spoken to directly (mind seems elsewhere)	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
8. Avoid, dislike, or reluctant to engage in tasks that require sustained mental effort	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
9. Do not follow through with instructions and fail to finish schoolwork, chores, or work duties	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
10. Leave my seat when remaining seated is expected	0 Never	1	2 Rarely	3	4 Sometimes	5	6 Often	7	8 Very Often
11. Blurt out an answer before	0	1	2	3	4	5	6	7	8

a question has been completed	Never Rarely Sometimes Often Very Often
12. Fidget in seat by squirming, tapping my hands and/or my feet	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
13. Constantly "on the go" or act as if "driven by a motor"	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
14. Unable to play or engage in leisure activities quietly	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
15. Run about or climb in situations where it is inappropriate	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
16. Talk excessively	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
17. Have difficulty waiting for my turn	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
18. Interrupt or intrude on others (butt into conversations or activities without permission)	0 1 2 3 4 5 6 7 8 Never Rarely Sometimes Often Very Often
SCT Items not included in Present Study	
19. Prone to daydreaming when I should be concentrating on something or working	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
20. Have trouble staying alert or awake in boring situations	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
21. Easily confused	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
22. Easily bored	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
23. Feel spacey or "in a fog"	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
24. Lethargic, more tired than others	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
25. Underactive or have less energy than others	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often
26. Slow moving	0 1 2 3 4 5 6 7 8 Never Rarely Sometime Often Very Often

27. Do not seem to process information as quickly or as accurately as others	0 Never	1	2 Rarely	3	4 Sometime	5	6 Often	7 Very Often	8
104 pilot SV-Items were removed from this document to maintain test security									

Section 2:

Please indicate by circling the number associated with the response that fits you the most

Not At All, Somewhat, Mild, Moderate, or Severe

If the situation does not apply to you, choose **N/A**

In the Past SIX MONTHS I have Experienced Difficulty in Functioning in the Following Areas:

28. In home life with immediate family	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
29. In getting household chores completed	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
30. In managing daily activities	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
31. In my social interactions with strangers	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
32. In my work/job	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
33. In budgeting my money, bills, and/or debt	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
34. In operating a motor vehicle	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
35. In my relationships with friends	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
36. In my marital, or partner, or dating relationships	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
37. In my educational classes (e.g., attendance)	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
38. In my performance on educational tests/assignments	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
39. In controlling my behavior at work, home, or school	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
40. In my decision making at work, home, or school	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
41. In maintaining hygiene (dressing, showing)	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe

42. In self-care (e.g., sleeping, eating)	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
43. In social activities	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
44. In community-based activities (e.g., church, clubs, organizations)	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
45. In maintaining my health (e.g., nutrition, exercise)	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
46. In time management	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
47. In meeting deadlines	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
48. With controlling my anger	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe
49. With my memory for daily activities	0 Not at All	1	2 Somewhat	3	4 Mild	5	6 Moderate	7	8 Severe

Appendix D

Phone Screening

ADHD Screening Form
The Construction of a Comprehensive ADHD Rating Scale:
A Pilot Study

Date of Screening _____
Completed by _____
☐ Provide Overview of Study Prior to Screening (*script below)*
"Thank you for your interest in participating in this study. We are interested in learning more about accurately diagnosing ADHD in college students.
For this part of the study, we are recruiting individuals between the ages of 18-26 and those who have a diagnosis of ADHD. In order to verify your eligibility to participate, we have some brief screening questions to ask you. But first, let me tell you about the study. If you are eligible and decide to participate, you will be emailed the link to complete the online materials. First, you will be asked to complete a brief demographic questionnaire so we can collect some background information about you. The next form is a list of questions on a self-report measure for ADHD. We ask that you complete each item honestly as they pertain to you. The final measure will be a brief exit survey about your experience and effort during the study. The entire study will take approximately 45 minutes of your time
All information will be kept confidential. This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way. Your SUID/name will only be connected to reimbursement. In addition, all of your information will be used for research purposes only. We also believe that this study should involve minimal risk to you.

Taking part in this research study is optional and your decision and you have the right to both participate, and the option to opt-out at any time.

In compensation for your time, participants who return the completed packet will receive $20 Cash and be entered into a raffle drawing for a $100 Visa gift card. The researchers will notify the winner of the raffle directly after the completion of the study.

That is a summary of the study. Would you like to continue with the phone screening to determine if you are eligible? ☐ Yes ☐ No

If NO

"Thank you for your time." Politely discontinue screening.

NEXT PAGE IF YES

If YES

"Thank you for your continued interest"

Assign a Screening ID# and Proceed with Questions below

ScreeningID#_____

1. How did you hear about the study? (*write in)*	_____
2. Are you between the ages of 18-26?	☐ Yes ☐ No
3. Do you have a diagnosis of ADHD?	☐ Yes ☐ No
4. Were you diagnosed by a professional?	☐ Yes ☐ No
If yes, what type of professional? (*write in)*	_____
5. At what age were you diagnosed? (*write in)*	_____
6. Did you experience ADHD symptoms prior to the age of 12?	☐ Yes ☐ No
7. Do you still experience symptoms of ADHD?	☐ Yes ☐ No
Impairment	
8. In the past 6 months, have your symptoms impacted you in your everyday life? In other words, have your symptoms caused you any impairment or difficulty? • *DSM-V Definition of Impairment- "Evidence that symptoms interfere with, or reduce the quality of social, academic, or occupational functioning"* • *Document evidence of impairment for each area* • *Check box if there is evidence of impairment* • *Provide additional clarification and examples if needed* *Continued on next page	☐ Yes ☐ No *Check if individual demonstrates impairment in at least ONE area*

Social Functioning	☐ Yes, Evidence of Impairment
Academic Functioning	☐ Yes, Evidence of Impairment
Occupational Functioning	☐ Yes, Evidence of Impairment
Additional Notes:	

☐ Not Eligible

"Thank you for your interest and participating in this phone screening. At this time, you do not meet our eligibility criteria for our study. Again, I appreciate your interest and should you have any questions, please do not hesitate to let me know."

☐ Eligible if:

- "Yes" is checked for #2, #3, #6, and #8
- Diagnosis was made by a qualified mental health provider, psychologist, counselor

NEXT STEPS if *Eligible* is checked:

"You meet the eligibility criteria to participate in our study. If you are still interested in participating, I will email you the hyperlink. Can you please provide me with the email address that you would like me to send the hyperlink to?"

☐ Email Address to send Hyperlink:_____

"In addition, can you please provide us with a home address that we can mail the $10 Visa Gift Card once you have completed the study materials?"

☐ Address to send $20 Compensation:

"Next, let me provide you with your Screening ID number. The Screening ID number is the unique identifier that verifies you meet the study criteria through this phone screening. In addition, this will alert us once you have completed the online study materials, so we can mail you the $10 cash to the address that you have provided us. You will report this on the demographic form."

☐ Provide Screening ID number (page 2 of form)

"Do you have any questions?"

☐ Answer any additional questions about study

"Thank you again for your interest, and I will email the hyperlink to you soon!"

Appendix E

Demographic Questionnaire

Age: _____
Sex: _____
SU ID:_____
Current GPA: _____

Year in School *(Please check)*
____Freshman
____Sophomore
____Junior
____Senior
____Other
____Graduate

Ethnicity: (*Please check)*
____American Indian or Alaska Native
____ Asian
____ Black or African American
____ Hispanic or Latino
____ Native Hawaiian or Other Pacific Islander
____ White

Primary language:
(Please Circle) English Other:_____

Please check any disorder with which you have been **diagnosed**

____ADHD/ADD	_____Anxiety Disorder
____Learning Disability	_____ Traumatic Brain Injury
____Vision Impairment	_____ Autism
____Hearing Impairment	_____ Other:_____
____Depression	_____ None

Are you currently experiencing any difficulties related to school?
No Yes
If Yes, please explain:_____

Are you currently taking any medications?
No Yes
If so, what is (are) the medication(s) treating? _____

Do you regularly take stimulant medication (e.g., Ritalin, Adderall)?
No Yes

Appendix F

Exit Survey-ADHD and Control Groups

I believe that I put forth my best effort on the self-report measure

(Please Circle) No Yes

If No, Please Explain:_____

I completed the research materials (e.g. self-report measure) honestly and accurately

(Please Circle) No Yes

If No, Please Explain:_____

Prior to this study, were you aware of the symptoms of ADHD

(Please Circle) No Yes

Prior to this study, I would rank my knowledge of ADHD on a scale of 0-8 as:

0	1	2	3	4	5	6	7	8
No Knowledge		Little		Good		Very Good		Superior Knowledge

Prior to this study, I learned about ADHD from:

(Check all that apply)

____Friend has ADHD ____TV Advertisements

____Family member has ADHD ____Brochures/Pamphlets

____Online websites ____News reports

____Research into ADHD (Journal Articles)

____I do not have any knowledge about ADHD

Appendix G

Exit Survey-Malingering Group

I believe that I put forth my best effort on the self-report measure

(Please Circle) No Yes

If No, Please Explain:_____

I completed the research materials (e.g. self-report measure) honestly and accurately

(Please Circle) No Yes

If No, Please Explain:_____

Prior to this study, were you aware of the symptoms of ADHD

(Please Circle) No Yes

Prior to this study, I would rank my knowledge of ADHD on a scale of 0-8 as:

0	1	2	3	4	5	6	7	8
No Knowledge			Little		Good		Very Good	Superior Knowledge

Prior to this study, I learned about ADHD from:

(Check all that apply)

____Friend has ADHD
____Family member has ADHD
____Online websites
____Research into ADHD (Journal Articles)
____I do not have any knowledge about ADHD
____TV Advertisements
____Brochures/Pamphlets
____News reports

I feel like the ADHD scenario at the beginning of the study was necessary for me to read in order to successfully fake the symptoms of ADHD

(Please Circle) No Yes

I believe that I was successful in faking ADHD

(Please Circle) No Yes

I used the following strategies while taking this ADHD self-report measure

(Check all that apply)

____Selected items that best matched the DSM-V Criteria (provided in handout)
____ Selected items that best matched my previous knowledge of ADHD
____ Selected items that best matched a person I know with ADHD
____ Impulsive with response selection
____ Did not read instructions fully
____ Completed tasks slowly
____ Skipped items
____Re-read items
____ Selected items about Inattention

____ Selected items about Hyperactivity
____ Letting mind wander or “zoning out”
____ Other:_____

Appendix H

Debriefing Letter

SYRACUSE UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
430 HUNTINGTON HALL
SYRACUSE, NY 13244

Developing a Self-Report Measure to Assess ADHD
Thank you again for participating in this study.

The purpose of this study is to learn more about accurately diagnosing ADHD in college students. We asked for you to complete a self-report measure as if you had ADHD. We specifically informed you that only those who are successful would be entered into a raffle drawing. This is because studies have found that performance increases when individuals are told that they will be given an incentive for demonstrating effort.

This is to notify you that all participants in this study who completed the materials (regardless of performance) are being entered into the raffle drawing for $100 Visa gift card.

Thank you again for your time and participation. If you have any questions, concerns, complaints about the research, please contact the Heather Potts at hepotts@syr.edu, Lawrence Lewandowski at 315-443-1015 or ljlewand@syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator contact the Syracuse University Institutional Review Board at 315-443-3013.

Thank you,

Heather Potts

Appendix I

Informed Consent: ADHD group

SYRACUSE UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
430 HUNTINGTON HALL
SYRACUSE, NY 13244

Developing a Self-Report Measure to Assess ADHD

My name is Heather Potts and I am a Graduate Student at Syracuse University. I am inviting you to participate in a research study. Involvement in the study is voluntary, so you may choose to participate or not. This sheet will explain the study to you and please feel free to ask questions about the research if you have any. I will be happy to explain anything in detail if you wish.

I am interested in learning more about accurately diagnosing ADHD in college students. You will begin by completing a brief demographic questionnaire. Next, you will be asked to complete a list of questions on a self-report measure for ADHD. We ask that you complete each item honestly as they pertain to you. The final measure will be a brief exit survey about your experience and effort during the study. The entire study will take approximately 45 minutes of your time. All information will be kept *confidential.* This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way.

To compensate for your time and effort, you will receive $20 cash for participating in this study. As an additional incentive for participating, you also will be entered into a raffle drawing for a $100 Visa gift card. The odds of winning the raffle are approximately 1 in 150. The researchers will notify the winner of the raffle directly after the completion of the study.

Through participation, you will be contributing to the development of a self-report measure to diagnosis ADHD. A benefit to you might be an increased understanding about ADHD. We believe that this study should involve minimal risk to you. Although not seen in previous studies, you may become concerned about your answers on the self-report measure. If you do not want to take part, you have the right to refuse to take part, without penalty. If you decide to take part and later no longer wish to continue, you have the right to withdraw from the study at any time, without penalty. Please inform the researcher if you have any questions, concerns, or would like to be provided with local counseling and psychological services information.

Whenever one works with e-mail or the Internet there is always the risk of compromising privacy, confidentiality and/or anonymity. Your confidentiality will be maintained to the degree

permitted by the technology being used. It is important for you to understand that no guarantees can be made regarding the interception of data sent via the Internet by third parties.

If you have any questions, concerns, complaints about the research, please contact the Heather Potts at hepotts@syr.edu or Lawrence Lewandowski at 315-443-1015 or ljlewand@syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator contact the Syracuse University Institutional Review Board at 315-443-3013.

All of my questions have been answered, I am 18 years of age or older, and I wish to participate in this research study.

Please print a copy of this informed consent for your records.

By clicking here I agree to participate in this research study.

Appendix J

Informed Consent: Control Group

SYRACUSE UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
430 HUNTINGTON HALL
SYRACUSE, NY 13244

Developing a Self-Report Measure to Assess ADHD

My name is Heather Potts and I am a Graduate Student at Syracuse University. I am inviting you to participate in a research study. Involvement in the study is voluntary, so you may choose to participate or not. This sheet will explain the study to you and please feel free to ask questions about the research if you have any. I will be happy to explain anything in detail if you wish.

I am interested in learning more about accurately diagnosing ADHD in college students. You will begin by completing a brief demographic questionnaire. Next, you will be asked to complete a list of questions on a self-report measure for ADHD. We ask that you complete each item honestly as they pertain to you. The final measure will be a brief exit survey about your experience and effort during the study. The entire study will take approximately 45 minutes of your time. All information will be kept *confidential.* This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way.

You will earn 1 research credit hour through Sona for participating in this study. If you decide to withdrawal from the study, you will receive .5 research credit hour for time that you did participate (5-30 minutes). As an additional incentive, those that complete all items of the self-report measure will be entered into a raffle drawing for a Visa gift card of $100. The odds of winning the raffle are approximately 1 in 150. The researchers will notify the winner of the raffle directly after the completion of the study.

Through participation, you will be contributing to the development of a self-report measure to diagnosis ADHD. A benefit to you might be an increased understanding about ADHD. We believe that this study should involve minimal risk to you. Although not seen in previous studies, you may become concerned about your answers on the self-report measure. If you do not want to take part, you have the right to refuse to take part, without penalty. If you decide to take part and later no longer wish to continue, you have the right to withdraw from the study at any time, without penalty. Please inform the researcher if you have any questions, concerns, or would like to be provided with local counseling and psychological services information.

Whenever one works with e-mail or the Internet there is always the risk of compromising privacy, confidentiality and/or anonymity. Your confidentiality will be maintained to the degree

permitted by the technology being used. It is important for you to understand that no guarantees can be made regarding the interception of data sent via the Internet by third parties.

If you have any questions, concerns, complaints about the research, please contact the Heather Potts at hepotts@syr.edu or Lawrence Lewandowski at 315-443-1015 or ljlewand@syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator contact the Syracuse University Institutional Review Board at 315-443-3013.

All of my questions have been answered, I am 18 years of age or older, and I wish to participate in this research study.

Please print a copy of this informed consent for your records.

By clicking here I agree to participate in this research study.

Appendix K

Informed Consent: Malingering Group

SYRACUSE UNIVERSITY
DEPARTMENT OF PSYCHOLOGY
430 HUNTINGTON HALL
SYRACUSE, NY 13244

Developing a Self-Report Measure to Assess ADHD

My name is Heather Potts and I am a Graduate Student at Syracuse University. I am inviting you to participate in a research study. Involvement in the study is voluntary, so you may choose to participate or not. This sheet will explain the study to you and please feel free to ask questions about the research if you have any. I will be happy to explain anything in detail if you wish.

I am interested in learning more about accurately diagnosing ADHD in college students. You will begin by completing a brief demographic questionnaire. Next, you will be asked to complete a list of questions on a self-report measure for ADHD. We ask that you complete each item honestly as they pertain to you. The final measure will be a brief exit survey about your experience and effort during the study. The entire study will take approximately 45 minutes of your time. All information will be kept *confidential.* This means that your name will not appear anywhere and your specific answers will not be linked to your name in any way.

You will earn 1 research credit hour through Sona for participating in this study. If you decide to withdrawal from the study, you will receive .5 research credit hour for time that you did participate (5-30 minutes). As an additional incentive, those that successfully convince the researcher that they have ADHD will be entered into a raffle drawing for a Visa gift card of $100. The odds of winning the raffle are approximately 1 in 150. The researchers will notify the winner of the raffle directly after the completion of the study.

Through participation, you will be contributing to the development of a self-report measure to diagnosis ADHD. A benefit to you might be an increased understanding about ADHD. We believe that this study should involve minimal risk to you. Although not seen in previous studies, you may become concerned about your answers on the self-report measure. If you do not want to take part, you have the right to refuse to take part, without penalty. If you decide to take part and later no longer wish to continue, you have the right to withdraw from the study at any time, without penalty. Please inform the researcher if you have any questions, concerns, or would like to be provided with local counseling and psychological services information.

Whenever one works with e-mail or the Internet there is always the risk of compromising privacy, confidentiality and/or anonymity. Your confidentiality will be maintained to the degree

permitted by the technology being used. It is important for you to understand that no guarantees can be made regarding the interception of data sent via the Internet by third parties.

If you have any questions, concerns, complaints about the research, please contact the Heather Potts at hepotts@syr.edu or Lawrence Lewandowski at 315-443-1015 or ljlewand@syr.edu. If you have any questions about your rights as a research participant, you have questions, concerns, or complaints that you wish to address to someone other than the investigator, if you cannot reach the investigator contact the Syracuse University Institutional Review Board at 315-443-3013.

All of my questions have been answered, I am 18 years of age or older, and I wish to participate in this research study.

Please print a copy of this informed consent for your records.

By clicking here I agree to participate in this research study.

Appendix L

Malingering Group Study Materials

The Scenario

You will be given 5 minutes to read the following information. At the end of 5 minutes, you will return the information and take a self-report measure as if you are trying to convince someone that you have ADHD. It is not necessary for you to try to act like you have ADHD; you only need to respond to the test items as if you do. Remember, if you are successful at deceiving the tests and following instructions throughout, you will be entered into a raffle drawing to win $100 Visa gift card!

Your roommate has been diagnosed with ADHD. He/She had trouble with classes, but then was given some medication for ADHD, and now does well. He/She even got a couple of A's recently, and has more time to socialize because studying is not as hard! During your midterms, you decided to try your roommate's medication, and ended up surprising yourself with how much easier things went. You may think that you have undiagnosed ADHD, so you "Google" the disorder to learn more about it. On the following pages are some of the things that you find.

Attention Deficit Hyperactivity Disorder

The symptoms of ADHD include inattention and/or hyperactivity and impulsivity. These are traits that most children display at some point or another. But to establish a diagnosis of ADHD, sometimes referred to as ADD, the symptoms should be inappropriate for the child's age.

Adults also can have ADHD; in fact, up to half of adults diagnosed with the disorder had it as children. When ADHD persists into adulthood, symptoms may vary. For instance, an adult may experience restlessness instead of hyperactivity. In addition, adults with ADHD often have problems with interpersonal relationships and employment.

Symptoms of ADHD

There are three different categories of ADHD symptoms: inattention, hyperactivity, impulsivity.

Inattention may not become apparent until a child enters the challenging environment of school. In adults, symptoms of inattention may manifest in work or in social situations.

A person with ADHD may have some or all of the following symptoms:

- Difficulty paying attention to details and tendency to make careless mistakes in school or other activities; producing work that is often messy and careless
- Easily distracted by irrelevant stimuli and frequently interrupting ongoing tasks to attend to trivial noises or events that are usually ignored by others

- Inability to sustain attention on tasks or activities
- Difficulty finishing schoolwork or paperwork or performing tasks that require concentration
- Frequent shifts from one uncompleted activity to another
- Procrastination
- Disorganized work habits
- Forgetfulness in daily activities (for example, missing appointments, forgetting to bring lunch)
- Failure to complete tasks such as homework or chores
- Frequent shifts in conversation, not listening to others, not keeping one's mind on conversations, and not following details or rules of activities in social situations

Hyperactivity symptoms may be apparent in very young preschoolers and are nearly always present before the age of seven. Symptoms include:

- Fidgeting, squirming when seated
- Getting up frequently to walk or run around
- Running or climbing excessively when it's inappropriate (in teens this may appear as restlessness)
- Having difficulty playing quietly or engaging in quiet leisure activities
- Always being 'on the go'
- Often talking excessively

Hyperactivity may vary with age and developmental stage.

Toddlers and preschoolers with ADHD tend to be constantly in motion, jumping on furniture, and having difficulty participating in sedentary group activities. For instance, they may have trouble listening to a story.

School-age children display similar behavior but with less frequency. They are unable to remain seated, squirm a lot, fidget, or talk excessively.

In adolescents and adults, hyperactivity may manifest itself as feelings of restlessness and difficulty engaging in quiet sedentary activities.

Impulsivity symptoms include:

- Impatience
- Difficulty delaying responses
- Blurting out answers before questions have been completed
- Difficulty awaiting one's turn
- Frequently interrupting or intruding on others to the point of causing problems in social or work settings
- Initiating conversations at inappropriate times

Impulsivity may lead to accidents such as knocking over objects or banging into people. Children with ADHD may also engage in potentially dangerous activities without considering the consequences. For instance, they may climb to precarious positions.

Many of these symptoms occur from time to time in normal youngsters. However, in children with ADHD they occur frequently -- at home and at school or when visiting with friends. They also interfere with the child's ability to function as other children of the same age or developmental level.

ADHD is diagnosed only when children consistently display some or all of the above behaviors in at least two settings, such as at home and in school, for at least six months.

Types of ADHD

There are three different subtypes of ADHD, including:

- Combined ADHD (the most common subtype), which involves symptoms of both inattentiveness and hyperactivity/impulsivity
- Inattentive ADHD (previously known as ADD), which is marked by impaired attention and concentration
- Hyperactive-impulsive ADHD, which is marked by hyperactivity without inattentiveness

For a diagnosis of ADHD, some symptoms that cause impairment must be present before age seven. Also, some impairment from the symptoms must be present in more than one setting. For instance, the person may be impaired at home and school or home and work. Also, there must be clear evidence the symptoms interfere with the person's ability to function at home, in social environments, or at work.

How is ADHD diagnosed in adults?

Like children, adults who suspect they have ADHD should be evaluated by a licensed mental health professional. But the professional may need to consider a wider range of symptoms when assessing adults for ADHD because their symptoms tend to be more varied and possibly not as clear-cut as symptoms seen in children.

To be diagnosed with the condition, an adult must have ADHD symptoms that began in childhood and continued throughout adulthood. Health professionals use certain rating scales to determine if an adult meets the diagnostic criteria for ADHD. The mental health professional also will look at the person's history of childhood behavior and school experiences, and will interview spouses or partners, parents, close friends, and other associates. The person will also undergo a physical exam and various psychological tests.

For some adults, a diagnosis of ADHD can bring a sense of relief. Adults who have had the disorder since childhood, but who have not been diagnosed, may have developed negative feelings about themselves over the years. Receiving a diagnosis allows them to understand the reasons for their problems, and treatment will allow them to deal with their problems more effectively.

Who Is At Risk?

ADHD is one of the most common childhood disorders and can continue through adolescence and into adulthood. The average age of onset is 7 years old.

ADHD affects about 4.1% American adults age 18 years and older in a given year. The disorder affects 9.0% of American children age 13 to 18 years. Boys are four times at risk than girls.

Studies show that the number of children being diagnosed with ADHD is increasing, but it is unclear why.

Long-Term Prognosis With ADHD

Some children with ADHD -- approximately 20% to 30% -- develop learning problems that may not improve with ADHD treatment. Hyperactive behavior may be associated with the development of other disruptive disorders, particularly conduct and oppositional-defiant disorder. Why this association exists is not known.

Many children with ADHD ultimately adjust. Some, though, especially those with an associated conduct or oppositional-defiant disorder, are more likely to drop out of school. These individuals fare more poorly in their later careers.

Inattention tends to persist through childhood and adolescence and on into adulthood, while hyperactivity tends to diminish with age.

As they grow older, some teens that have had ADHD since childhood may experience periods of anxiety or depression.

Several of the symptoms of ADHD may get worse as the demands at school or home increase. They include:

- Difficulty following instructions
- Being unable to get organized, either at home or at school
- Fidgeting, especially with the hands and feet
- Talking too much
- Failing to finish projects, including chores and homework
- Not paying attention to and responding to details
- Getting poor grades in school
- Being isolated from peers due to poor grades and secondary depressio

Please Continue to Study these Materials Until Instructed to Stop by the Researcher

Appendix M

Procedural Script: Control Condition

Developing a Self-Report Measure to Assess ADHD
Procedural SCRIPT
CONTROL CONDITION

Directions: Please fill out each area detailed below. Please make sure that the identifying information (box 1) is complete before you submit the form.

I. Identifying Information		
Name of primary research assistant:		
Name of secondary research assistant: or N/A		
Date and Time:		
Number of Participants:		
Session Number:		
Session Preparation **Set up Computers** • Username: m-kdpotter • Password: Testing1 **Load Qualtrics** • Desktop Word document "ADHD Link" • Open the Control • Put sign in sheet by door **Study Protocol** • Sign in sheet • Informed Consent • Demographic survey introduction • Self-Report and Exit Survey introduction **Check out** • Log Off		
II. Data Collection – Material Preparation	**Circle**	
1. Informed Consents	**Yes**	**No**
2. Note Pad and Pen	**Yes**	**No**
Notes:		

Informed Consent and Welcome Procedures		
[Please check [✓] each box as you complete each step]✓		
1.	State to the students: **Welcome! We are going to get started. If you have not already done so, please clean off the top of your desk, except for the packet and pencils. Please also turn off all electronics.** **If you have not already done so, please make sure to put your name on the sign in sheet for us to assign Sona credit hours.**	
2	Review Informed Consent: **This study will be conducted online. The online survey has been loaded for you,** **We are asking that you participate in a study to develop a self-report measure to assess for ADHD. We will be asking you to complete a demographic survey, a pilot self-report measure, and an exit survey. For your participation in this study, you will receive Sona credit and be entered into a $100 Visa gift card raffle drawing.** **We do not believe that you will experience any risk with your participation today, however should you have questions or concerns later you can always contact us. Please review the informed consent and please let us know if you have any questions. If you agree to participate, please electronically sign the document. Paper copies are available for you to take home.**	
3.	**Please review the informed consent and let us know if you have any questions.** Experimenter walks around and answers any questions	
4.	**Thank you, we will begin. Please make sure to listen to the directions carefully, including instructions regarding when to move on to the next section. Are there any questions?**	
5	**Please move onto the next section**	

Demographic Information		
[Please check [✓] each box as you complete each step]✓		
1.	Experimenter introduces demographics form. **The first section is a demographic survey. We are asking for you to include your SUID. This will be used only for the final raffle drawing and to assign Sona credits. Your SUID will not be connected to any of your responses.**	

2	**If you have any questions about these, just raise your hand, and one of us will come over to help you.**	
3.	Walk around and answer any questions	

Self-Report Measure and Exit Survey		
[Please check [✓] each box as you complete each step]✓		
1.	Experimenter introduces the Self-Report Measure and Exit Survey **In the next task, we'll be asking you to complete a Self-report measure followed by a brief exit survey. The self-report measure has two parts. Please make sure to take time to read each section's introduction header, as this will tell you the different response options.**	
2	**For all survey items, please answer honestly based upon how you think and feel, NOT how others think and feel and NOT based upon how others expect you to respond. Answer honestly based upon how you think and feel In addition, please let me know if you have any questions.** **You must provide an answer for each item to move onto the next section.**	
3	**After you have completed the Two Part self-report measure you will complete a brief exit survey.**	
4	**Please check in when you have completed the exit survey and please let us know if you have any questions.**	
5.	**You may begin to take the survey. Again, please answer these items honestly as they related to you.**	
2	Experimenter walks around answers any questions	
3.	Thank participants when they have completed the exit survey and inform them that they are free to leave.	

Appendix N

Procedural Script: Malingering Condition

Developing a Self-Report Measure to Assess ADHD
Procedural SCRIPT
MALINGERING CONDITION

Directions: Please fill out each area detailed below. Please make sure that the identifying information (box 1) is complete before you submit the form.

I. Identifying Information		
Name of primary research assistant:		
Name of secondary research assistant: or N/A		
Date and Time:		
Number of Participants:		
Session Number:		
Session Preparation **Set up Computers** • Username: m-kdpotter • Password: Testing1 **Load Qualtrics** • Desktop Word document "ADHD Link" • Open Malingering Condition link • Put sign in sheet by the door **Study Protocol** • Verify everyone has signed in • Informed Consent • Demographic survey introduction • Introduction to Self-Report measure (Malingering) • Study Materials-5 minute study time • Self-report measure • Exit Survey • Debriefing letter		
II. Data Collection – Material Preparation Circle		
1. Extra Informed Consents	**Yes**	**No**
2. Note Pad and Pen	**Yes**	**No**
Notes:		

Informed Consent and Welcome Procedures		
[Please check [✓] each box as you complete each step]✓		
1.	State to the students: **Welcome! We are going to get started. If you have not already done so, please clean off the top of your desk, except for the packet and pencils. Please also turn off all electronics.** **If you have not already done so, please make sure to put your name on the sign in sheet for us to assign Sona credit hours.**	
2	Review Informed Consent: **This study will be conducted online. The online survey has been loaded for you,** **We are asking that you participate in a study to develop a self-report measure to assess for ADHD. We will be asking you to complete several a demographic survey, a pilot self-report measure, and an exit survey.** **We do not believe that you will experience any risk with your participation today, however should you have questions or concerns later you can always contact us. Please review the informed consent and please let us know if you have any questions. If you agree to participate, please electronically sign the document. Paper copies are available for you to take home.**	
3.	**Please review the informed consent and let us know if you have any questions.** Experimenter walks around and answers any questions	
4.	**Thank you, we will begin. Please make sure to listen to the directions carefully, including instructions regarding when to move on to the next section. Are there any questions?**	
5.	**Please move onto the next section.**	

Demographic Information Procedure		
[Please check [✓] each box as you complete each step]✓		
1.	Experimenter introduces demographics form. **The first section is a demographic survey. We are asking for you to include your SUID. This will be used only for the raffle drawing, which we will discuss later. Your SUID will not be connected to any of your responses.** **If you have any questions about these, just raise your hand, and one of us will come over to help you.**	

	Please make sure to wait prior to moving onto the next section	
2	Walk around and answer any questions	
3.	Wait for all participants to complete demographic	
4.	**Okay now we are going to move onto the next section.**	

Self-Report Measure and Exit Survey		
[Please check [✓] each box as you complete each step]✓		
1.	Experimenter introduces the Self-Report Measure and Exit Survey **In the next task, we'll be asking you to complete the Self-report measure followed by a brief exit survey.**	
2	**We are asking that you complete a Two Part self-report measure faking the symptoms and diagnosis of ADHD. To assist you with this, we have provided you with study materials. You will have 5 minutes to review and study information about ADHD.**	
3.	**In order to increase motivation and effort to fake ADHD, we are entering anyone who successfully deceives the clinician by faking ADHD on the Two Part self-report measure into a raffle drawing to win a Visa gift card of $100.**	
4.	**Are there any questions?** Wait for responses	
5.	**I will read the scenario with you:** **Your roommate has been diagnosed with ADHD. He/She had trouble with classes, but then was given some medication for ADHD, and now does well. He/She even got a couple of A's recently, and has more time to socialize because studying is not as hard! During your midterms, you decided to try your roommate's medication, and ended up surprising yourself with how much easier things went. You may think that you have undiagnosed ADHD, so you "Google" the disorder to learn more about it. On the following pages are some of the things that you find.** **Please spend the next 5 minutes studying the materials.**	
5.	Time 5 minutes Walk around and answer any questions.	
5.	After 5 minutes has elapsed: **The 5 minute study time is over. Please hand in the study materials.**	
6.	**Again, your goal is to successfully fake the symptoms of ADHD to deceive the clinician. Those that are successful will be entered into a raffle drawing for a $100 Visa gift Card.**	

	After you complete the Two Part Self-report measure, we ask that you to fill out the final exit survey HONESTLY.	
7.	**Are there any questions?**	
8.	**You may begin. Please notify me when you are done.**	
9.	Walk around and answer any questions.	
10.	Hand the debriefing letter to participants when they are done.	
11.	Thank participants as they leave.	

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Department of Psychology, School Psychology Ph.D. program

The George Washington University 2006-2008
Graduate School of Education and Human Development, M.A.

James Madison University 2002-2006
Department of Psychology, B.A.