

# **Analysis of the Clinical Assessment of Attention Deficit-Adult in Comparison to the Minnesota Multiphasic Personality Inventory-2-Restructured Form in Adult Psychoeducational Clinic**

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## **Abstract**

Past research has found that the Clinical Assessment of Attention Deficit-Adult (CAT-A) may be useful for aiding in correctly identifying Attention-Deficit/Hyperactivity Disorder (ADHD; Marshal et al., 2010). However, these studies did not utilize other well-known self-report tests as a comparative measure to examine the suitability of the CAT-A validity scales in detecting malingering. The present study examines the utility of the CAT-A validity scales in comparison to the Response Bias Scale, Infrequent Responses, and Infrequent Psychopathology Responses validity scales of the Minnesota Multiphasic Personality Inventory-2-Restructured Form. An archival study design with 105 patients was utilized. Results showed that the rate of agreement between the CAT-A and the MMPI-2-RF validity scales was only moderate and not significantly related. However, the CAT-A is a useful tool for assessing cognitive symptom reporting. Findings from this study also supplement those of other studies in that there is a present need for more research examining the validity scales of the CAT-A as well as other self-report measures.

## **Key Words:**

ADHD, malingering, CAT-A, MMPI-2-RF

As the awareness for mental health and disabilities has increased, the prevalence of adult Attention-Deficit/Hyperactivity Disorder (ADHD) has also recently become more acknowledged. Adult ADHD is characterized by difficulty sustaining attention, disorganization, forgetfulness, distractibility, and inattention to detail (Zalsman & Shilton, 2016). These symptoms often lead to a wide variety of struggles that may interfere with daily life. For instance, adults with ADHD often describe instances of leaving projects unfinished, risky behavior, overspending or straying from their budget, and forgetting important commitments. In terms of prevalence, a comprehensive meta-analysis found that approximately 7.2% of adolescents under the age of 18 have ADHD (Thomas, Sanders, Doust, Beller, & Glasziou, 2015). Of these, as many as 85% continue to show ADHD symptoms in

adulthood; although they may not meet full criteria for a diagnosis (Bordoff, 2017).

However, despite the high rate of ADHD symptoms in adulthood, studies indicate a discrepancy between the estimated prevalence of ADHD among adults receiving evaluations, and those attempting to obtain a diagnosis for personal gain (Simon et al., 2009). For instance, it is estimated that 25% to 48% of college students self-referring for ADHD evaluations feign or exaggerate symptoms (Sullivan, May, & Galbally, 2007). Thus, emphasizing the importance of using symptom validity tests designed to identify malingering patients. Malingering can be described as the action of purposefully faking or exaggerating ADHD symptoms for personal gain, such as academic accommodation or stimulant medications

(American Psychiatric Association, 2013). An individual is suspected of malingering if their score exceeds the range of “normal” scores for the diagnosed population being examined in the same context. This is referred to as significantly elevating validity scales. It is also important to clarify the distinction between malingering and exaggeration of symptoms. Malingering or feigning of ADHD symptoms differs from exaggeration of symptoms in that malingerers do not actually have ADHD and consciously feign symptoms for gain (Harrison, Edwards, & Parker, 2007). Whereas an exaggerator may have ADHD but magnifies the presence of their symptoms to appear as having worse symptoms than they actually possess (Harrison et al., 2007). While the tests given during an evaluation are generally reliable, several other studies have found that there is a need for tests with greater sensitivity to malingering, or the fabrication of symptoms (Quinn, 2003). Therefore, more information about validity scales is necessary to help clinicians make more accurate diagnoses of adult ADHD. The purpose of this study is to examine the validity scales of the Clinical Assessment of Attention Deficit-Adult (CAT-A; Bracken, & Boatwright, 2005) in comparison to the validity scales of the Minnesota Multiphasic Personality Inventory 2 Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008) in order to determine the accuracy of the CAT-A validity scales in detecting possible malingering.

In order to diagnose adult ADHD, patients undergo a psychoeducational evaluation consisting of a cognitive and psychological test battery to gain a comprehensive overview of their symptoms. Several self-report measures are given to account for the patient’s symptoms. A clinical interview is conducted along with the self-report measures to offer patients the opportunity to describe any symptoms they experience currently and in the past. Specifically, these interviews aid in obtaining retrospective information about the patient’s childhood, as symptoms during childhood are necessary for a diagnosis. However, clinical interviews often come with risks for unreliability since patients may find it difficult to recall their childhood clearly and a patient’s memories of childhood symptoms may be affected by symptoms they are currently experiencing (Bordoff, 2017).

Collateral interviews with family members or friends are often utilized for this purpose to gain more accurate details. In addition, some higher functioning ADHD patient groups do not experience significant difficulty until the expectation for self-management increases as they get older (Epstein & Loren, 2013). To help reduce diagnostic issues, the age of onset criterion rose from the age of 7 to 12, and the minimum number of necessary symptoms for diagnosis reduced from six to five in the revision of the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM-IV) to the most recent edition, DSM-5 (American Psychiatric Association, 2013).

With the academic and pharmaceutical benefits offered to those diagnosed with ADHD, it is not surprising that a large number of students feign ADHD symptoms. For example, those with ADHD are often eligible for accommodations such as extended time on tests, extended deadlines, private testing rooms, computers, and note taking assistance. While some of these benefits are also given to those with learning disabilities, students may be more likely to feign ADHD because an ADHD diagnosis may also come with a prescription for psychostimulant medication, as accommodations and medication are generally the first line of treatment for ADHD (Bordoff, 2017; Sullivan et al., 2007). These external incentives, as well as the growing awareness of ADHD in adults, has contributed to the increase in students seeking ADHD evaluations. Between 1994 and 2009, there was a six-fold increase in self-referred visits for psychostimulant prescriptions with the largest growing population being patients between 20 and 39 years old (Bordoff, 2017; Olfson, Blanco, Wang, & Greenhill, 2013).

This dramatic increase in adults self-referring for ADHD evaluations to access medications has led to concern about the sharing and abuse of psychostimulant medications. For instance, one study found 84% of students with ADHD receiving prescriptions for this medication have been asked by students without ADHD to share their medications (Advokat, Guidry, & Martino, 2008). Fifty-four percent of these students reported having been asked to sell their medications and 19% had been asked how to fake ADHD symptoms during an

evaluation. Psychostimulants are illicitly used for many purposes other than the treatment of ADHD symptoms. For example, several studies have found that many students who abuse ADHD medication do so to enhance their academic performance, to increase energy, to stay awake, and as alternatives to methamphetamine and cocaine (Advokat et al., 2008; Bordoff, 2017; Marshall et al., 2010; Swanson & Volkow, 2003).

In response to concerns regarding ADHD malingering and medication sharing, a growing body of research has developed to examine the accuracy of tests used to detect faked ADHD. Patients may do so to increase the likelihood that they are given academic benefits and/or medication. Due to the vast amount of information that is easily accessible to the public, individuals wishing to malingering or exaggerate during an ADHD evaluation find it easy to become symptom educated. However, because not all ADHD symptoms listed in the DSM-5 are required for a diagnosis, ADHD may not be expressed identically among individuals. As a result, many people attempting to malingering will endorse more symptoms than what is typical because they are not familiar with ADHD (Nigg, 2005). In order to detect malingering and exaggeration, validity tests are commonly included in the assessment procedure.

Symptom validity tests use self-report measures to identify symptoms that are being feigned or exaggerated (Wallace et al., 2019). Self-report measures are not customarily used to identify dishonest symptom reporting but are instead used to assist in diagnosis by corroborating the patient's presenting symptoms and symptom history discussed during the interview. The only self-report measures currently used for both diagnosis and identification of malingering in adult ADHD are the Conners' Adult ADHD Rating Scales (CAARS; Conners, Erhardt, & Sparrow, 1999) and the Clinical Assessment of Attention Deficit-Adult (CAT-A; Bracken & Boatwright, 2005). Although other self-report measures exist that assess features of adult ADHD among other psychological and cognitive symptoms, the CAARS and CAT-A are the only two measures to our knowledge that exclusively assess adult ADHD.

Unlike the CAARS, which only measures current symptoms, the CAT-A rating form contains two parts, one that measures childhood symptoms and one that measures adulthood symptoms. The CAT-A contains three validity scales to test for malingering and exaggeration. This study focused on two of those validity scales, namely the Negative Impression (NI) scale, which measures exaggeration by assessing the degree to which a patient endorses more symptoms than is typical of ADHD, and the Infrequency (IF) scale, which measures malingering by assessing the severity and frequency of endorsed items that are reported by less than 2% of responders (Bracken & Boatwright, 2005). The purpose of these scales is to identify exaggerators and malingerers by maintaining a balance between specificity (true negatives) and sensitivity (true positives). This study did not examine the Positive Impression (PI) scale because it measures the amount of unusually positive responses that may indicate exaggerated well-being or functioning and is not expected to be elevated for a patient attempting to feign or exaggerate ADHD symptoms (Bracken & Boatwright, 2005). While not much research has been done investigating the validity scales of the CAT-A, there is a large body of research supporting the use of related validity scales on the Minnesota Multiphasic Personality Inventory-2 Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008).

Unlike the CAT-A, which was designed for ADHD evaluations, the MMPI-2-RF is used in a wide variety of contexts within clinical evaluations to measure adult personality and psychopathology and is a well-established comparative standard for assessing validity (Harp, Jasinski, Shandera-Ochsner, Mason, & Berry, 2011). The MMPI-2-RF contains several validity measures but the most comparable to those of the CAT-A are the Infrequent Responses (F-r) scale, Infrequent Psychopathology Responses (Fp-r) scale, and the Response Bias Scale (RBS). The F-r scale measures the degree to which a patient is over reporting, or frequently reporting, items that were not commonly endorsed by the normative sample (Ben-Porath & Tellegen, 2008). Similar to the F-r scale, the Fp-r scale measures the amount of psychopathological responses that were infrequently reported by a sample of participants with various psychiatric

disorders (Ben-Porath & Tellegen, 2008). The RBS scale is related to the likelihood of an examinee failing performance validity tests (PVTs) (i.e., tests that assess effort and motivation; Ben-Porath, 2012). Each of these scales is discussed in more detail in the methods section.

Researchers have demonstrated the predecessor of the MMPI-2-RF, the Minnesota Multiphasic Personality Inventory – Second Edition (MMPI-2; Butcher, Graham, Tellegen, & Kaemmer, 1989) has several useful validity scales for detecting inaccurate reporting of ADHD symptoms (Young & Gross, 2011). One common way malingering has been assessed is through simulator studies. In the aforementioned study design, a group of participants were asked to act as if they have ADHD and the results can then be compared to a control group in which participants were asked to try their best during the assessment, and clinical group of individuals that have been diagnosed with ADHD. Young and Gross (2011) found significant between groups differences for the malingering (simulator group), clinical, and control groups on six of the validity scales including the MMPI-2 versions of the present study's targeted scales: F scale, Fp scale, and the RBS which was subsequently developed in 2007 (Gervais, Ben-Porath, Wygant, & Green, 2007). The malingering group scored significantly higher than both the clinical and control groups on all these scales. The Fp and F scales demonstrated the best balance of sensitivity and specificity, followed closely by the RBS and findings suggest that the MMPI-2 is a useful tool for ADHD diagnostic evaluations (Young & Gross, 2011). In comparison, a more recent simulator study using the MMPI-2-RF found that the MMPI-2-RF validity scales have potential for identifying malingering in ADHD evaluations but should be used cautiously (Harp et al., 2011). Specifically, when comparing the scores of the honest reporting condition to those of the malingering condition, it was found that at the recommended cutoffs, the F-r and Fp-r validity scales showed good specificity but poor sensitivity. After adjusting the cutoffs, the Fp-r scale performed best and improved sensitivity to a moderate level. The F-r scale also showed improvement after using the experimental cut scores. The researchers concluded that the two scales may be useful

indicators of ADHD malingering, preferably alongside multiple measures including those of cognitive symptoms (Harp et al., 2011).

Alternatively, the CAT-A has also been shown to be effective at identifying malingering. An archival study revealed that approximately 22% of patients attempted to mangle during the evaluation (Marshall et al., 2010). Specifically, results showed that the CAT-A Infrequency scale exhibited good sensitivity (58%) when held to a specificity of 90%. It was also found that individuals undergoing an evaluation for ADHD feign specific impairments on tests that appear to be assessing a particular facet of ADHD, for example, attention. Because of this, researchers emphasized the necessity of diagnosing ADHD using a variety of assessments, including the CAT-A, alongside clinical interviews (Marshall et al., 2010). However, comprehensive literature reviews of the research on feigned ADHD concluded that there is still a need for sensitive tools that can be used in clinical practice, as well as a lack of research on such measures (Tucha et al., 2015; Musso & Gouvier, 2014). In addition, there is also a lack of research comparing and examining the utility of ADHD diagnostic tools that include the CAT-A and its validity scales. The present study aims to help close this gap in research.

The purpose of the present study was to further examine the utility of the CAT-A validity scales in detecting malingering and exaggeration by measuring the rate of agreement between the validity scales on the CAT-A and MMPI-2-RF. Past research has used the MMPI-2-RF as a comparative standard and has proved useful for analyzing newer or less researched tests. Therefore, it was expected that individuals classified as malingering on the MMPI-2-RF would also be classified as malingering on the CAT-A. Conversely, individuals not identified as malingering on the MMPI-2-RF were not expected to be identified as malingering on the CAT-A. Such findings would imply that the CAT-A has potential to be a reliable assessment of ADHD symptoms and a useful tool for diagnosis.

## Methods

### Participants

This archival study consisted of 105 patients, however four were excluded due to incomplete tests resulting in 101 final patients. Gender was nearly evenly distributed with 50.5% ( $N = 51$ ) being female. The majority of patients were Caucasian at 51.5% ( $N = 52$ ). The second largest race group included was African American at 13.9% ( $N = 14$ ). The remaining patients were Hispanic/Latino, Asian, Mixed, other, or did not have their race recorded. All patients were referred for an ADHD or learning disability assessment at the psychoeducational clinic at the University of North Carolina at Charlotte. All patients were 18 years of

age or older ranging in age from 18 to 59 ( $M = 25.17$ ;  $SD = 8.04$ ). While the majority of patients were students at UNC Charlotte ( $N = 88$ ), the clinic is open to the public for evaluations and a small percentage of students were from other local universities. It is also important to note that while the majority of patients were referred due to suspected ADHD and attentional difficulties ( $N = 67$ ) and all of the patients included in this study were given both the CAT-A and MMPI-2-RF as part of their evaluation, not all participants were diagnosed with ADHD. Many patients were diagnosed with a learning disability, psychological disorder, or a comorbid diagnosis. For all participant diagnoses, see Table 1.

**Table 1: Patient Diagnoses**

Diagnosis	Frequency	Percentage
No Diagnosis	18	17.8
ADHD	20	19.8
LD	7	6.9
PD	32	31.7
ADHD + LD	4	4
ADHD + PD	11	10.9
LD + PD	4	4
ADHD + LD + PD	2	2
None Recorded	3	3

*Abbreviations:* Attention-Deficit/Hyperactivity Disorder (ADHD); Learning Disability (LD); Psychiatric Disorder (PD).

### Procedure

Psychoeducational assessments were conducted by a licensed clinical psychologist and trained graduate students between 2009 and 2017. These assessments consisted of a clinical interview with each participant and the administration of a battery of cognitive and psychological tests including but not limited to the CAT-A and the MMPI-2-RF. The duration of each assessment varied because

evaluations were tailored depending on the needs of the patient, but approximately lasted two to three hours. For the purpose of this study we focused on the CAT-A and MMPI-2-RF. Participants did not receive any compensation as data was collected as part of a clinical evaluation.

### Measures

**Minnesota Multiphasic Personality Inventory-2-Restructured Form.** The MMPI-2-RF (Ben-Porath & Tellegen, 2008) is a self-report psychological assessment instrument comprising 338 true/false questions, which the participant completed independently. The MMPI-2-RF is the most recent update from the MMPI-2 to the MMPI-2-RF reduced the number of questions reducing test taking fatigue and increasing accurate responses. Although existing research supports the validity of the MMPI-2-RF in most contexts, it is important to note that validity may be reduced in the context of an ADHD evaluation due to the nature of the disorder, which may make it difficult for patients to complete the exam or answer every question truthfully (Ben-Porath, 2012). Extensive research also supports the reliability of the MMPI-2 in many contexts, which was also improved upon in the update to the MMPI-2-RF (Ben-Porath, 2012). Specifically, test-retest reliability and internal consistency are reported as broadly acceptable across the validity scales utilized in this study ( $r = .51$  to  $.82$  and Cronbach's  $\alpha = .39$  to  $.71$ , respectively; Tellegen & Ben-Porath, 2008).

The MMPI-2-RF validity scales examined in this study include the Infrequent Responses (F-r) scale, Infrequent Psychopathology Responses (Fp-r) scale, and the Response Bias Scale (RBS). The F-r scale consists of 32 items answered infrequently by the normative sample (e.g. "My memory seems to be alright"). Most of these items are only included within this one scale but four of these items are also included on the RBS. The Fp-r scale, similar to the F-r scale, measures the amount of psychopathological responses that were infrequently reported by a psychiatric sample (e.g. "Someone has control over my mind"). This scale consists of 21 items and two of these items are also included on the RBS. The RBS is made up of 28 items and was developed for identifying negative response biases for cognitive symptoms, as well as to predict the likelihood that an examinee will fail PVTs (e.g. "I cannot keep my mind on one thing"). Elevation of these scales above the recommended cutoff score, T-score of  $\geq 80$  (with a maximum possible T-score of 120), suggests that a patient may be malingering or exaggerating experienced symptoms.

**Clinical Assessment of Attention Deficit-Adult.** The CAT-A (Bracken & Boatwright, 2005) is a self-report measure that assesses behaviors associated with ADHD in the DSM-5, including clinical symptoms and multiple contexts. It includes two parts and is scored using a four-point item Likert scale. The first part includes 54 items examining current symptoms while the second part includes 54 items examining childhood memories, creating a total of 108 questions that should all be completed by the adult patient (Bracken & Boatwright, 2005). While the CAT-A demonstrates good reliability and validity in diagnosis as well as good internal consistency ( $\alpha = .98$ ; Bracken & Boatwright, 2005), more research is needed to further confirm the utility of the validity scales.

The CAT-A contains two comparable validity indices to the above MMPI-2-RF scales. The Negative Impression (NI) scale was developed to detect individuals who endorse more items to seem more impaired than they are (e.g. "I act without thinking"). This scale utilizes all the items on the CAT-A. The Infrequency (IF) scale is similar to the F-r scale and detects the degree to which an examinee endorses more items than that of the normative sample. This scale is made up of 10 items (e.g. "I was unable to sit quietly through a movie"). Patients who elevate the IF scale, T-score of  $\geq 80$ , are considered to be exaggerating. However, some individuals who elevate this scale may be experiencing symptoms at a high level, which should become apparent in other aspects of the evaluation including the clinical interview and behavioral observations.

### Data Analysis

It was expected that when comparing the CAT-A and the MMPI-2-RF, the validity scales of these measures would display similar patterns of elevations. This study utilized the cutoff scores recommended in the test manual for each of the scales as described previously, as well as an adjusted cutoff score for the MMPI-2-RF scales. Because the MMPI-2-RF is utilized in multiple contexts and populations, it was tested if a cutoff score that is lower than the recommended cutoff score would work better for this population. We determined an adjusted cutoff score of T-score of

$\geq 70$  would be used in comparison with the recommended cutoff score T-score of  $\geq 80$ . The utility of all cutoff scores were examined using the rate of agreement.

An examinee is suspected of malingering if their scores exceed these cutoffs of a T-score of  $\geq 80$ . This is also referred to as elevation. It was expected that if the F-r scale and Fp-r scale of the MMPI-2-RF were elevated then the IF scale of the CAT-A would also be elevated. Similar comparisons were made between the RBS of the MMPI-2-RF and the NI scale from the CAT-A. For both comparisons, the rate of agreement in malingering or scale elevation (i.e., sensitivity) was assessed as well as the rate of agreement for honest responding or lack of scale elevation (i.e., specificity). For all the scales, scale elevation was coded as a 1 and lack of scale elevation was coded as a 0. Missing score values were coded as 888 and were not included in the analyses. Correlations between every validity scale

were examined and it was expected that validity scales of the same test would show a significant correlation. Chi-squared analysis were also performed between each of the validity scales. Ideally, in both cutoff score conditions, the CAT-A will display similar results to the well-established MMPI-2-RF scales, thus suggesting that the CAT-A is a valid test to detect malingering in the psychoeducational setting.

## Results

Two significant correlations were found among the validity scales and can be found in Table 2. As expected, these correlations were found among the scales of the same test. The NI scale displayed a significant correlation with the IF scale,  $r = .86, p < .01$ . The F-r and Fp-r scales were also found to be positively correlated,  $r = .41, p < .01$ . No significant correlations were found between any of the CAT-A and MMPI-2-RF scales.

**Table 2: Correlations Between the CAT-A and MMPI-2 RF Validity Scales**

Measure	1	2	3	4	5
1. NI	-	.858**	.060	.038	-.025
2. IF		-	-0.06	-1.27	-.032
3. F-r				.413**	.172
4. Fp-r				-	-.006
5. RBS				-	-

*Note.* \*\* $p < .01$  Abbreviations: Infrequency (F-r); Infrequency-Psychopathology (Fp-r); Response Bias Scale (RBS); Negative Impression (NI); Infrequency (IF).

With the recommended cutoff scores for the CAT-A, it was found that more participants elevated the NI scale than the IF scale. For the MMPI-2-RF, it was found that the RBS demonstrated the highest percentage of elevation when using the recommended cutoff T-score of  $\geq 80$ . After adjusting

the MMPI-2-RF cutoff scores to a T-score of  $\geq 70$ , the percentage of participants who elevated the Fp-r and RBS scales increased while the F-r scale remained the same. The percentage of elevation for each validity scale is shown in Table 3.

**Table 3: Number of Participants That Elevated Each Validity Scale**

MMPI-2-RF 1		MMPI-2-RF 2		CAT-A	
Scale	%	Scale	%	Scale	%
F-r	27.5	F-r	27.5	NI	45.3
Fp-r	5.5	Fp-r	9.9	IF	31
RBS	28.4	RBS	48.9		

*Note.* MMPI-2-RF 1 denotes use of the recommended cutoff score of  $t$ -score  $\geq 80$ . MMPI-2-RF 2 denotes the use of the adjusted cutoff score of  $t$ -score  $\geq 70$ . *Abbreviations:* Infrequency (F-r); Infrequency-Psychopathology (Fp-r); Response Bias Scale (RBS); Negative Impression (NI); Infrequency (IF).

The rate of agreement for each validity scale is shown in Table 4. The rate of agreement for all MMPI-2-RF scales and the CAT-A IF scale averaged 61.5%, using the recommended cutoff T-score of  $\geq 80$  for the MMPI-2-RF. After adjusting the cutoff scores for the MMPI-2-RF to a T-score of  $\geq 70$ , this average decreased to 56.7%. The rate of agreement for all MMPI-2-RF scales and the CAT-A NI scale was on average 57.5%, using the

recommended cutoff T-score of  $\geq 80$ . After adjusting the cutoff scores for the MMPI-2-RF to a T-score of  $\geq 70$ , it was found that this average decreased to 56.3%. A chi-squared test was performed to examine the significance of the rate of agreement. Only one significant association was found, between the NI scale and the RBS scale, using a chi-squared analysis,  $X^2(1, N = 75) = 3.84, p = .05$ , which also had a rate of agreement of 61.3%.

**Table 4: Rate of Agreement Among Validity Scales (In Percentages)**

MMPI-2-RF	CAT-A IF Scale	CAT-A NI Scale
Scale		
F-r	61	60.2
F-r*	54.4	58.9
Fp-r	67	53.8
Fp-r*	62	48.7
RBS	56.2	58.6
RBS*	53.9	61.3**

*Note.* \*These scales demonstrate the rate of agreement using the adjusted cutoff score of T-score  $\geq 70$ . \*\* This value was shown to be significant using a chi-squared analysis  $X^2(1, N = 75) = 3.84, p = .05$  *Abbreviations:* Infrequency (F-r); Infrequency-Psychopathology (Fp-r); Response Bias Scale (RBS); Negative Impression (NI); Infrequency (IF).

The IF scale demonstrated the highest rate of agreement with the Fp-r scale at 67%. The NI scale showed the highest rate of agreement with the RBS

scale at 61.3% using the adjusted cutoff score for the RBS scale. Although these rates were the highest, they were not statistically significant

according to the chi-squared analyses. The lowest rates of agreement were between the IF scale and the adjusted RBS scale at 53.9%, and the NI scale and adjusted Fp-r scale at 48.7%. Overall, the rate of agreement among each validity scale decreased after adjusting the cutoff score to a T-score of  $\geq 70$ , with the exception of the RBS and NI scale.

### Discussion

The goal of the present study was to analyze the utility of the CAT-A validity scales in comparison to the validity scales of the MMPI-2-RF. It was predicted that if the CAT-A validity scales are accurate, there would be a high rate of agreement among those scales and the well-known and established MMPI-2-RF validity scales. Overall, there were very few findings to support that the CAT-A validity scales and the MMPI-2-RF validity scales display identical patterns of elevation. However, the significant association between the NI and RBS indicates that these two scales are capturing similar aspects of cognitive symptom over reporting.

In the current study, the CAT-A and the MMPI-2-RF displayed moderate rates of agreement that were not significant, other than the relationship between the RBS and NI scale, indicating that the validity scales across the two measures may each be capturing different aspects of an individual's self-reporting. The chi-squared analysis further showed that the rate of agreement between the MMPI-2-RF and CAT-A were only moderately associated as only one significant value was found between the RBS and the NI scale. Since the RBS scale assesses cognitive symptoms, this significant finding suggests that the NI scale may also be a suitable validity scale for detecting malingering of cognitive symptoms. Furthermore, the RBS measures general cognitive symptoms in all contexts and the NI measures cognitive symptoms specifically related to ADHD. Of all the MMPI-2-RF validity scales, the RBS demonstrated the highest rate of agreement with the NI scale as expected, further emphasizing the utility of the NI scale and its sensitivity.

The lack of significant associations may be due to the purpose for which the scales were developed.

The F-r and Fp-r scales of the MMPI-2-RF measure over reporting of psychopathological and mood symptoms, and the RBS measures over reporting of cognitive symptoms. In contrast, the NI and IF scales of the CAT-A measure over reporting of attentional deficits and associated symptoms. The difference in the type of symptom being measured by each scale may be why the two tests were only moderately related. The rate of agreement between the validity scales of the CAT-A and the MMPI-2-RF decreased after reducing the cutoff score for the MMPI-2-RF suggesting that the recommended cutoff scores for the MMPI-2-RF may be the most appropriate for detecting malingering in ADHD.

Two significant correlations were found; however, these correlations were only found among the scales of the same test (i.e., two CAT-A scales were significantly correlated with each other), as expected. Although a significant correlation between the validity scales of the CAT-A would indicate an increase in credibility, it is concerning that the correlation between the NI scale and the IF scale was very high. This high correlation suggests that there is a lack of variability and good sensitivity and specificity among the two scales. While the IF scale only includes ten items on the CAT-A, the NI scale consists of all the items on the assessment, including those within the IF scale. As a result, the NI and IF scales appear to measure the same construct as evidenced by this high correlation.

It is important to note that while few significant values were found, this does not discredit the use of the CAT-A validity scales in diagnostic contexts as there are several explanations for why these findings may have been produced. While the age of the population used in this study has shown to be the largest growing population for self-referred visits (Bordoff, 2017), this study utilized patients that had been referred to the clinic by a variety of referral sources in addition to self-referrals, which likely reduced a bias towards patients self-referring for malingering purposes and increased the validity of the study. Additionally, while the MMPI-2-RF has validity scales that are considered the gold standard for detecting malingering, the MMPI-2-RF was not developed specifically for ADHD

assessments; whereas the development of the CAT-A was to fulfill the need for a test specifically for this purpose (Bracken & Boatwright, 2005). As previously discussed, the different purposes of these tests and each validity scale may be another reason why we did not find more significant associations within the context of this study. However, the chi-squared analysis showed a significant relationship between the RBS and the NI which suggests that the NI scale may be accurate at detecting malingering in an ADHD assessment.

This study is among the first to examine the validity scales of the CAT-A, and its findings align with those of Marshall et al. (2010) in that the CAT-A shows potential for being an accurate tool for ADHD assessments. The results also support why many have recommended the use of multiple diagnostic measures during an evaluation. Because ADHD is a complex disorder including both the CAT-A and the MMPI-2-RF, in addition to other assessments and clinical and collateral interviews, can increase the amount of information obtained as compared to what may be permitted by only one assessment.

### **Limitations and Future Directions**

Limitations of this study include the sample size and the population used in the design. Given that the majority of patients used in this study were college age, it is difficult to generalize findings from this study to older populations. The small sample size also reduces external validity. To address these issues, future studies may wish to also separately examine the CAT-C, which is designed for children, and compare findings of those of the CAT-A. It would also be favorable to use patients not attending a clinic located at a university to ensure a greater diversity in age and other demographics among patients. Because the CAT-A examines select responses within the Academic/Occupational context, it is possible that the high rate of college students included in this study may have skewed the study's findings.

Although the location and use of college students is a limitation, this specific sample is also a strength of this study. It is expected that in such a setting, there would be a higher rate of patients seeking

evaluations for personal gain and would therefore be feigning symptoms providing real world examples of exaggerated scores. The distribution of gender is another strength of this study given that more males are diagnosed with ADHD than females (Rucklidge, 2008)

It is not uncommon for individuals with ADHD to also have another psychiatric disorder, such as anxiety or depression that may be related to difficulties with ADHD (Sobanski, 2006); therefore, future studies examining the CAT-A validity scales may wish to examine the prevalence of malingering across populations with comorbid mental health disorders. Comorbidity of ADHD with various mental disorders and learning disabilities may affect the performance of the validity scales of the CAT-A. One way to assess other disorders would be to incorporate the CAARS because it has subscales that measure symptoms not directly related to ADHD, such as anxiety, which may indicate comorbidity.

In summary, the CAT-A shows potential to be a useful assessment for assisting in accurate diagnosis of ADHD, as well as identifying malingering. The significant association between the RBS and the NI scale furthers this point as it indicates that the NI scale is performing as intended. However, the lack of other significant associations and correlations, as well as the high correlation between the NI and IF scales, presents the concern that the CAT-A validity scales examined in this study may not be sufficient. Future studies may wish to replicate this study to determine if similar findings can be made.

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