

# The Assessment and Diagnosis of Attention Deficit Hyperactivity Disorder in Adult Forensic Psychiatric Outpatients

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**Abstract** The primary purpose of the present study was to examine the validity of commonly utilized ADHD rating scales within an adult forensic population. Participants were 120 patients assessed for dysfunctional anger and impulsive aggression at a hospital-based clinic. Two psychiatrists made independent diagnoses about the presence or absence of ADHD among individuals presenting with symptoms consistent with this disorder. Following the diagnoses, participants were assessed with multiple ADHD measures, including measures based on self-report, observer-report, or a computerized neuropsychological measure (IVA + Plus). With the exception of the IVA + Plus, the ADHD measures significantly differentiated individuals diagnosed with ADHD from individuals who were not so diagnosed. These measures also demonstrated good diagnostic utility via test specific parameters (sensitivity, specificity, positive predictive power, and negative predictive power). A sub-set of measures demonstrated particularly good classification accuracy, with high sensitivity (91 %) and good specificity (81 %). Implications of these findings for the effective assessment and diagnosis of ADHD in adult outpatient psychiatric settings are discussed.

**Keywords** Attention-Deficit Hyperactivity Disorder · Assessment · Construct Validity · Adult Forensic Patients

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## Introduction

Attention deficit hyperactivity disorder (ADHD) is a neurobehavioral disorder characterized by cognitive, behavioral, emotional, and neurophysiological features (Barkley et al. 2002). The primary symptoms include inattention, hyperactivity, and impulsivity. In North America, ADHD is diagnosed based on the criteria listed in the Diagnostic and Statistical Manual of Mental Disorders, under disorders that are usually first diagnosed in infancy, childhood, or adolescence (American Psychiatric Association 2000).

ADHD is one of the most commonly diagnosed behavioral conditions in youth (American Psychiatric Association 2000). Symptoms typically emerge in early childhood (before age 7) and are persistent throughout adolescence. Studies with children have provided strong support for both the DSM criteria and ADHD assessment tools (Barkley 1998; Hinshaw et al. 2002).

## Adult ADHD

Although ADHD is considered a childhood disorder, a considerable proportion of children (30–70 %) exhibit chronic and persistent symptoms into adulthood (Barkley et al. 2002; Eme 2009), resulting in an adult prevalence rate of 4 % (Kessler et al. 2006). The validity and reliability of a diagnosis of adult ADHD is less clear and there are specific challenges to diagnosticians working with adults, particularly within forensic settings. One difficulty is the reliance on self reported symptoms, including the recall of a childhood ADHD diagnosis. Adults presenting in forensic settings are often poor historians and they may be more prone to exaggerate symptoms for various reasons, such as the desire to receive stimulant medication or to have a psychiatric explanation for their problematic behavior.

Another concern pertains to differential diagnosis: In forensic settings, it is important to differentiate between ADHD and Antisocial Personality Disorder, as there are several shared features, such as problems with impulsivity, proneness to boredom, and restlessness. In other words, self-reported symptoms consistent with the ADHD diagnosis might actually be a result of antisocial personality traits. On the other hand, symptoms such as proneness to boredom and restlessness might be explained by both disorders, because they can co-exist (e.g., Murphy and Barkley 1996). Only a careful assessment can result in the correct diagnosis or diagnoses.

### Assessment of Adult ADHD

A diagnosis of adult ADHD requires a clinical interview to assess the presence or absence of criteria, as well as examining functional impairment and pervasiveness of the disorder. It is generally considered best practice to utilize a combination of self-report, observer-rated instruments, and neuropsychological tests (Quinn 2003).

There are some studies that have examined whether test scores are able to differentiate participants who either have or have not been previously diagnosed with ADHD. O'Donnell et al. (2001) reported that the ADHD self-report symptom checklist was able to discriminate college students who self-reported having ADHD from those who indicated that they were not diagnosed with ADHD. Quinn (2003) compared an ADHD behavior checklist and the Integrated Visual and Auditory Continuous Performance Test (the most recent version of this test is called the IVA + Plus) for college students randomly assigned to a control condition (no evidence of a diagnosis of ADHD) and a simulated malingering condition where they were told to fake ADHD symptoms. A third group consisted of individuals with a diagnosis of ADHD. Individuals diagnosed with ADHD obtained more problematic scores on both the behavioral checklist and the IVA + Plus when compared to the control group. Individuals were able to successfully fake ADHD symptoms on the behavioral measure but not the IVA + Plus, suggesting that a computerized performance test should be included in an assessment battery for adult ADHD, especially when malingering is a concern.

In spite of the accumulating research on adult ADHD and the likelihood of a relatively high prevalence rate in forensic populations, clinicians are often skeptical of assessing, diagnosing, and treating ADHD in this population. Such skepticism likely results from the limited evidence on the validity of the diagnosis and various assessment measures with forensic clients. Although there are some recommendations of measures to include in an adult ADHD assessment, there is no agreed upon battery of tests. Indeed, tests

that target continuous performance, sustained and divided attention, measures of memory and complex information processing, as well as several self-report ADHD tools have been inconsistently used across studies. A better understanding of the assessment of ADHD will hopefully facilitate the adequate diagnosis and treatment of this disorder. Indeed, adequate identification is particularly important due to the potential problems with self-report, the varying motivation of individuals to cooperate with evaluators, and difficult differential diagnosis.

### The Present Study

The primary purpose of the present study was to investigate the validity of a comprehensive battery of self-report, observer-rated, and continuous performance tests in differentiating a group of forensic outpatients who had been previously diagnosed with ADHD (based on an independent consensus diagnosis of two forensic psychiatrists) from individuals who are not diagnosed with ADHD. We hypothesized that the measures included in the present study would show construct validity. That is, we predicted that each measure in the assessment battery would be significantly correlated with other measures in the battery (concurrent validity) and would distinguish between individuals who were diagnosed with ADHD by two independent clinicians from those who were not (discriminant validity). We predicted that the continuous performance test would result in greater sensitivity and specificity when compared to self-report and observer-rated measures, given the limitations of self-report. We also hypothesized that the instruments administered in the present study would show diagnostic utility as evidenced by sensitivity, specificity, positive predictive power, and negative predictive power.

### Method

#### Participants

Participants were 120 adult men who were assessed at an outpatient forensic psychiatric clinic between 2008 and 2010. Individuals are typically referred to this program when they are engaging in aggression or other difficulties associated with anger dysregulation (e.g., relationship breakdown). ADHD has been shown to have a relatively strong association with aggression, particularly impulsive aggression (Dowson and Blackwell 2010).

The average age of the present sample was 32.6 years ( $SD=10.3$  years). Approximately 50 % of the sample were unemployed at the time of assessment and the average years of education was 11.8 ( $SD=2.5$ ). The majority of the sample

(78.5 %) was Caucasian, followed by Aboriginal (6.5 %), African-Canadian (2.8 %), and Hispanic (2.8 %). Approximately half of the sample (53.8 %) had been charged and/or convicted of an offence and were at varying stages of the criminal justice system; including, for example, probation (30.1 %) and pre-trial sentencing (19.4 %).

### Materials and Procedure

All participants signed a consent form at the time of their assessment permitting use of their data for research; this research was approved by the institutional ethics board. Each participant was evaluated because of a clinical suspicion of ADHD. The presence or absence of ADHD was determined based on DSM-IV-TR criteria following a comprehensive clinical interview and review of relevant available collateral information. Importantly, diagnoses were not based on any ADHD assessment tool or self-report measure. The diagnostic interviews were conducted independently by two psychiatrists who were certified in forensic psychiatric practice. Final group classification was based on consensus diagnoses and the inter-rater agreement was approximately 90 %. Individuals completed the ADHD questionnaires prior to completing the IVA + Plus and the order was consistent for all participants. The assessment usually started at either 9:00 am or 1:00 pm and was typically completed within 2 h. Participants were allowed a break on completion of a segment of the battery or after then entire paper portion of the assessment was completed; no breaks were permitted during the administration of the IVA + Plus.

Individuals were excluded from participating in the present study if: (a) they were receiving treatment for another DSM Axis I or II disorder; (b) they were receiving treatment for a serious medical illness or neurological problem; and, (c) if they had a recent (< 6 month) head injury. Participants were not excluded from the study if they had a history of illicit drug use; however, at the time of testing, none of the outpatients had a current diagnosis of a substance use disorder. Additionally, none of the participants were taking psychotropic medication at the time of testing. All patients included in the study spoke and read English either as a first or second language and indicated that they comprehended the instructions and questions. All participants completed the following test battery for ADHD.

*Adult ADHD Self-Report Symptom Checklist (ASRS-v1.1; Adler et al. 2003)* The ASRS-v1.1 is an 18-item scale of adult attention-deficit/hyperactivity disorder developed by the World Health Organization. Questions are based on current nosological criteria and pertain to frequency, rather than severity, of ADHD symptoms. Questions are divided into two parts: Part A comprises the six screening questions and is considered to be the most predictive of symptoms

consistent with ADHD. The remaining 12 questions (Part B) are intended to provide additional evidence of a patient's symptoms.

For the present study, the number of checkmarks was tabulated for both part A and B (representing a frequency of sometime to very often) and could range up to 6 and 12, respectively. Subsequent studies have supported the overall utility of the measure as a screening measure for adult ADHD in a variety of contexts (Kessler et al. 2005, 2007).

*Conners' Adult ADHD Self-report and Observer Rating Scales (CAARS; Conners et al. 1999)* The CAARS is a 66-item measure that contains 9 empirically-derived scales related to adult ADHD symptoms. The CAARS is formatted in both a long and short-form and includes both a self-report and an observer rated version. In the present analysis, we utilized the long form of the self-report (CAARS-Self) and observer rated (CAARS-Observer) versions; we also used the overall ADHD index as the criterion for ADHD. The observer and self-report versions were initially standardized with nonclinical populations (Conners et al. 1999). Subsequent investigations have shown the CAARS to have good internal consistency and test-retest reliability (Erhardt et al. 1999; Adler et al. 2008). The overall ADHD index has shown excellent discriminant classification in previous investigations (Conners et al. 1999).

*Wender Utah Rating Scale (WURS; Ward et al. 1993; Wender 1971)* The WURS is a 61-item self-report measure designed to assess a childhood history of ADHD in adults. The measure has shown good test-retest reliability and internal consistency (Stein et al. 1995) and concurrent validity (Mackin and Horner 2005; Weyandt et al. 1995). In a recent investigation, Norvilitis et al. (2008) reported that the WURS was a reliable and valid measure of ADHD among a sample of college students in both the United States and China.

*Brown Attention Deficit Disorder Scale (Brown ADD Scale; Brown 1996)* The Brown ADD scale is a 40-item scale that measures symptoms associated with ADHD. Hyperactivity and impulsivity are not addressed in this scale. The items are scored on a Likert-type scale and are grouped into five clusters: organizing and activating to work; sustaining attention and concentration; sustaining energy and effort; managing affective interference; and, utilizing working memory and accessing recall. The measure has shown adequate psychometric properties (Brown 1996). In a more recent study, Kooij et al. (2008) reported adequate reliability but relatively poor convergent validity in an outpatient sample of adults.

*Integrated Visual and Auditory Continuous Performance Test (IVA + Plus; Sandford 1995)* The IVA + Plus is a computerized continuous performance test utilizing visual

and auditory stimuli to assess response control. Constant and sustained attention is required, as participants respond or inhibit their response to 500 counterbalanced trials. There are two global scales: Full Scale Response Control Quotient (FSRCQ) and the Full Scale Attention Quotient (FSAQ). The former index measures impulsivity and commission errors, whereas the latter index measures attending and omission errors. Normative quotient scores have a mean of 100 and a standard deviation of 15. Lower scores are indicative of greater impairment, such that individuals with lower scores are more likely to have ADHD than those with higher scores. Previous studies have shown the measure to have excellent internal consistency and convergent validity (Sandford et al. 1995; Quinn 2003). More recently, White et al. (2005) reported that the IVA + Plus adequately discriminated adults with and without ADHD.

## Results

### Intercorrelations Among ADHD Measures

Pearson correlation coefficients were calculated to examine the relationships among the multiple ADHD measures, including four self-report scales (ASRS-v1.1, CAARS-Self, Brown ADD Scale, and the WURS), an observer-rated scale (CAARS-Observer) and a computerized continuous performance test (IVA + Plus; Sandford 1995). As shown in Table 1, both Part A and Part B of the ASRS-v1.1 were positively and significantly associated with the Brown ADD scale, the CAARS-Self and CAARS-Observer, and the WURS. The Brown ADD scale was positively correlated with the CAARS-Self and CAARS-Observer, and the WURS. The

CAARS-Self and CAARS-Observer were positively associated with WURS. Finally, the IVA + Plus (FSRCQ) was negatively associated with the ASRS-v1.1, the Brown ADD scale, and the CAARS-Self.

### Discriminant Validity of ADHD Measures

Table 2 shows the mean scores and comparisons across the self-report, observer-rated, and computerized rating scales for ADHD for individuals diagnosed with ADHD and individuals who were deemed not to meet diagnostic criteria for ADHD. After using a Bonferroni correction to account for spurious findings, results showed that each of the rating scales (with the exception of the IVA + Plus) significantly differentiated ADHD and non-ADHD participants. The size of the effects were large and ranged from 1.24 (CAARS-Observer; 95 %  $CI=0.77$  to 1.70; and WURS; 95 %  $CI=0.83$  to 1.64) to 1.94 (ASRS-v1.1, Part B; 95 %  $CI=1.50$  to 2.39).

Next, we were interested in calculating the diagnostic accuracy of the individual rating scales. There are several diagnostic accuracy statistics, which are presented in Table 3. As a brief description, sensitivity refers to the proportion of those with the disorder who are correctly identified by the test, while specificity is the proportion of participants without the disorder who are correctly identified by the test. Two other important indices of accuracy are presented: Positive predictive power (PPP) is the proportion of those who screen positive who actually have the disorder, whereas negative predictive power (NPP) is the proportion of those who screen negative and who do not have the disorder. Recommended cutoffs were obtained from the literature (see Kooij et al. 2008) or from specific instructions provided with the test. For example, clinical cutoffs for Part

**Table 1** Intercorrelations among ADHD measures

	2	3	4	5	6	7	8
1. ASRS-v1.1 (Part A)	.82*** (118)	.79*** (115)	.73*** (114)	.40*** (88)	-.24* (89)	-.17 (89)	.63*** (114)
2. ASRS-v1.1 (Part B)	—	.83*** (115)	.83*** (114)	.43*** (88)	-.26* (89)	-.20 (89)	.60*** (114)
3. Brown ADD scale		—	.86*** (112)	.52*** (86)	-.24* (87)	-.17 (87)	.68*** (112)
4. CAARS-Self (ADHD Index)			—	.51*** (87)	-.26* (87)	-.20 (87)	.64*** (113)
5. CAARS-Observer (ADHD Index)				—	-.23 (69)	-.19 (69)	.51*** (87)
6. IVA + Plus (FSRCQ)					—	.57*** (90)	-.26* (88)
7. IVA + Plus (FSAQ)						—	-.08 (88)
8. WURS							—

ADHD Attention Deficit Hyperactivity Disorder; *Adult Symptom Checklist* Adult ADHD Self-report Symptom Checklist; *Adult Symptom Checklist Part A* six screening questions; *Adult Symptom Checklist Part B* additional questions related to ADHD Symptoms; *Brown ADD Scale* Brown Attention Deficit Disorder Scale; *CAARS-Self* Connors Adult ADHD Rating Scale, Long Version, Self-Report; *CAARS-Observer* Connors Adult ADHD Rating Scale, Long Version, Observer-Report; *IVA + Plus* Integrated Visual and Auditory Continuous Performance Test; *FSRCQ* Full Scale Response Control Quotient; *FSAQ* Full Scale Attention Quotient; *WURS* Wender Utah Rating Scale. Lower scores on the IVA + Plus (FSRCQ and FSAQ) are indicative of greater impairment. IVA + Plus (FSRCQ and FSAQ) are scored such that lower scores are indicative of greater ADHD symptoms



**Table 2** ADHD rating scale scores for offenders who were diagnosed with ADHD and offenders not diagnosed with ADHD

Variable	ADHD diagnoses						<i>F</i>	<i>df</i>	<i>p</i>	<i>d</i>
	No ADHD Diagnosis			ADHD Diagnosis						
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>				
ASRS-v1.1 (Part A)	1.76	1.56	55	4.37	1.56	59	−8.91	112	<.001	1.67
ASRS-v1.1 (Part B)	2.80	2.80	55	8.39	2.95	59	−10.35	112	<.001	1.94
Brown ADD scale	33.85	22.42	55	75.71	24.65	56	−9.36	109	<.001	1.78
CAARS-Self ADHD Index	48.85	11.56	55	68.93	12.14	56	−8.92	109	<.001	1.69
CAARS-Observer ADHD Index	56.33	11.95	36	70.63	11.29	49	−5.63	83	<.001	1.24
IVA + Plus (FSRCQ)	92.61	19.88	42	83.05	20.10	44	2.22	84	.029	0.48
IVA + Plus (FSAQ)	85.83	18.88	42	79.98	16.84	44	1.52	84	.132	0.33
WURS	33.17	19.74	54	58.32	20.91	57	−6.51	109	<.001	1.24

ADHD Attention Deficit Hyperactivity Disorder; *Adult Symptom Checklist* Adult ADHD Self-report Symptom Checklist; *Adult Symptom Checklist Part A* six screening questions; *Adult Symptom Checklist Part B* additional questions related to ADHD symptoms; *Brown ADD Scale* Brown Attention Deficit Disorder Scale; *CAARS-Self* Connors Adult ADHD Rating Scale, Long Version, Self-Report; *CAARS-Observer* Connors Adult ADHD Rating Scale, Long Version, Observer-Report; *IVA + Plus* Integrated Visual and Auditory Continuous Performance Test; *FSRCQ* Full Scale Response Control Quotient; *FSAQ* Full Scale Attention Quotient; *WURS* Wender Utah Rating Scale. Lower scores on the IVA + Plus (FSRCQ and FSAQ) are indicative of greater impairment. *d* = Cohen's *d* effect size

A and B of the ASRS-v1.1 were 4 and 8, respectively. As shown in Table 3, the measures generally demonstrated good predictive power.

#### Discriminant Function Analysis and Individual Classification of Participants

A discriminant function analysis (see Table 4) was conducted to predict whether an individual was diagnosed with ADHD or not. Based on the previous analysis, predictor variables were the ASRS-v1.1; CAARS-Self and CAARS-Observer; Brown ADD scale, and the WURS. The log determinants

were similar and Box's M indicated that the assumption of equality of covariance matrices was not violated. Significant mean differences were observed for all the predictors on the diagnosis of ADHD. The analysis yielded a highly significant discriminant function, Wilks's  $\Lambda = .455$ ,  $\chi^2(6, N=81) = 59.89$ ,  $p < .001$ , accounting for 54.5 % of between group variability. Closer analysis of the structure matrix revealed that all independent variables were significant predictors of group membership: ASRS-v1.1, Part B (.778); CAARS-Self (.726); Brown ADD scale (.716); ASRS-v1.1, Part A (.690); CAARS-Observer (.614); and the WURS (.566). Ninety one percent of individuals diagnosed with ADHD were accurately

**Table 3** Sensitivity, Specificity, and Predictive Values of ADHD rating scales with 95 % Confidence Intervals (in parentheses) for Consensus Diagnosis of ADHD

	Sensitivity	Specificity	PPP	NPP
ASRS-v1.1 (Part A)	.76 (.63–.86)	.84 (.71–.92)	.83 (.70–.92)	.77 (.64–.86)
ASRS-v1.1 (Part B)	.66 (.53–.78)	.93 (.82–.98)	.91 (.77–.97)	.72 (.60–.82)
Brown ADD Scale	.84 (.71–.92)	.73 (.59–.83)	.76 (.63–.85)	.82 (.67–.91)
CAARS-Self ADHD Index	.63 (.49–.75)	.91 (.79–.97)	.88 (.72–.95)	.70 (.58–.80)
CAARS-Observer ADHD Index	.76 (.61–.86)	.75 (.57–.87)	.80 (.66–.90)	.69 (.52–.82)
IVA + Plus (FSRCQ)	.30 (.17–.45)	.74 (.58–.86)	.54 (.33–.74)	.50 (.37–.63)
IVA + Plus (FSAQ)	.39 (.29–.54)	.69 (.53–.82)	.57 (.38–.74)	.52 (.38–.65)
WURS	.82 (.69–.91)	.69 (.54–.80)	.73 (.61–.83)	.79 (.64–.89)

ADHD Attention Deficit Hyperactivity Disorder; *ASRS-v1.1* Adult ADHD Self-report Symptom Checklist; *Adult Symptom Checklist Part A* six screening questions; *Adult Symptom Checklist Part B* additional questions related to ADHD symptoms; *Brown ADD Scale* Brown Attention Deficit Disorder Scale; *Connors-Self Report* Connors Adult ADHD Rating Scale, Long Version, Self-Report; *Connors-Observer Rated* Connors Adult ADHD Rating Scale, Long Version, Observer-Report; *IVA+Plus* Integrated Visual and Auditory Continuous Performance Test; *FSRCQ* Full Scale Response Control Quotient; *FSAQ* Full Scale Attention Quotient; *WURS* Wender Utah Rating Scale; *PPP* Positive Predictive Power; *NPP* Negative Predictive Power

**Table 4** Classifications of Diagnostic Groups from Discriminant Function Analysis

Predicted	Actual		Total
	ADHD	No ADHD	
ADHD	39	7	46
No ADHD	4	31	35
Total	43	38	81

Sample sizes are lower than those in the core analyses because of listwise deletion of data for discriminant function analysis. Sensitivity (attention-deficit/hyperactivity disorder [ADHD] accurately predicted: 39/43=90.7 %; specificity (No ADHD group accurately predicted): 31/38=81.6 %; overall correct classification rate: 70/81=86.4 %

identified (sensitivity; 39 out of 43), whereas 82 % of individuals not diagnosed with ADHD were accurately identified (specificity; 31 out of 38). Overall, 86 % of participants were correctly classified.

We next ran two separate discriminant function analyses to determine whether the same predictor variables used in the earlier discriminant function analysis would classify individuals diagnosed with a Cluster B Personality Disorder in general or a diagnosis of Antisocial Personality Disorder (based on the SCID-II) from those who were not so diagnosed. In the present sample, 36 % of participants were diagnosed with a Cluster B personality disorder, whereas only 3 % were diagnosed with an Antisocial Personality disorder. These analyses examined the specificity of the predictor variables because showing that the same ADHD measures distinguished those diagnosed with a personality disorder from those who are not so diagnosed would suggest the measures may be assessing psychopathology more than they are assessing ADHD per se.

The log determinants were similar for both analyses and Box's M indicated that the assumption of equality of covariance matrices was not violated. There was not a significant discriminant function in predicting a Cluster B Personality Diagnosis, Wilks's  $\Lambda=.918$ ,  $\chi^2(6, N=84)=6.75$ ,  $p=.344$  or a diagnosis of Antisocial Personality Disorder based on the SCID-II, Wilks's  $\Lambda=.692$ ,  $\chi^2(6, N=39)=12.54$ ,  $p=.051$ ; although the latter analysis approached statistical significance. These results support the notion that the combination of measures that accurately predicted a diagnosis of ADHD were specific to this disorder.

## Discussion

The primary purpose of the present study was to investigate the validity of a comprehensive battery of self-report, observer-rated, and continuous performance rating scales in differentiating a group of forensic outpatients with and

without ADHD (based on an independent consensus diagnosis of two psychiatrists). Specifically, the analyses were primarily designed to determine the construct validity (concurrent and discriminant validity) and diagnostic utility of the tests (i.e., sensitivity, specificity, PPP and NPP).

Both the self-report and observer-rated measures showed good construct validity as well as diagnostic utility among our sample of forensic outpatients. These results are consistent with several previous studies on the reliability and validity of commonly used self-report and observer-rated measures among adults with ADHD, suggesting our results might generalize outside of the forensic context (e.g., Adler et al. 2008; Kooij et al. 2008). We found a similar sensitivity for our combination of tests as did Kooij et al., with relatively good specificity as well (which Kooij et al. could not report because they did not include non-ADHD participants). Contrary to our hypotheses, however, the IVA + Plus did not evidence good concurrent or discriminant validity nor did it show good diagnostic predictive power. It is not clear why we did not find support for this performance measure, unlike other studies. There was a trend in the right direction, however, with the IVA + Plus (FSRCQ) showing some significant correlations with other ADHD measures and the ADHD group showing a trend towards lower scores than the non-ADHD group.

Consistent with our prediction, we did find that a combination of ADHD measures—ASRS-v1.1 (parts A and B); CAARS-Self, CAARS-Observer; Brown ADD scale; and the WURS—uniquely contributed to the discrimination of forensic patients diagnosed with adult ADHD from those who did not have this consensus diagnosis. This is an important finding because it indicates that ADHD can be detected even among adults who might engage in impulsive, inattentive and hyperactive behaviors for other reasons, including personality traits, substance use, and executive functioning deficits (e.g., as a result of head injury or substance use). One possible explanation is that we had a much lower prevalence for Antisocial Personality Disorder and substance use disorders than we might have observed among mentally disordered offenders detained in an inpatient facility or offenders in a correctional setting. This study was conducted in a sample of forensic outpatients initially referred for anger or aggression problems. The combination of ADHD measures might not perform as well in inpatient or correctional settings; further research should examine this question.

## Study Limitations

Our sample was comprised of adult men referred to a forensic outpatient clinic for suspected diagnosis of ADHD with or without dysfunctional anger and/or impulsive aggression. Psychiatric comorbidity was relatively

uncommon given the selection criteria used for the clinic and thus for the study (not in treatment for an Axis I or II disorder), so we were not able to examine psychiatric comorbidity. We might have found substantial associations between ADHD and other psychiatric disorders in a more psychiatrically disturbed sample of forensic outpatients or inpatients. Further research with other forensic and outpatient samples is needed to examine the generalizability of the findings reported here.

We found that self-report measures produced the largest effect sizes, whereas the one “objective” test (the IVA + Plus) did not significantly discriminate patients diagnosed with ADHD from those who did not. It is possible that some of these individuals lied about their symptoms, for reasons that might include drug-seeking (stimulant medication is the most common treatment for ADHD) or a wish to reduce culpability for their angry or aggressive behavior by attributing it to an untreated condition. Their deception might also have influenced clinician diagnosis. It is noteworthy that Quinn (2003) found that individuals instructed to fake ADHD symptoms were able to do so on self-report but not on the IVA + Plus. Consistent with this idea, Suhr et al. (2011) found that young adults who failed a test of credible performance scored as more impaired on the Continuous Performance Test than those who were diagnosed with ADHD or had psychological symptoms but were not diagnosed with ADHD. Another possibility is that some of the participants in this study had undiagnosed learning or other cognitive disorders, which can be difficult to discriminate from ADHD (Advokat et al. 2007). The effect of the non-standardization of testing conditions, such as time of test administration and the fact that participants were not advised to abstain from stimulants such as coffee may have influenced the results.

Finally, there is no gold standard for identifying ADHD. We relied on the consensual diagnosis of two independent clinicians. Requiring both to diagnose ADHD increases our confidence that ADHD was indeed present, but this assumes high inter-rater reliability of the clinicians.

### Future Directions

It would be helpful to replicate our study findings in different forensic and outpatient samples, to examine the robustness of the classification accuracy provided by these tests. In particular, it would be useful to determine if the same result—stronger concurrent and discriminative validity for self-report and clinician-rated measures than an objective computerized task—is obtained. It would also be interesting to look at the comorbidity of ADHD and other psychiatric disorders in a more psychiatrically impaired and heterogeneous population, such as a general psychiatric inpatient service. It would also be worthwhile to specifically examine adult ADHD in a

correctional population where we would expect to find a higher prevalence of Antisocial Personality Disorder and thus a greater need for differential diagnosis. Research with larger, diverse samples could contribute to the development of a formal algorithm—with weighted scale scores and explicit combination rules—to increase classification accuracy using multiple ADHD measures.

Once diagnosis is established, it would be important to conduct randomized clinical trials to evaluate the impact of treatment for adult ADHD on symptoms and associated behavior. A basic study design would examine the impact of stimulant medication to reduce inattention, hyperactivity and impulsivity associated with ADHD in a sample that has been accurately identified using an empirically validated ADHD assessment battery. Important questions for future research include the long-term prognosis for forensic patients with adult ADHD upon treatment, and determining whether a diagnosis of adult ADHD adds to the prediction of recidivism provided by more traditional criminological factors such as prior offense history and substance abuse history.

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