Article

Utility of the Personality Assessment Inventory for Detecting Malingered ADHD in College Students

Journal of Attention Disorders
2016, Vol. 20(9) 763–774

DOI: 10.1177/1087054714548031
jad.sagepub.com
SAGE

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Abstract

Objective: The purpose of the current study is to examine the utility of the Personality Assessment Inventory (PAI) for detecting feigned ADHD in college students. **Method:** A sample of 238 undergraduate students was recruited and asked to simulate ADHD (ADHD simulators) or respond honestly (controls) on the PAI. Archival data (n = 541) from individuals diagnosed with clinical ADHD, no diagnosis, learning disorder, mood/anxiety, comorbid ADHD-mood/anxiety, or suspect effort were used. **Results:** Few individuals scored above the cutoffs on PAI validity scales. When alternative cutoff scores were examined, cutoffs of ≥77 on the Negative Impression Management (NIM) scale, ≥3 on the Malingering Index (MAL), and ≥1 on the Rogers Discriminant Function (RDF) yielded excellent specificity in all groups and sensitivities of .33, .30, and .20, respectively. **Conclusion:** Individuals who were asked to simulate ADHD easily manipulate the PAI; however, alternative cutoff scores proposed for PAI validity indices may improve the detection of feigned ADHD symptoms. *(J. of Att. Dis. 2016; 20(9) 763-774)*

Keywords

malingering, adult ADHD, college students, comorbid psychopathology, Personality Assessment Inventory

Clinicians face numerous challenges in diagnosing ADHD in adults. First, adults are often inaccurate historians in recalling childhood symptoms of ADHD (Mannuzza, Klein, Klein, Bessler, & Shrout, 2002). Also, researchers have not agreed upon a neuropsychological profile that is specific to ADHD (Wasserstein, 2005), or even whether individuals with ADHD perform differently on neuropsychological measures compared to normal controls (Riccio et al., 2005; Rosselli et al., 2000). Difficulties in diagnosing ADHD in adulthood are compounded by the high comorbidity between ADHD and other psychiatric diagnoses (Kessler et al., 2006; Sobanski et al., 2007) such as personality disorders (Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993, 1998; Mannuzza et al., 1991; Williams et al., 2010) and Axis I disorders (Kessler et al., 2006; Sobanski et al., 2007). Furthermore, college students without ADHD may mistake symptoms of other Axis I disorders for symptoms of ADHD. For example, impaired concentration and psychomotor agitation/feeling fidgety are diagnostic criteria for depression and anxiety (*Diagnostic and Statistical Manual of Mental Disorders* [5th ed.; *DSM-5*]; American Psychiatric Association [APA], 2013). Finally, a growing body of literature suggests that diagnosing ADHD in adults is further complicated by exaggerated or feigned symptoms. Estimated base rates of noncredible performance in university environments range from 8.3% (Harrison, Rosenblum, & Currie, 2010) to 47.6% (Sullivan, May, & Galbally, 2007).

College students have a number of incentives for feigning ADHD deficits, including obtaining stimulant medications and academic accommodations. College students may abuse stimulant medications to improve attention, reduce hyperactive symptoms, improve grades, and for recreational intoxication (Teter, McCabe, Cranford, Boyd, & Guthrie, 2005; White, Becker-Blease, & Grace-Bishop, 2006). It has been estimated that 7.5% to 43% of individuals prescribed stimulant medications reported misuse (Advokat, Guidry, & Martino, 2010; McCabe, Teter, & Boyd, 2006; Rabiner, Anastopoulos, Costello, McCabe, & Swartzwelder, 2009; Weyandt et al., 2009; White et al., 2006). These medications are a valuable commodity in the illicit marketplace, selling for over $5 per pill in some instances

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(Garnier-Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012). A recent survey of 483 college students prescribed stimulant medications found that 61.7% shared them at least once, with 9.8% of the respondents reporting that they sold their prescription medication (Garnier et al., 2010). In addition to stimulant medications, academic accommodations are an incentive for feigning ADHD. The U.S. government has passed several laws (i.e., the Individuals With Disabilities Education Improvement Act, Section 504 of the Rehabilitation Act, and the Americans With Disabilities Act) that enable individuals with disabilities to receive accommodations. Depending on the area of impairment, usually demonstrated in a neuropsychological evaluation, students might receive extended time, quiet testing environments, note takers, or even alternative courses (Sullivan et al., 2007). Students without disabilities may attempt to receive diagnoses that would grant them access to such accommodations. More subtly, students seeking psychoeducational evaluations for difficulty in college courses may exaggerate symptoms to ensure they meet criteria for academic accommodations.

Despite a growing body of literature, few traditional neuropsychological tests and self-report measures have demonstrated acceptable sensitivity in distinguishing between simulated ADHD and genuine clinical ADHD (for review, see Musso & Gouvier, 2014). It appears that individuals feigning ADHD easily mimic actual symptoms. They often obtain elevated scores on these measures, but their scores fall within believable ranges and cannot be adequately differentiated from individuals who genuinely meet diagnostic criteria.

Several studies to date have examined the utility of embedded validity indices of broad, objective personality tests in detecting malingered ADHD in college students. Young and Gross (2011) examined the utility of current embedded Minnesota Multiphasic Personality Inventory–2 (MMPI-2; Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) validity indices. Overall, college students asked to simulate ADHD on the MMPI-2 scored higher compared with a clinical ADHD sample on a number of validity indices including the Infrequency (INF; Butcher et al., 1989), Infrequency Psychopathology Scale (Fp; Arbisi & Ben-Porath, 1995), Backward Infrequency Scale (Fb; Butcher et al., 1989), Response Bias Scale (RBS; Gervais, Ben-Porath, Wygant, & Green, 2007), and the Henry–Heilbronner Index (HHI; Henry, Heilbronner, Mittenberg, & Enders, 2006). Despite significant differences, few validity indices demonstrated adequate sensitivity or specificity. The most useful scales were the Fp (≥5) and the HHI (≥9) with sensitivities of .59 and .47 and specificities of .94 and .89, respectively.

Harp, Jasinski, Shandera-Ochsner, Mason, and Berry (2011) examined the MMPI-2–Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008) and reported, for the most part, college students asked to simulate ADHD produced profiles that were consistent with a clinical ADHD sample. Similarly, individuals clinically diagnosed with ADHD who were asked to exaggerate their symptoms (ADHD exaggerators) performed in a manner that was consistent with the clinical ADHD group asked to respond honestly. When diagnostic statistics of the validity indices were examined, the proposed cutoff scores for the Infrequent Responses (F-r), Infrequent Psychopathology Responses (Fp-r), and Infrequent Somatic Responses (Fs) scales yielded excellent specificity but poor sensitivity (18.2%, 9.1%, and 4.5%, respectively). Alternative cutoff scores retained excellent specificity (>.90) and produced better sensitivity for ADHD simulators: F-r ≥ 70 for .41; Fp-r ≥ 77 = .64; Fs ≥ 91 = .36. The sensitivity for these proposed cutoff scores was lower for ADHD exaggerators: F-r ≥ 70 for .28; Fp-r ≥ 77 = .17; Fs ≥ 91 = .33.

Several studies have examined the utility of the Personality Assessment Inventory's (PAI; Morey, 1991) validity indices in detecting feigned ADHD in college students. Sullivan et al. (2007) compared college students seeking psychoeducational evaluations who failed at least one index on the Word Memory Test (WMT) to individuals who did not. Only two individuals who failed the WMT obtained a *T*-score above 70 on any of the PAI's negative response bias scales (Inconsistency [ICN], Infrequent [INF], or Negative Impression Management [NIM]). One individual scored above the cutoff for the Rogers Discriminant Function (RDF) and also performed below chance on the WMT. No individuals obtained scores above the cutoff for the Malingering Index (MAL). In another study, three groups of college students were examined: (a) had an external incentive (e.g., academic accommodations, stimulants, etc.) to obtain a diagnosis of ADHD or learning disorder, (b) no reported external incentive, and (c) control group (Pella, Hill, Shelton, Elliott, & Gouvier, 2012). No individuals in the control group scored above the recommended cutoffs for any of the PAI validity indices. Of the no external incentive group, 3.9% and 6.6% scored higher than the recommended cutoffs on the MAL and NIM scales, respectively; 4.5% of the external incentive group failed the MAL and 4.5% failed the the NIM scale. For the RDF, 19.3% of the no external incentive group and 22.8% of the external incentive group scored above the cutoff for malingering.

In a more recent study, Rios and Morey (2014) examined the validity indices of the PAI-Adolescent (PAI-A) as well as the RDF and MAL in college students aged 17 and 18 asked to feign ADHD symptoms. These students were divided into two groups: coached or uncoached. Their scores were compared with data from the clinical standardization sample. Students who were able to successfully simulate symptoms on the Conners' Adult ADHD Rating Scales (CAARS) obtained higher scores on the NIM and

RDF and lower scores on the Positive Impression Management (PIM) scale compared with the clinical sample. Only uncoached students obtained significantly higher scores on the MAL compared with the clinical sample. A cutoff score of <25 on the PIM scale resulted in 97.3% sensitivity and 91.1% specificity.

Neither Sullivan et al. (2007) or Pella et al. (2012) explicitly investigated performance of individuals known to be feigning ADHD symptoms. Although Rios and Morey (2014) used ADHD simulators, they examined the utility of PAI-A validity indices. To better understand the utility of the PAI and its validity indices for detecting malingered ADHD, this study utilized individuals explicitly asked to feign ADHD symptoms (ADHD simulators). The aim of the current study was to examine the susceptibility of the PAI to feigned ADHD. This study had several hypotheses: (a) ADHD simulators would obtain clinically believable scores (operationalized as <80T) on the PAI clinical scales, (b) current cutoff scores of the PAI validity indices would not be useful in detecting ADHD simulators, and (c) alternate cutoff scores would provide better sensitivity and specificity for detecting ADHD simulators.

Method

Participants

This study collected data from two distinct groups: a clinical group and a group of student volunteers. The clinical group was comprised of archival data. The student volunteer group was prospectively recruited for the purposes of this study. The Institutional Review Boards from both universities approved this study.

Clinical group. Data included in this study were collected from students who completed psychoeducational evaluations from 2005 to 2012. The majority of archival data (n = 551) was obtained from a psychology clinic affiliated with a large, Southern university. These data were supplemented by archival data (n = 40) from a smaller, Southern university. Of the clinical sample, 50.4% were male, 84.4% were Caucasian, 9.1% were African American, 3.2% were Hispanic, 1.5% were Asian, and 1.7% were of Other ethnicity. The mean age of individuals from the archival data was 21.16 years (SD ± 2.91; range = 17-29). The mean years of education of the sample was 13.80 (SD ± 1.75; range = 11-22). Mean full-scale IQ (FSIQ) was 104.30 (SD ± 12.48; range = 72-151).

Student volunteers. A sample of 240 undergraduate student volunteers from a large university in the southeast United States was recruited by the university's online recruitment system to participate in this study for extra credit in courses in the Department of Psychology. For the purposes of the current study, only individuals who reported no previous history of psychopathology, learning disorder, or ADHD were included in the participant sample. Of this sample, 31.3% were male, 79.2% were Caucasian, 7.9% were African American, 5.8% were Hispanic, 4.2% were Asian, and 2.9% identified as another ethnicity. The mean age of the undergraduate student volunteers was 19.72 years (SD ± 1.42; range = 18-25). The student volunteers had a mean of 13.05 years of education (SD ± 1.09; range = 12-15) and mean Shipley-II estimated FSIQ was 106.48 (SD ± 9.56; range = 70-130).

Procedure

Clinical group. The clinical group completed the PAI as part of a larger semi-flexible neuropsychological battery. Clinical graduate students administered all assessments. Diagnoses were made under the supervision of a licensed psychologist. Archival data were grouped by type of diagnosis. In this sample, 23.0% of individuals did not meet criteria for any Axis I or Axis II disorder (no diagnosis). A total of 13.7% were diagnosed with a learning disorder (learning disorder), 24.0% were diagnosed with ADHD (clinical ADHD), 11.0% were diagnosed with ADHD and a comorbid depression or anxiety disorder (comorbid), and 19.6% were diagnosed with depression and/or an anxiety/anxiety-related disorder (mood/anxiety). Effort was measured using Wechsler Adult Intelligence Scale–Third Edition (WAIS-III; Wechsler, 1997a) embedded validity indices: Mittenberg Index (Mittenberg, Theroux-Fichera, Zielinski, & Heilbronner, 1995), Reliable Digit Span (Greiffenstein, Baker, & Gola, 1994), and Vocabulary-Digit Span (Mittenberg et al., 1995). In addition, the following Wechsler Memory Scale–Third Edition (WMS-III; Wechsler, 1997b) embedded indices were used: Logical Memory Rarely Missed Items Index (Killgore & DellaPietra, 2000), Auditory Recognition Delayed raw score (Langeluddecke & Lucas, 2003), and Faces I total score (Glassmire et al., 2003; Langeluddecke & Lucas, 2003). As part of the study, individuals who failed two or more embedded effort indices were classified as the suspect effort group (8.6% of the sample). Data were entered into a de-identified database by trained, undergraduate research assistants. Data were double-checked for accuracy. Discrepancies were addressed by a graduate student.

Student volunteers. Participants were randomly assigned to either the ADHD simulator group (n = 152) or the college control group (n = 88). The ADHD simulators were provided with a scenario (Appendix A) modified from Sollman, Ranseen, and Berry's (2010) study. The college control group received materials balanced for length, but the scenario involved helping a friend obtain information about mathematics disorder (Appendix B). Mathematics

disorder was chosen because it was believed that information on this topic was less likely to introduce biases that might influence how participants answered questionnaires. College controls were instructed to respond honestly to the questionnaires.

As part of the scenario, ADHD simulators were presented with pseudowebpages that provided information about ADHD. This information was obtained by typing the keywords "Adult ADHD" into Google and copying the top five webpages that were found. The control participants received similar pseudowebpages that provided information about mathematics disorder. Students were asked to take notes from the information provided. Both groups completed the consent form, demographic questionnaire, and Shipley-II prior to receiving their respective instructions. After completing the Shipley-II, groups were provided with instructions and pseudowebpages and asked to complete the PAI using their respective, group-specific instructions. The questionnaires were completed in groups with a maximum size of eight participants per group.

Test Administered

PAI. The 4 validity scales, 11 clinical scales, 5 treatment scales, and 2 interpersonal scales of the PAI (Morey, 1991) were used for the current study. Eight of the clinical scales are comprised of three additional subscales, and the Borderline Features Scale is comprised of four subscales. The other two clinical scales, Alcohol and Drug Problems, do not have any subscales. Individuals respond to one of four Likert-type choices (*false, slightly true, mainly true*, and *very true*) for each item.

The computer-scoring program yields four PAI validity scales. The ICN scale measures the consistency with which a client responds to similar questions. The cutoff score for the ICN index is $T \geq 73$. The INF scale contains items that most individuals respond to despite clinical status. The cutoff score for the INF scale is $T \geq 75$. Elevations on either of these scales may indicate careless responding, language and reading problems, or confusion. The NIM scale seeks to identify individuals who portray themselves in a manner that is more negative than merited. Morey (2003) warned that the NIM is not necessarily a malingering scale but suggests that *T*-scores at or above 92 are indicative of someone seeking to portray themselves in an exceptionally negative manner. The PIM scale measures attempts to portray oneself in an overly favorable light by denying even minor faults. Morey suggests scores above 68 indicate that individuals are attempting to portray themselves in an overly favorable manner.

Additional validity indices have been developed for the PAI. Of interest in this study are the RDF (Rogers, Sewell, Morey, & Ustad, 1996) and the MAL (Morey, 1993, 1996). The RDF is calculated by summing 20 weighted scores of the PAI with any score greater than 0 being indicative of malingering. The MAL is comprised of eight configural features of PAI profiles, and a cutoff score of ≥3 is considered questionable whereas a cutoff score of ≥5 has excellent specificity for detecting malingering. Two additional indices were designed for detecting positive response distortion, the Cashel Discriminant Function (CDF; Cashel, Rogers, Sewell, & Martin-Cannici, 1995) and the Defensiveness Index (DEF; Morey, 1996). The CDF is comprised of six PAI scales multiplied by weights then summed. Scores of greater than or equal to 160 are considered indicative of overt response distortion. The DEF is comprised of eight configural features found more frequently in individuals instructed to simulate positive response distortion. The eight items are summed, and one item (PIM *T*-score > 49) is double weighted. Scores of 6 or greater are indicative of positive response distortion.

Statistical Analyses

To examine differences in demographic information, a 1 × 3 MANOVA was run with groups (no diagnosis, clinical ADHD, learning disorder, mood/anxiety, comorbid, control, ADHD simulators, and suspect effort) as the independent variable, and FSIQ score, age, and years of education as dependent variables. Chi-square analyses were run to examine group difference in race and gender. Two additional MANCOVAs were run to examine group differences on the PAI clinical and treatment scales and the PAI validity indices. Age and gender were used as covariates. Planned orthogonal contrasts (ANCOVAs) were run to determine whether the ADHD simulator group differed from the other clinical groups and the control group. A significance level of $p < .001$ was used due to the number of planned contrasts. Alternative cutoff scores were also examined for the PAI validity scales. Sensitivities and specificities of the cutoff scores were calculated for differentiating ADHD simulators and the suspect effort group from all other clinical and control groups.

Results

Descriptive Statistics

Means and standard deviations of demographic variables are presented in Table 1. There was a significant multivariate main effect for group, Wilks's $\lambda = 0.87$; $F(3, 21) = 5.25$, $p < .001$, $\eta^2 = 0.04$. Between-subjects tests indicated that the dependent variables were significant: age, $F(7, 797) = 10.73$, $p < .001$, $\eta^2 = 0.08$; education, $F(7, 797) = 6.81$, $p < .001$, $\eta^2 = 0.06$; and total FSIQ, $F(7, 797) = 2.36$, $p < .05$, $\eta^2 = 0.02$. Scheffe's post hoc analyses revealed that the ADHD simulators and college control groups were significantly younger than the clinical ADHD, learning disorder, mood/anxiety,

Table 1. Demographic Information for Clinical and Experimental Groups.

				Age	FSIQ	Years education
Group	*n*	% male	% Caucasian	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
No diagnosis	136	61	85	20.67 (2.88)[a,b]	104.69 (12.45)[a]	13.71 (1.90)[a,b,c]
Clinical ADHD	142	54	82	21.07 (2.97)[b,c]	106.79 (13.18)[a]	13.79 (1.70)[b,c]
Learning disorder	81	58	88	21.21 (2.73)[b,c]	102.87 (12.44)[a]	13.65 (1.76)[a,b,c]
Mood/anxiety	116	40	86	21.99 (3.13)[c]	102.32 (12.43)[a]	14.00 (1.69)[c]
Comorbid	65	35	88	21.29 (2.54)[b,c]	104.05 (10.30)[a]	14.13 (1.62)[c]
Suspect effort	51	49	82	20.80 (2.82)[a,b,c]	103.88 (12.95)[a]	13.64 (1.61)[a,b,c]
ADHD simulators	152	33	78	19.81 (1.52)[a]	106.13 (9.67)[a]	13.12 (1.12)[a,b]
Control	88	49	82	19.50 (1.15)[a]	107.01 (9.39)[a]	12.92 (1.00)[a]

Note. Superscripts indicate means that are not significantly different at the $p < .05$ level.

and comorbid groups. The ADHD simulator and college control groups had fewer years of education than the comorbid group, and the college control group had fewer years of education than the clinical ADHD group. There were no significant differences in FSIQ between groups on post hoc analyses. There were significant gender differences between groups, $\chi^2(7) = 45.08$, $p < .001$. The ADHD simulator group had a significantly greater percentage of females compared with the no diagnosis, learning disorder, and mood/anxiety groups. There were no significant differences in race between groups, $\chi^2(35) = 38.23$, $p = .33$.

PAI Clinical and Treatment Scales

The ADHD simulators did not obtain mean scores >80T on any of the PAI clinical scales. Regarding PAI clinical and treatment scales, the MANCOVA was significant, Wilks's $\lambda = 0.35$; $F(18, 126) = 7.14$, $p < .001$, $\eta^2 = 0.14$. Figure 1 illustrates groups' scores on the PAI clinical scales. The univariate main effects were examined, and significant main effects were found for all PAI clinical and treatment scales (Appendix C). Examination of planned univariate ANCOVAs comparing the ADHD simulators with all other groups revealed that the ADHD simulators' scores were significantly higher than the no diagnosis and clinical ADHD groups' scores on all clinical and treatment scales. Comparisons for all groups can be found in Appendix D.

PAI Validity Indices

Means and standard deviations of the PAI validity indices are presented in Table 2. The ADHD simulators did not score above the recommended cutoff on any of the PAI's negative response bias indices, but simulators' mean scores on the RDF were above the cutoff for malingering. The MANCOVA examining differences in PAI validity indices was significant, Wilks's $\lambda = 0.59$; $F(8, 56) = 7.90$, $p < .001$, $\eta^2 = 0.07$. The univariate main effects were examined, and significant main effects were found for each validity index.

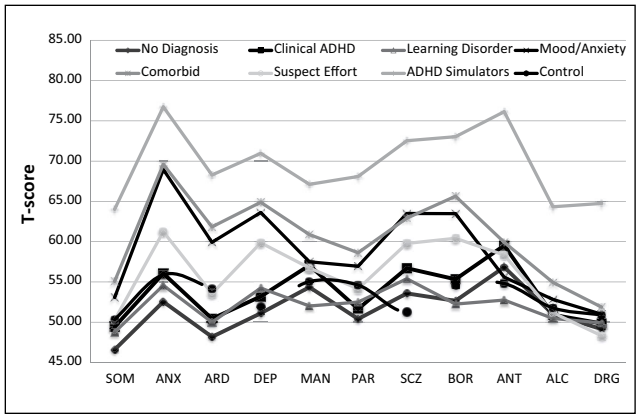

Figure 1. Means for PAI clinical scales by group.
Note. PAI = Personality Assessment Inventory; SOM = somatic complaints; ANX = anxiety; ARD = anxiety-related disorders; DEP = depression; MAN = mania; PAR = paranoid; SCZ = schizophrenia; BOR = borderline features; ANT = antisocial features; ALC = alcohol; DRG = drug.

The ADHD simulators' scores were significantly different ($p < .001$) from the no diagnosis and college control groups for all validity indices (Appendix D). All clinical groups obtained significantly lower scores on the NIM and RDF validity indices compared with ADHD simulators. There were no significant differences between ADHD simulators and the learning disorder and comorbid groups for the ICN scale. The clinical ADHD and learning disorder groups' scores on the INF scale were not significantly different compared with the ADHD simulators. Only the comorbid group obtained similar scores on the PIM as ADHD simulators. Compared with ADHD simulators, the mood/anxiety, comorbid, and suspect effort groups obtained similar scores on the MAL and DEF.

Alternative Cutoff Scores for PAI Validity Indices

Because ADHD Simulators did not score above the cutoff on most negative response bias indices, alternative cutoff

Table 2. Means (*SD*) of PAI Validity Indices by Group.

	ICN	INF	NIM	PIM	RDF	MAL	CDF	DEF
Group	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
No diagnosis	49.83 (9.32)*	53.49 (10.34)*	49.40 (7.84)*	48.60 (10.20)*	−0.86 (0.93)*	0.63 (0.81)*	144.34 (13.47)*	3.58 (1.70)*
Clinical ADHD	49.20 (8.35)*	54.55 (10.68)	50.67 (8.74)*	45.33 (10.37)*	−0.86 (1.13)*	0.88 (0.94)*	145.78 (14.69)	3.25 (1.62)*
Learning disorder	53.40 (10.19)	54.73 (11.32)	51.43 (9.78)*	50.65 (9.86)*	−0.43 (0.99)*	0.62 (0.74)*	144.18 (15.25)	3.42 (1.59)*
Mood/anxiety	51.27 (7.90)*	53.33 (9.46)*	57.17 (13.20)*	38.64 (12.31)*	−0.62 (1.19)*	0.99 (0.95)	145.52 (18.16)	2.16 (1.71)
Comorbid	52.66 (8.86)	54.14 (9.28)*	57.58 (12.26)*	39.20 (11.88)	−0.61 (1.20)*	0.95 (0.97)	148.58 (14.71)	2.14 (1.62)
Suspect effort	48.52 (7.48)*	53.12 (9.58)*	56.08 (11.99)*	41.88 (11.47)*	−0.77 (1.22)*	0.84 (0.93)	147.54 (14.91)	2.70 (1.68)
Control	50.62 (8.61)*	51.89 (8.30)*	51.40 (10.57)*	45.49 (10.57)*	−0.59 (1.05)*	0.71 (0.86)*	143.76 (11.75)*	3.10 (1.77)*
ADHD simulators	55.68 (9.15)	59.40 (10.96)	69.24 (20.19)	33.52 (10.25)	0.46 (1.23)	1.56 (1.26)	152.51 (15.66)	2.20 (1.35)

Note. PAI = Personality Assessment Inventory; ICN = Inconsistency; INF = Infrequency; NIM = Negative Impression Management; PIM = Positive Impression Management; RDF = Rogers Discriminant Function; MAL = Malingering Index; CDF = Cashel Discriminant Function; DEF = Defensiveness Index.
*Means differ from the ADHD simulators at the $p < .001$.

Table 3. Examination of Recommended and Alternative Cutoff Scores for PAI Validity Indices.

	ADHD Simulators	Suspect effort	No Diagnosis	Clinical ADHD	Comorbid	Mood/ anxiety	Learning Disorders	College Control
	Sensitivity				Specificity			
Inconsistency scale								
Cutoff 67	0.14	0.02	0.93	0.96	0.94	0.97	0.89	0.93
Cutoff 70	0.10	0.02	0.96	0.98	0.97	0.97	0.93	0.97
Cutoff 73	0.06	0.00	0.98	0.99	1.00	0.98	0.95	0.97
Infrequency scale								
Cutoff 67	0.30	0.12	0.86	0.85	0.91	0.91	0.81	0.92
Cutoff 71	0.20	0.08	0.93	0.89	0.95	0.95	0.88	0.98
Cutoff 75	0.11	0.04	0.95	0.95	0.97	0.97	0.93	0.99
Negative Impression Management								
Cutoff 73	0.38	0.16	0.99	0.97	0.83	0.85	0.95	0.91
Cutoff 77	0.33	0.10	0.99	0.98	0.92	0.90	0.95	0.93
Cutoff 81	0.26	0.06	0.99	0.98	0.94	0.91	0.99	0.95
Cutoff 92	0.18	0.00	0.99	1.00	0.98	0.99	1.00	0.99
Rogers Discriminant Function								
Cutoff 0	0.66	0.26	0.82	0.79	0.74	0.69	0.68	0.71
Cutoff 0.75	0.39	0.10	0.96	0.94	0.86	0.87	0.89	0.92
Cutoff 1	0.30	0.08	0.96	0.96	0.92	0.89	0.94	0.97
Cutoff 1.25	0.23	0.06	0.99	0.99	0.95	0.94	0.96	0.97
Malingering Index								
Cutoff 3	0.22	0.06	0.98	0.96	0.95	0.93	0.99	0.98
Cutoff 2	0.46	0.24	0.89	0.73	0.77	0.72	0.86	0.86
Positive Impression Management								
Cutoff 27	0.28	0.06	0.98	0.94	0.82	0.84	1.00	0.94
Cutoff 25	0.18	0.06	0.99	0.98	0.91	0.88	1.00	0.94

Note. PAI = Personality Assessment Inventory.

scores were examined. Sensitivity in the ADHD simulators and suspect effort groups and specificities for other clinical and control groups were calculated for alternative cutoff scores (Table 3). The ICN index was not sensitive to malingered ADHD, even when lower cutoff scores were examined. A cutoff score of 75 on the INF scale produced excellent specificity in all groups but sensitivity (0.11) was limited. A cutoff score of $T \geq 70$ produced better sensitivity (.20) but specificity was somewhat lower for clinical ADHD (.88) and learning disorder (.89) groups. For the NIM index, a cutoff score of $T \geq 77$ produced adequate specificity in all groups and sensitivity ranged from .10 to .33. Regarding the

RDF, the recommended cutoff of 0 yielded good sensitivity but poor specificity in all groups. A cutoff score of ≥1 produced better sensitivity (.46) and excellent specificity in all groups with the exception of the mood/anxiety group (specificity = .89). The MAL cutoff score of ≥3 produced excellent specificity but sensitivity was .22. Lowering the MAL cutoff score to ≥2 resulted in unacceptable specificity for most groups.

The PIM and DEF indices were examined to determine whether cutoff scores could be established that differentiate individuals malingering ADHD from the other groups. For the PIM, a cutoff score of $T \leq 25$ produced adequate specificity for all groups but sensitivity was only .18. Alternative cutoff scores were not explored for the CDF because mean scores for ADHD simulators were not in the expected direction. For the DEF, a cutoff score of ≤1 was examined. It did not produce an adequate balance of sensitivity or specificity.

Discussion

The purpose of the present study was to further examine the utility of PAI in detecting malingered ADHD in college students. To date, studies suggest that few college students fail PAI validity indices during psychoeducational assessments (Pella et al., 2012; Sullivan et al., 2007). However, alternative cutoff scores had not been examined. There were three important findings from the current study. First, while ADHD simulators obtained higher scores on all PAI clinical scales, their scores fell within a clinically believable range. Second, few individuals failed suggested cutoff scores for the PAI validity indices. Finally, while alternative cutoff scores did produce better sensitivity, the vast majority of ADHD simulators would not have been detected.

Few studies have examined ADHD simulators' clinical profiles on broad personality inventories. ADHD simulators produced higher scores on the RC1, RC4, RC8, and RC9 subscales of the MMPI-2-RF compared with the clinical ADHD sample (Harp et al., 2011). However, only scores on RC4 reached clinical significance (≥65T). Rios and Morey (2014) found that ADHD simulators who successfully feigned ADHD on the CAARS obtained scores above 70T on Somatic Complaints, Anxiety (only uncoached), Mania (only uncoached), and Schizophrenia scales of the PAI-A. The authors conclude ADHD simulators are generally able to identify features of ADHD but tend to exaggerate those features on these scales. In the current study, ADHD simulators obtained significantly higher scores on most PAI scales compared with clinical groups. Scores on the Anxiety, Depression, Schizophrenia, Borderline, and Antisocial scales were clinically significant (≥70T). However, these scores still fell within clinically believable ranges (less than 80T) and would not easily be identified as potentially indicating malingering. This highlights one of the most significant challenges in diagnosing ADHD in college students. Depending on the cognitive test results, clinical interview, and other self-report questionnaires, clinicians may mistake feigned ADHD symptoms for psychopathology or comorbid ADHD and psychopathology.

The results of the current study support Sullivan and colleagues' (2007) finding that few college students presenting for psychoeducational evaluations fail PAI validity indices. In the current study, recommended cutoff scores for the ICN, INF, NIM, and MAL were highly specific to malingered ADHD. However, fewer than 25% of individuals asked to fake ADHD obtained *T*-scores above the recommended cutoffs for most PAI validity indices, with the RDF being a notable exception. Alternative cutoff scores were examined for the PAI validity indices. High specificity was found for a cutoff score of $T \geq 70$ on the ICN, $T \geq 75$ on the INF, and MAL ≥ 3; however, sensitivity for simulated ADHD was low. A cutoff score of $T \geq 77$ on the NIM produced excellent specificity in all groups and sensitivity was .33. A cutoff score of ≥1 on the RDF produced high specificity in all groups and sensitivity of .30 for simulated ADHD. While the current study offers evidence that lower cutoff scores may be useful in detecting more college students who are feigning symptoms, a significant percentage of malingerers would not be detected, even with the adjusted cutoff scores. One explanation for these findings is that most PAI questions assess psychopathology rather than cognitive symptoms, and individuals may be less inclined to endorse these items when feigning cognitive disorders (Rios & Morey, 2014). The current study highlights the need for alternative tools designed specifically for detecting malingered ADHD symptoms.

One strength of the current study is the use of clinical data from individuals with psychopathology. Wasserstein (2005) argued that the formal assessment of psychopathology is an important aspect of psychoeducational evaluations. Many students present with complaints of attention problems without realizing psychiatric conditions can interfere with attention and concentration. In addition, depression and anxiety may be associated with psychomotor agitation and feelings of restlessness (APA, 2013). Therefore, it is important to formally assess psychiatric symptoms to rule out anxiety, mood, and psychotic disorders as a differential or comorbid diagnosis. Previous studies failed to report the diagnostic statistics of MMPI-2, MMPI-RF, PAI, and PAI-A scales for detection of malingered ADHD in clinical samples where individuals may present with anxiety and mood disorders or comorbid ADHD and anxiety/mood disorders (Harp et al., 2011; Pella et al., 2012; Rios & Morey, 2014; Young & Gross, 2011). As the current study illustrates, cutoff scores that adequately differentiate malingerers from clinical ADHD samples

might not perform adequately in individuals with mood/anxiety disorder or comorbid ADHD and mood/anxiety disorders. For example, a cutoff score of 73T or greater on the NIM scale produced adequate specificity for clinical ADHD but not for comorbid ADHD and mood/anxiety disorders whereas a cutoff score of 77T or greater on the NIM scale yielded excellent specificity for the all of the clinical groups. In clinical practice, cutoff scores for malingered ADHD must demonstrate adequate specificity in individuals with psychiatric symptoms as well. Measures offering less than excellent (≥.90) specificity may misdiagnose patients as malingering, depriving them of treatment and accommodations they may need.

One surprising finding was that the suspect effort group did not fail validity indices at rates comparable with the ADHD simulator group. One hypothesis is failure of the embedded indices of the WAIS-III and WMS-III is indicative of poor effort (e.g. boredom, attentional lapses, etc.) rather than the intentional distortion of responses. We believe that elevations on the PAI validity indices are more likely to reflect intentional response distortion compared with embedded validity indicators from cognitive measures, as elevations on the PAI scales reflect systematic responding (with the possible exceptions of ICN and INF) while failing cognitive embedded validity indicators may result from either systematic bias or random fluctuations in task engagement during psychoeducational evaluations. An alternative explanation is that cognitive effort and distortion on self-report measures are two distinct constructs with little overlap (Nelson, Sweet, Berry, Bryant, & Granacher, 2007). At this time, little is known about the construct of malingered ADHD, and further research is necessary.

One of the limitations of the current study is the significantly greater portion of females in the ADHD simulator group. At this time, it is unclear whether males and females choose different response strategies in malingering ADHD. Further research is required to address this issue. As with all analog research designs, generalizability of findings may be limited. Individuals asked to simulate ADHD to obtain class credit do not have as much at stake as individuals self-referred for evaluations, who have an external incentive to distort their responses. It is possible that responses given by the ADHD simulator group may be exaggerated compared with self-referred college students. In the current study, we attempted to identify individuals suspected of feigning symptoms on cognitive indices. However, individuals who failed two or more cognitive effort measures (i.e., suspect effort group) did not perform similarly compared with ADHD simulators. Another limitation of the current study is coaching in the form of pseudowebpages. Because analog participants were only provided with 5 min to read the material, it is possible that individuals presenting to a clinic intent on exaggerating responses would be more prepared to fake symptoms.

In conclusion, this study makes several contributions to the current literature. First, while ADHD simulators produce elevated scores on the PAI clinical scales, their scores fall within believable ranges. Second, this study corroborates the findings of Sullivan et al. (2007) who reported very few college students fail recommended cutoffs of the PAI validity indices. However, unlike the Sullivan study, we also examined alternative cutoff scores and found somewhat improved sensitivity and excellent specificity using modified cutoff scores. For example, college students presenting for ADHD evaluations who score $T \geq 77$ on the NIM index are likely malingering based on the results of the current study. A cutoff score of ≥ 1 on the RDF is also specific to intentional response distortion. In addition, this study highlights the necessity of including groups with mood and anxiety disorders in malingered ADHD research because specificity of self-report questionnaires appears to be lower in individuals with psychiatric symptoms. It is important to note that, even with improved sensitivity, over 70% of malingerers went undetected in the current study. Future research should continue to search for validity indices that offer better sensitivity and specificity for detecting malingered ADHD in college students.

Appendix A

Scenario for ADHD Simulators

Your roommate has been diagnosed with ADHD. She had trouble with classes, but then was given some medication for ADHD, and now does well. 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.

When you are done reviewing these materials, please use the colored paper to jot down symptoms that will help you remember how to fake on the tests you will be given. Tell the examiner when you are done.

Please take the following tests 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, you are trying to fake ADHD as a college student, so you must perform at least as well as someone who enrolled in a university would. Also, you want to respond in a way that would make it likely to get diagnosed with ADHD but you don't want to overplay the part to avoid being detected as a faker.

Appendix B

Scenario for the College Control Group

Your roommate was having trouble with some of her classes. She went to a psychologist for testing. After the evaluation, she tells you that she has been diagnosed with a learning disability which explains why she had trouble with classes. Specifically, she was diagnosed with a mathematics disorder. She expresses a lot of concern because she had difficulty understanding her diagnosis. You decided to do some research to help explain it to her. You "Google" the disorder to learn more about it. On the following pages are some of the things that you find.

When you are done reviewing these materials, please use the colored paper to jot down symptoms that will help you remember how to explain it to her. Tell the examiner when you are done.

Now, as part of this study, you will be asked to complete a few of the same tests that she took. Please take the following tests giving your best effort. It is necessary for you to try as hard as you can in order to advance the research that we are conducting. Remember, you are trying to take these tests as a college student, smart enough to be accepted and enrolled at a large university. You are taking these tests because you are responsible and would like to get credit in your Psychology classes. Please sit quietly and fill out the following forms, answering as best as you can.

Appendix C

Between-Subjects ANCOVA Statistics for Comparison of Groups on PAI Clinical Scales.

	F ratio	η_p^2
SOM	44.36	0.28
ANX	64.78	0.36
ARD	43.14	0.27
DEP	50.59	0.30
MAN	21.19	0.15
PAR	36.77	0.24
SCZ	42.47	0.27
BOR	52.52	0.31
ANT	44.47	0.28
ALC	25.56	0.18
DRG	32.52	0.22
SUI	19.52	0.14
STR	27.88	0.19
AGG	29.16	0.20
NON	28.62	0.20
RXR	21.4	0.16
DOM	7.61	0.06
WRM	25.4	0.18
ICN	9.37	0.08
INF	5.75	0.05
NIM	34.13	0.23
PIM	30.12	0.21
CDL	4.61	0.04
DEF	14.12	0.11
RDF	18.98	0.14
MAL	11.47	0.09

Note. PAI = Personality Assessment Inventory; SOM = Somatic Complaints; ANX = Anxiety; ARD = Anxiety-Related Disorders; DEP = Depression; MAN = Mania; PAR = Paranoid; SCZ = Schizophrenia; BOR = Borderline Features; ANT = Antisocial Features; ALC = Alcohol Problems; DRG = Drug Problems; SUI = Suicidal Ideation; STR = Stress; AGG = Aggression; RXR = Treatment Rejection; DOM = Dominance; WRM = Warmth; ICN = Inconsistency; INF = Infrequency; NIM = Negative Impression Management; PIM = Positive Impression Management; DEF = Defensiveness; RDF = Rogers Discriminant Function; MAL = Malingering.

Appendix D

Planned Orthogonal Contrasts Comparing ADHD Simulators to Other Clinical and Control Groups on the PAI Scales.

	Clinical ADHD		No diagnosis		Control		Learning disorder		Mood/anxiety		Comorbid		Suspect effort	
PAI clinical scale	*F*	η^2	*F*	η^2	*F*	η^2	*F*	η^2	*F*	η^2	*F*	η^2	*F*	η^2
Somatic complaints	121.02	0.29	172.93	0.38	79.02	0.25	76.89	0.25	53.70	0.17	18.89	0.08	43.84	0.18
Anxiety	182.47	0.39	250.57	0.47	133.15	0.36	142.60	0.38	21.39	0.08	13.99	0.06	40.55	0.17
Anxiety-related disorders	124.29	0.30	150.46	0.35	63.77	0.21	84.11	0.27	25.28	0.09	**7.33**	**0.03**	35.30	0.15
Depression	148.28	0.34	183.82	0.39	113.70	0.33	85.12	0.27	19.24	0.07	**8.56**	**0.04**	20.04	0.09
Mania	57.44	0.17	76.97	0.21	56.77	0.19	91.66	0.29	32.44	0.11	14.54	0.06	28.48	0.13
Paranoia	140.90	0.33	166.10	0.37	58.61	0.20	74.99	0.25	47.32	0.15	18.93	0.08	45.94	0.19
Schizophrenia	106.16	0.27	136.76	0.33	126.65	0.35	74.84	0.25	30.33	0.10	16.89	0.07	22.14	0.10
Borderline features	140.49	0.33	192.62	0.40	119.63	0.34	134.24	0.37	32.79	0.11	14.87	0.07	30.06	0.13
Antisocial behaviors	93.76	0.24	122.11	0.30	109.34	0.32	128.87	0.36	118.27	0.31	43.52	0.17	43.96	0.18
Alcohol	77.57	0.21	69.45	0.20	38.72	0.14	55.65	0.20	46.34	0.15	23.51	0.10	30.73	0.13
Drug	79.21	0.22	80.30	0.22	35.19	0.13	49.06	0.18	56.46	0.18	28.38	0.12	39.12	0.17
Suicidal ideation	72.98	0.20	68.73	0.20	18.22	0.07	41.62	0.15	12.34	0.05	**7.69**	**0.04**	10.57	0.05
Stress	73.55	0.20	87.24	0.24	84.41	0.27	60.66	0.21	20.39	0.07	**4.81**	**0.02**	23.74	0.11
Aggression	71.73	0.20	104.59	0.27	88.25	0.27	84.34	0.27	60.92	0.19	24.30	0.10	38.19	0.16
Nonsupport	95.01	0.25	146.96	0.34	79.41	0.25	55.32	0.20	22.77	0.08	13.96	0.06	16.57	0.08
Treatment rejection	48.49	0.14	86.55	0.23	33.47	0.12	72.63	0.24	**2.43**	**0.01**	**0.02**	**0.00**	**6.18**	**0.03**
Dominance	24.57	0.08	13.73	0.05	**5.32**	**0.02**	**0.08**	**0.00**	**0.01**	**0.00**	**2.80**	**0.01**	**1.10**	**0.01**
Warmth	99.51	0.26	82.90	0.23	62.99	0.21	27.61	0.11	39.76	0.13	39.37	0.16	17.47	0.08
Inconsistency	41.75	0.13	31.21	0.10	13.85	0.06	**4.65**	**0.02**	21.02	0.07	**4.22**	**0.02**	30.90	0.13
Infrequency	**10.19**	**0.03**	19.32	0.06	30.85	0.12	**6.36**	**0.03**	17.47	0.06	12.61	0.06	12.06	0.06
Negative Impression Management	90.87	0.24	100.38	0.26	57.11	0.20	50.09	0.18	28.62	0.10	14.32	0.06	15.02	0.07
Positive Impression Management	83.96	0.23	128.82	0.31	76.85	0.25	125.11	0.35	14.46	0.05	**9.38**	**0.04**	19.59	0.09
Malingering Index	22.01	0.07	43.86	0.13	32.24	0.12	23.48	0.09	**8.87**	**0.03**	**9.59**	**0.04**	**9.33**	**0.05**
Rogers Discriminant Function	73.24	0.20	84.88	0.23	46.18	0.17	22.30	0.09	36.53	0.12	22.85	0.10	30.50	0.13
Cashel Discriminant Function	**9.04**	**0.03**	16.17	0.05	22.35	0.09	**10.13**	**0.04**	**4.56**	**0.02**	**2.85**	**0.01**	**2.44**	**0.01**
Defensiveness Index	33.72	0.11	53.20	0.16	19.00	0.08	35.50	0.14	**0.01**	**0.00**	**0.03**	**0.00**	4.17	0.02

Note. Bolded responses are not significant at the $p < .01$ level.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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