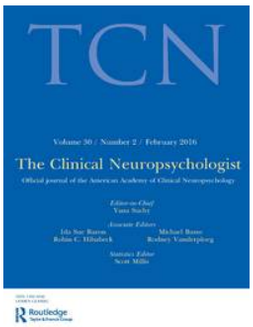

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Development of a symptom validity index to assist in identifying ADHD symptom exaggeration or feigning

Allyson G. Harrison and Irene T. Armstrong

Regional Assessment & Resource Centre, Queen's University, Kingston, Canada

ABSTRACT

Objective: Concerns have been identified regarding the ease with which students and young adults can feign or exaggerate symptoms of ADHD, and no formal measures exist to identify such behavior when it occurs. This article describes the development and initial validation of a new symptom validity measure designed to detect feigned or exaggerated ADHD symptom reporting.

Method: Employing items from a commonly used self-report measure of ADHD (Conners' Adult ADHD Rating Scale [CAARS]) and select items from a scale measuring symptoms of dissociation, we assessed students diagnosed with ADHD, students with other diagnoses, and student volunteers with no psychopathology.

Results: This new measure (Exaggeration Index or EI) demonstrated excellent specificity (.97) and adequate sensitivity (.24) in discriminating between those who are suspected of or instructed to feign or exaggerate symptoms of ADHD and all other clinical groups.

Conclusion: The results strongly suggest that the EI may be a useful adjunct to existing validity measures when identifying exaggerated or implausible symptoms of ADHD.

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ADHD; validity testing; assessment; exaggeration

In North America, cheating and deception as a means of getting ahead and achieving one's goals (c.f. Callahan, 2004) appear to extend to the postsecondary sector, where recent research has found that the majority of undergraduate students admit to engaging in some form of academic cheating (Hughes & McCabe, 2006). Indeed, almost three-quarters of first-year students at 11 large Canadian universities reported cheating on written work in high school, with more than half continuing these behaviors at the postsecondary level. While this research indicates that students frequently admit to cheating on written work in an effort to gain an unfair advantage over their peers, there is also reason to suspect that students may engage in other unscrupulous practices in an effort to get ahead academically. For example, recent studies suggest that a high number of students are attempting to feign or mimic symptoms of a disability in order to access academic accommodations or other supports (Harrison, 2006; Mullis, 2003; Sollman, Ranseen, & Berry, 2010; Suhr, Hammers, Dobbins-Buckland, Zimak, & Hughes, 2008; Sullivan, May, & Galbally, 2007).

CONTACT Allyson G. Harrison harrisna@queensu.ca

An increasing number of college and university-level students are presenting to specialists complaining of symptoms of Attention Deficit Hyperactivity Disorder (ADHD) and seeking to qualify for disability supports and services (Goldstein, 2006; Hagar & Goldstein, 2001; Harrison, 2004; McGuire, 1998; Weyandt & DuPaul, 2012; Wolforth & Harrison, 2008). They often have no prior diagnosis, and may not be able to provide any information about childhood behavior to corroborate lifetime impairment. In such situations, a clinician not only has to assess whether or not the student demonstrates neurocognitive and functional symptoms consistent with ADHD but must also be aware of the possibility that the person may be exaggerating or feigning these symptoms for reasons of secondary gain (see, Harrison, Green, and Flaro (2012) and Tucha, Fuermaier, Koerts, Groen, and Thome (2015) for examples of the various types of secondary gains available to students so labeled).

Diagnosis of ADHD in adults is challenging at the best of times (Braun et al., 2004; Quinn, 2003; Van Voorhees, Hardy, & Kollins, 2011), because it is often difficult to establish that the adult met the diagnostic criteria for ADHD in childhood, as set out in the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013). As such, clinicians often rely heavily on self-report data. Reliance on self-report inventories is problematic, as symptoms of ADHD are non-specific (Alexander & Harrison, 2013; Harrison, 2004; Harrison, Alexander & Armstrong, 2013; Lewandowski, Lovett, Codding, & Gordon, 2008; Suhr, Zimak, Buelow, & Fox, 2008; Van Voorhees et al., 2011), and such inventories are also vulnerable to exaggeration or feigning of symptoms (cf. Dalton, Tom, Rosenblum, Garte, & Aubuchon, 1989; Fisher & Watkins, 2008; Lyons, Caddell, Pittman, Rawls, & Perrin, 1994). Given the heavy weighting that self-report plays in diagnosis of ADHD in adults (see Joy, Julius, Akter, & Baron, 2010; McCann & Roy-Byrne, 2004; Nelson, Whipple, Lindstrom, & Foels, in press), it would seem imperative that any self-report questionnaires for this disorder allow clinicians to determine easily whether an individual is exaggerating or overreporting symptoms. Unfortunately, no symptom validity scales currently exist within commercially available ADHD self-rating tests. Although the Conners' Adult Attention Rating Scale (CAARS**:** Conners, Erhardt, & Sparrow, 1999) includes an Inconsistency Index, this is designed to identify inconsistent responses to items measuring similar content, not overreporting of symptoms. While Suhr, Buelow, and Riddle (2011) described an infrequency index derived from actual CAARS items, the utility of this index in accurately identifying feigned ADHD has not been validated (see Hirsch & Christiansen, 2015 for an examination of the infrequency index).

In the field of neuropsychology, assessment of test-taking effort and symptom credibility have become standard practice (see Bender, 2008; Boone, 2007; Bianchini, Mathias, & Greve, 2001; Bush et al., 2005; Heilbronner et al., 2009; Iverson, 2007), especially since psychologists have little ability to identify dishonest clients unless tests of symptom validity are included in the assessment battery (Faust, Hart, Guilmette, & Arkes, 1988; Trueblood & Binder, 1997). Slick, Sherman, and Iverson (1999) have proposed criteria for identification of malingered neurocognitive dysfunction, and the National Academy of Neuropsychology has adopted these guidelines as recommended parts of any neuropsychological evaluation (Bush et al., 2005). Clinicians are now encouraged to include Symptom and/or Performance Validity Tests (SVTs and PVTs) in any assessment where secondary gains are available to the person being evaluated (Bush et al., 2005; Green, 2004; Green, Rohling, Lees-Haley, & Allen, 2001; Harrison et al., 2012; Iverson, 2007; Larabee, 2005; Larrabee, 2012), including assessments for ADHD (Musso & Gouvier, 2012). Currently, however, no validity tests exist to help clinicians determine whether an individual is exaggerating or accurately reporting bona fide symptoms of

ADHD. This is troubling, as emerging prevalence data suggest that feigned ADHD, at least in the context of postsecondary assessments, may be as common as that found in personal injury litigants and disability seekers (Alfano and Boone, 2007), with estimated rates of feigned ADHD ranging from 20 percent (Harrison, 2006) to almost 50 percent (Sullivan et al., 2007). This is consistent with Larrabee, Millis, and Meyers (2009) who have suggested 40% (+/– 10%) as the new estimate of rates of feigning in neuropsychological assessments. Such studies demonstrate the need to include measures of non-credible performance when assessing postsecondary students referred for ADHD evaluation, and underscore the need for well-validated measures that can be employed to detect symptom exaggeration (see Tucha et al., 2015 for a review). Such a validity test must not only be sensitive to exaggeration or feigning of symptoms but must also not incorrectly classify those with genuine impairments as putting forth a non-credible performance. In other words, any symptom validity test developed must be highly specific and yet also sensitive to non-credible symptom reporting.

A good validity test requires items that, on the surface, seem like they should be relevant for someone with the disorder in question but in fact are endorsed infrequently by those with the actual condition (Tombaugh, 1996). Performance validity tests such as the Word Memory Test (Green, 2003) are based on this principle, with items that seem as if they would be hard for someone with cognitive impairments but in fact can be completed even by those with severe cognitive impairments or intellectual limitations (Green, Flaro, Brockhaus, & Montijo, 2010). Similarly, symptom scales embedded into existing inventories such as the Fp scale on the MMPI-2 (Arbisi & Ben-Porath, 1995) seek to identify symptom exaggeration by use of items rarely endorsed even by those with bona fide psychiatric conditions.

Embedded validity measures are an important component of evaluating response bias in self-report of symptoms. In a recent review of embedded validity measures within the MMPI-2, MMPI-2-RF, and the PAI, Sleep, Petty and Wygant (2015) found that the MMPI-2 and MMPI-2-RF were better at assessing response bias with respect to malingering neurocognitive deficits or pain, with validity indices that are highly correlated. Furr and Bacharach (2014) review the literature on minimizing response bias by means of embedded validity scales, and conclude that, despite some concerns about real-world applicability, validity scales work well to differentiate "known fakers" from genuine responders.

Recently, Harrison and her colleagues identified patterns of performance in those asked to feign either ADHD (Harrison, Edwards, & Parker, 2007) or Dyslexia (Harrison, Edwards, Armstrong, & Parker, 2010; Harrison, Edwards, & Parker, 2008; Harrison et al., 2010). In all cases, they demonstrated that those instructed to feign these conditions could not only produce a believable disability profile but also made significantly more errors on commonly used information processing tests (Reading Fluency and Processing Speed subtests from the Woodcock Johnson Psychoeducational Battery-III (WJPB-III); Woodcock, McGrew, & Mather, 2001) than did clients with genuine disabilities. In their study of feigned ADHD, they conclude by noting that not only should clinicians be suspicious of individuals who score particularly high on CAARS–DSM indices (i.e. *T*-Scores over 80) but also of those who make many errors of commission on tests of processing speed, as such a performance pattern was associated almost exclusively with those feigning ADHD (Harrison et al., 2007). They recommended developing an algorithm or index using high scores from the CAARS in conjunction with such an error pattern as a way to identify those feigning ADHD, and also suggested that developing additional symptom validity items to embed within a self-report scale (ones that seem typical of ADHD but are not) might help to better identify this group. After reviewing

the literature, Musso and Gouvier (2012) also recommended the development of a SVT designed specifically to detect malingered ADHD in young adults.

The current study therefore aimed to develop such an index by inserting a set of 18 additional items (derived from the Dissociative Experiences Scale; Bernstein & Putnam, 1986) into the CAARS to determine whether these items, alone or in combination with existing CAARS items, could discriminate between honest and exaggerated symptom reporting. While these additional items appear to indicate severe problems with attention, they are endorsed infrequently in both the general population and in those with severe psychological difficulties (c.f. Barker-Collo & Moskowitz, 2005; Waller, Putnam, & Carlson, 1996; Waller & Ross, 1997). In addition, one of the criteria for diagnosis of ADHD is that the symptoms cannot be better explained by other mental health problems such as a dissociative disorder (American Psychiatric Association, 2000), suggesting that these symptoms should exist on a dimension separate from those of ADHD.

We hypothesized that those exaggerating or reporting non-credible symptoms of ADHD would report higher levels of ADHD symptoms on the CAARS than either those with genuine ADHD or symptomatic clinical controls, and would thus obtain significantly higher T-scores on the various CAARS indices relative to the other groups in this study. Finally, we hypothesized that those specifically asked to feign ADHD would endorse the 18 additional symptom validity items at a level greater than individuals with either ADHD or those with other disorders in which attention symptoms are also experienced, and that use of these additional symptom validity items, alone or in combination with other items or test scales, would allow for greater accuracy in identification of symptom exaggeration over and above what was demonstrated by Harrison et al. (2008).

Method

Participants

Participants in this study were obtained in one of two ways: clinically (e.g. students seeking psychoeducational assessments due to concerns about attention problems) or students with no history of ADHD recruited from a non-treatment seeking control group (NTSC). The study was approved by the General Research Ethics Board at Queen's University.

Clinical group

Clinical participants were 608 community college or university-level students who either required updated documentation of a previously diagnosed learning or attention disorder or had been referred for an evaluation of their reported attention symptoms. They were assessed by clinical psychologists at a university-based regional assessment center between 2007 and 2014, and consented to have their data used for research purposes. These participants' archival data were classified into three distinct subgroups based upon diagnosis or lack thereof; specifically, ADHD, clinical controls, or suspected symptom exaggeration.

The ADHD group consisted of 171 students who were diagnosed with ADHD using the clinical criteria outlined in DSM-IV, including objective evidence that the symptoms were present and caused substantial impairment both in childhood and currently. While neuropsychological and psychoeducational test data were not used in making the diagnosis, they were used to quantify the extent to which the disorder currently impaired the individual in

academic or other life functions. The ADHD students met not only the DSM-IV diagnostic criteria for this disorder but had also met the criteria outlined by Slick et al. (1999) regarding symptom credibility. That is, these students provided evidence to corroborate lifetime impairment; had self-reported deficits in keeping with observed and documented behavioral problems; had provided evidence from reliable collateral informants to confirm that their self-reported impairments were both present and severe; and had obtained a passing score on at least one well-validated stand-alone PVT (most commonly the Green Word Memory Test [Green, 2003], but occasionally the Medical Symptom Validity Test [MSVT; Green, 2004], Test of Memory Malingering [TOMM; Tombaugh, 1996], or the Victoria Symptom Validity Test [VSVT; Slick, Hopp, Strauss, & Thompson, 1997]). Sollman and Berry (2011) summarize the psychometric properties of these validity measures.

The Clinical Control group consisted of individuals referred for assessment between 2007 and 2014. All were complaining of problems with attention and concentration, but upon testing were not found to meet the diagnostic criteria for ADHD. Of these, 135 were learning disabled; 107 were given no diagnosis; 24 were diagnosed with depression, 26 were diagnosed with an anxiety disorder, 17 were diagnosed with personality disorders, and the balance had other problems (e.g. obsessive compulsive disorder, post-traumatic stress disorder, brain injury, lower overall intellectual ability). All Clinical Controls had obtained a passing score on the Word Memory Test or another well-validated PVT, and provided credible performance relative to the Slick et al. (1999) criteria.

Finally, 51 students in the clinical group failed at least one well-validated stand-alone PVT, (and/or were identified by the assessing clinicians as probable malingerers using the Slick et al., 1999 criteria). They comprise the Suspected Exaggeration group. Although the sensitivity of these Performance Validity Tests and the Slick et al. criteria in identifying fabricated or exaggerated ADHD is unknown, it was felt that the self-reports of these students were of questionable validity. Hence, data from these students were examined separately as they were suspected of possible symptom exaggeration.

Non-treatment-seeking participants

The non-treatment-seeking participants were 114 undergraduate students enrolled in an introductory psychology course who were offered course credit in exchange for their participation. All confirmed a negative history of suspected or diagnosed ADHD. Participants were randomly assigned to either the honest reporting condition or the feigning condition. Fifty-seven of these participants were asked to feign ADHD as part of a larger study (described below); the remaining subjects were asked to respond honestly. Information pertaining to ethnicity was not collected, but demographic information about undergraduate students at this university indicates that 25% of the student population self-identify as visible minorities, and of those, less than five percent were educated in a language other than English (Joanne Brady, University Registrar, personal communication, 20 January 2009).

Table 1 presents the demographic information for the groups listed above including mean age, IQ, and the percent of male participants. The NTSC groups (Honest Reporters and Instructed to Feign) were significantly younger than the ADHD group, the Clinical Controls or those suspected of exaggerated symptoms, $F_{(4, 821)} = 11.1$, $p < .001$, whereas the difference in mean age among the rest was not significant (all *post hoc* comparisons were Bonferroni corrected). Groups also differed with respect to sex; only the ADHD group had a majority of men ($X^2_{(4)} = 28.0$, $p < .001$). Mean full scale IQ differed among the four groups as the NTSC

Table 1. Descriptives by group.

		Age			IQ			Male
Group	*N*	Mean	SD	Range	Mean	SD	Range	%
ADHD	171	21.4	4.5	17, 38	99.6	15.4	68, 142	55.6
Clinical Controls	386	22.4	6.2	17, 56	98.4	14.0	63, 138	35.0
Suspected Malingerers	51	21.8	5.2	17, 40	95.9	10.7	74, 116	43.1
Non-treatment Seeking Controls	114	18.6	1.2	17, 26	106.6	6.8	94, 122	27.2

groups had a higher mean FSIQ than the Clinical Control and Suspected Exaggeration group while the ADHD group had mean FSIQ between the two extremes, ($F_{(4, 464)} = 4.8$, $p = .001$).

Materials

Prior to receiving group instructions, the Feigning participants completed the North American Adult Reading Test (NAART; Uttl, 2002) in order to estimate their overall intelligence, whereas the ADHD subjects and clinical controls completed the Wechsler Adult Intelligence Test-IV (Wechsler, 2008). All participants completed an experimental version of the Conners' Adult ADHD Rating Scale (CAARS) – Self report version (Conners et al., 1999). The CAARS is a 66-item scale that allows for the calculation of eight different indices, with some items contributing to more than one scale. CAARS items are rated on a 4-point scale (0 = *not at all*, 1 = *just a little*, 2 = *pretty much*, 3 = *very much*).

The CAARS provides the following scores: (a) four factor-derived subscales: (b) three scales that correspond to the DSM-IV symptoms of Hyperactivity/Impulsivity, Inattention, and Total DSM symptoms; and (c) an overall ADHD Index that is said to measure the "overall level of ADHD symptoms" (Conners et al., 1999, p. 23). The test manual states that the ADHD Index "is the best screen for identifying those "*at risk*" for ADHD" (Conners et al., 1999, p. 23). The ADHD index is reported to have 71% sensitivity and 75% specificity (Conners et al., 1999, p. 70). The manual does not stipulate a specific cut-off score that may be taken to indicate ADHD, but recommends that any score over a *T* value of 65 might be considered to indicate an area of clinically significant problems, and suggests that *T*-scores over 70 or 75 be used as a cut-off for inferring clinically significant problems. In addition, while the manual suggests that individuals obtaining *T*-scores on the ADHD Index of over 70 are likely to meet the diagnostic criteria for ADHD, it also cautions that *T*-scores above 80 on any of the subscales should be considered as possible indicators of symptom exaggeration.

Experimental version of the CAARS

As noted above, we introduced an experimental version of the CAARS by including 18 additional items as potential symptom validity items. Permission was received from the test publisher to insert these items (Hazel Weldon, personal communication, 30 August 2004). Seventeen were from the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986), specifically the "pathological" items of the DES that are endorsed rarely in the normal population (Barker-Collo & Moskowitz, 2005; Waller & Ross, 1997; Waller et al., 1996) with the text shortened to blend into the format of the existing self-report inventory. One additional item relating to belief that one's marks should be better was also included as it was hypothesized that those who have ADHD might be less inclined to feel this way than would those seeking

a diagnosis for reasons of secondary gain. These 18 experimental symptom validity items included in the CAARS formed the Experimental version of this test (E-CAARS). To protect the security of these items, they are not listed in this paper, but all items describe more atypical or unusual symptoms of dissociation (amnestic states, identity alteration, identity confusion, depersonalization, and derealization), and are endorsed at very low levels by non-clinical populations.[1] DES items were adapted from the original form (rating from 0–100 on a visual analog scale) to the 4-point scale employed by the CAARS.

To ensure that those completing the questionnaire could not easily identify these items, all original 66 items from the CAARS were reproduced into a separate booklet, and the 18 additional items (embedded items) were distributed randomly among the CAARS items. Thus, the booklet appeared as if it were a normal ADHD self-report inventory. Instructions for the E-CAARS were identical to the original, asking participants filling out the E-CAARS to rate each item on a 4-point scale (0 = *not at all*, 1 = *just a little*, 2 = *pretty much*, 3 = *very much*). Initial piloting data from the first 40 students assessed indicated that NTSC subjects did not identify these items as inconsistent from the other CAARS questions or identify them as possibly validity items. Each E-CAARS was scored using a purchased CAARS self-report form and calculating the *T*-scores for each subscale in the original test. The 18 additional items were scored separately.

Procedure

Procedure differed depending on group. Clients referred for assessment of possible ADHD were informed at the start of the assessment (as part of the informed consent process) that some experimental tests (specific tests not identified) were to be included in the testing battery, and that the experimental tests would have no influence on the final diagnosis. Clients were told that they did not have to agree to complete these tests, and that they would still be provided with a complete assessment regardless of their decision. All clients who agreed to complete such experimental tests (99.8%) were included in the ADHD group, the clinical control sample, or the suspected feigning group, depending on final diagnosis.

Students referred for a psychoeducational assessment (Clinical Controls and ADHD cases) completed a 27-page background questionnaire that includes requests for old assessment reports, elementary school records, and retrospective behavior ratings provided by a knowledgeable collateral (parent/guardian) regarding behavior before age 12. After a one-hour intake interview, these clients then underwent 6–8 h of testing using a flexible battery that included measures of cognitive and executive functioning, memory, attention, academic performance, and multiple self- and observer-report inventories including personality measures.

For the non-treatment seeking participants, informed consent was obtained, and participants were asked to take part in a study to examine how individuals respond to instruction sets on tests designed to evaluate attention. They then completed a brief questionnaire, reporting whether or not they had ever been diagnosed with or ever suspected or having ADHD, whether there was any family history of ADHD or attention difficulties, and they were also asked about past learning problems at school; all were told to answer the questions to the best of their ability on this particular test.

Next, the non-treatment seeking participants were given a set of written instructions in a sealed envelope and told that these instructions pertained to the remainder of the tasks they would be completing. For the Feigning group, participants were instructed to pretend they had ADHD in order to gain access to academic accommodations and other "perks," but to perform in a believable manner so as not to be caught exaggerating. They were then provided with an outline of the diagnostic criteria for ADHD as described in the DSM-IV-TR (American Psychiatric Association, 2000), along with a brief list of typical problems encountered by individuals with ADHD[2]. The Honest Reporters were given instructions to try their best; the balance of their instructions included reading a short story unrelated to the task.

After giving NTSC participants in both groups were given 10 min to review the materials, subjects in each group completed the E-CAARS, as well as a number of other tests not reported here. Because group assignment was random and provided in sealed envelopes, the evaluator was blind to group assignment. Participants were debriefed following completion of these measures. Two participants who admitted to not complying with their group instructions were removed from the database.

Results

The CAARS Inconsistency Index is a scale that identifies inconsistent reporting at a level that would invalidate test interpretation; the test manual notes that scores of 8 or more on this index indicate an excessive level of inconsistent responding and that such protocols should not be interpreted. The proportion of respondents with Inconsistency Index scores equal to 8 or more differed among the groups, $X^2_{(4)} = 10.3$, $p = .036$, primarily because the Honest Reporters had very consistent scores. Once the Honest Reporters were removed, there remained no difference in the proportions in each group scoring above the cut-off ($X^2_{(3)} = 4.5$, $p = .21$). Thus, the Inconsistency Index score was not helpful in identifying either those instructed to fake ADHD or those suspected of exaggerating their endorsement of ADHD symptoms. In all subsequent analyses, however, scores from participants who were significantly inconsistent in their item endorsement pattern (i.e. those who scored 8 or more on the CAARS Inconsistency Index) were removed as their scores were invalid (4 [7%] from Honest Reporters; 6 [10.5%] from Instructed to Feign; 13 [25.5%] from Suspected Exaggeration group; 76 [19.4%] from Clinical Controls; and 37 [21 .6%] from ADHD).

Examining the scores in Table 2, one can see that the NTSC Instructed to Feign group and the clinical group suspected of exaggerating symptoms were both very good at endorsing items on the CAARS scales associated with ADHD, often returning CAARS *T*-scores that were equal to or higher than those with genuine ADHD. Similarly, the Instructed to Feign group and Suspected Exaggeration group either did not differ from or exceeded the true ADHD subjects on almost all of the CAARS DSM index scores, all p values $< .001$. Analyses were completed using both parametric and non-parametric measures and results do not differ, hence we report only the parametric outcomes. On average, the Clinical Controls and the Honest Reporters scored lower than did the other groups on all but the *Problems with Self Concept* scale. Additionally, the proportion of individuals returning *T*-scores over 80 (which the CAARS manual suggests may indicate symptom exaggeration) was sensitive but not specific to feigning. As seen in Table 3, 54.9% of the Instructed to Feign group and 31.6% of

Table 2. Mean and Standard Deviation scores of Conners Adult ADHD Rating Scale (CAARS) T scores as a function of group.

	Group											
	Honest Reporters		Instructed to feign		Suspected exaggeration		Clinical controls		ADHD			
CAARS *T*-Score	*n* = 53		*n* = 51		*n* = 38		*n* = 310		*n* = 134			
	M	SD	M	SD	M	SD	M	SD	M	SD	$F_{(4, 581)}$	η^2_p
A[a]	52.62	9.0	69.06	9.1	66.11	12.4	59.09	12.6	62.95	10.7	17.80	.11
B[a]	51.83	12.8	65.65	9.1	60.63	10.8	57.76	11.5	57.73	10.8	19.73	.12
C[b]	52.74	13.5	64.00	11.3	62.21	13.7	51.77	13.1	55.56	11.5	14.79	.09
D[c]	47.85	7.7	52.31	9.3	57.97	11.9	54.57	12.1	53.38	10.9	5.58	.04
E[d]	53.79	9.6	75.84	11.9	74.13	13.1	64.49	13.9	71.70	11.0	31.01	.18
F[a]	46.91	9.2	73.00	12.5	64.42	13.7	53.22	13.3	61.10	12.2	42.21	.23
G[a]	52.04	10.3	76.92	14.2	72.63	13.6	61.14	14.0	69.78	11.5	37.32	.20
H[e]	52.36	10.1	67.82	9.8	64.37	13.0	55.68	12.0	58.94	9.5	19.79	.12

Note: All univariate ANOVAs, $p < .001$. A = Inattention/Memory Problems; B = Hyperactivity/Restlessness; C = Impulsivity/Emotional Lability; D = Problems with Self-Concept; E = DSM-IV Inattentive Symptoms; F = DSM-IV Hyperactive–Impulsive Symptoms; G = DSM-IV ADHD Symptoms Total; H = ADHD Index. Only participants scoring below 8 on the CAARS Inconsistency Index included. [a]Honest Reporters < Clinical Controls < ADHD < Suspected Exaggeration < Feigning. [b](Honest Reporters, Clinical Controls & ADHD) < (Feigning & Suspected Exaggerating). [c]Honest Reporters < Feigning < ADHD < Clinical Controls < Suspected Exaggeration. [d]Honest Reporters < Clinical Controls < (ADHD, Feigning & Suspected Exaggeration). [e]Honest Reporters < (Clinical Controls & ADHD) < (Feigning & Suspected Exaggeration).

Table 3. Total number and Percentage of Group Participants Exceeding Conners Adult ADHD Rating Scale (CAARS) T > = 80 Cut Scores and the Dissociative Experiences Scale (DES) (> 24, > 20, and > 18).

		Percentage of Group > = 80				
CAARS subscales	Total *N*	Honest reporter	Instructed to feign	Suspected exaggeration	Clinical control	ADHD
A	39	1.9	9.8	13.2	6.8	5.2
B	17	7.5	7.8	2.6	2.3	0.7
C	37	9.4	7.8	15.8	5.5	3.7
D	1	0	0	0	1	0
E	120	1.9	43.1	39.5	15.8	24.6
F	43	0	33.3	18.4	3.9	5.2
G	104	0	54.9	31.6	11.6	20.7
H	23	3.8	9.8	10.5	3.9	0
Total of Selected embedded Items from DES (raw scores)						
> = 24 (90th percentile)	45	1.9	35.3	22.6	5.3	5.6
> = 20 (85th percentile)	67	3.8	43.1	32.3	9.8	8.4
> = 18 (80th percentile)	95	7.5	49.0	45.2	14.6	15.0

Note: A = Inattention/Memory Problems; B = Hyperactivity/Restlessness; C = Impulsivity/Emotional Lability; D = Problems with Self-Concept; E = DSM-IV Inattentive Symptoms; F = DSM-IV Hyperactive–Impulsive Symptoms; G = DSM-IV ADHD Symptoms Total; H = ADHD Index.

the Suspected Exaggeration group returned DSM-IV ADHD Symptoms Total *T*-scores over 80; however, so did 20.7% of the ADHD group and 11.6% of the Clinical Controls. Similarly, while 43.1% of the Instructed to Feign group and 39.5% of the Suspected Exaggeration group returned *T*-scores on the DSM Inattention Index over 80, 24.6% of the ADHD group and 15.8% of the Clinical Controls also scored above this cut off. Note too that 62.7% of the Instructed to Feign group, 47.4% of the Suspected Exaggeration group, 34.1% of the ADHD

group, 25.7% of the Clinical Controls and 20.8% of the Honest Reporters returned at least one *T* score over 80 on any index, $X^2_{(4)} = 35.4$, $p < .001$.

Given that the CAARS test manual suggests using *T* scores equal to or over 80 as a sign of possible malingering, CAARS *T* scores using a cut score of 80 were entered into a discriminant function analysis; DSM-IV ADHD Symptoms Total and DSM-IV Hyperactivity-Impulsive Symptoms were the only two subscales needed to correctly classify 85.3% of the participants (primarily Honest Reporters) with only 3.8% of the honest responders (Honest Reporters, Clinical Controls, and ADHD clients) misclassified as non-credible. However, 75.3% of the Instructed to Feign/Suspected Exaggeration groups ($n = 67$) were also misclassified as honest.

One goal of this study was to determine whether the additional 18 items embedded into the CAARS inventory could discriminate between honest responders (Honest Reporters, ADHD, and Clinical Controls) and Feigning groups (Instructed to Feign and Suspected Exaggeration). The sum of the additional E-CAARS items was greater for both the Instructed to Feign group (Mean ± SD: 19.5 ± 11.0) and the Suspected Exaggeration (Mean ± SD: 17.0 ± 8.0) compared to the Clinical Controls (Mean ± SD: 11.3 ± 7.1), the ADHD group (Mean ± SD: 12.1 ± 7.1), and the Honest Reporters (Mean ± SD: 7.6 ± 8.0), $F_{(4, 483)} = 20.9$, $p < .001$. On their own, the sum of these additional 18 embedded items was able to correctly classify 83.2% of participants (mainly Honest Reporters) but with 67 (81.7%) of the Instructed to Feign/Suspected Exaggeration participants incorrectly classified as honest, and 15 honest responders (3.7%) misclassified. As shown at the bottom of Table 3, cut scores for the sum of these embedded items derived from the original DES (corresponding to the 80th, 85th, and 90th percentiles, respectively) were able to correctly identify 49.0, 43.1, and 35.3% of the Instructed to Feign group and 45.2, 32.3, and 22.6% of the Suspected Exaggeration group, but misclassified a sizeable proportion of the Clinical Controls, Honest Reporters, and the ADHD group.

To determine if any specific items showed better ability to differentiate the groups, raw scores (i.e. item scores from 0–3) from the additional embedded items in the E-CAARS inventory were employed in an ANOVA to examine group differences (see Table 4). Five of these additional E-CAARS items (embedded items 4, 5, 8, 13, and 17, respectively) appeared to best differentiate (F ratio > 10) the Instructed to Feign/Suspected Exaggeration groups from the remaining groups.

Exaggeration Index (EI)

Although various scores on each measure discussed above differentiated the groups at better than chance level, they did not directly address the classification of individual test takers. As such, it was important to determine if an index could be developed that could best identify non-credible symptom reporting without misclassifying either the Honest but symptomatic clinical controls or those with ADHD. Inspection of the data identified that eight configural features were observed significantly more frequently in the test results of those Instructed to Feign/Suspected Exaggeration of ADHD than in those who were responding honestly (whether Honest Reporters, ADHD, or Clinical Controls). These were integrated into a new "Exaggeration Index" (EI), designed for clinical application (see Table 5 for the items comprising this index). We combined high totals on the 18 embedded E-CAARS items, high scores on the 5 specific embedded items (noted above), and T-scores of 80 and over on the DSM-IV Hyperactive/Impulsive symptoms and ADHD Symptoms Total indices of the CAARS (see Table

Table 4. Descriptive statistics for embedded items as a function of group, and the p-value for each ANOVA.

	Group												
	Honest Reporters		Instructed to Feign		Suspected Exaggeration		Clinical Controls		ADHD				
	n = 53		*n* = 50		*n* = 31		*n* = 246		*n* = 106				
Embedded item #	M	SD	M	SD	M	SD	M	SD	M	SD	*p*	$F_{(4, 471)}$	η^2
1[a]	.53	.64	1.08	.85	1.16	.96	1.02	.96	.83	.87	=.002	4.30	.04
2[a]	1.28	.79	2.12	.80	2.28	.80	1.85	.94	2.03	.80	< .001	9.51	.08
3[a]	.28	.60	1.16	1.06	.79	.86	.52	.80	.54	.80	< .001	8.90	.07
4[a]	.09	.35	.84	1.00	.24	.51	.12	.42	.10	.41	< .001	22.75	.16
5[a]	.11	.38	.94	1.04	.76	.87	.29	.55	.47	.68	< .001	15.15	.11
6[a]	.36	.62	.84	.79	1.00	.96	.56	.79	.66	.83	= .001	4.47	.04
7[a]	.36	.65	.96	.86	.76	.74	.41	.74	.41	.81	< .001	7.14	.06
8[a]	0	0	.60	.88	.41	.63	.17	.49	.20	.51	< .001	10.10	.08
9[a]	.17	.38	.90	1.00	.72	1.03	.52	.79	.52	.76	< .001	5.95	.05
10[b]	.15	.41	.52	.74	.14	.35	.15	.45	.18	.55	< .001	5.91	.05
11[a]	.26	.49	.90	.93	.45	.78	.33	.70	.31	.59	< .001	8.09	.06
12[a]	.15	.41	.78	.89	.57	.68	.30	.64	.33	.69	< .001	7.69	.06
13[a]	.42	.60	1.14	.83	.45	.57	.39	.68	.40	.70	< .001	12.98	.10
14[c]	1.00	.83	1.16	.93	1.55	.99	1.13	.94	1.28	1.06	=.188	1.99	.02
15[a]	.72	.82	1.48	.97	1.67	1.15	1.14	.97	1.18	.90	< .001	6.43	.05
16[a]	.38	.60	.96	.90	1.16	1.01	.57	.78	.66	.80	<.001	7.01	.06
17[a]	.30	.72	1.10	1.02	1.21	1.18	.48	.76	.47	.76	< .001	12.29	.10
18[a]	1.04	.71	1.94	.91	1.84	.99	1.34	1.00	1.30	.99	< .001	7.95	.06

[a]Honest Reporters, Clinical Controls, and ADHD < Instructed to Feign, Suspected Exaggeration. [b]Honest Reporters, Clinical Controls, ADHD, and Suspected Exaggeration < Instructed to Feign. [c]Honest Reporters & Clinical Controls < Instructed to Feign < ADHD and Suspected Exaggeration.

Table 5. Items included in the feigning ADHD Index.

Item		Weight
1	Embedded item # 4 score > 1	1
2	Embedded item # 5 score > 1	1
3	Embedded item # 8 score > 1	1
4	Embedded item # 13 score > 1	1
5	Embedded item # 17 score > 1	1
6	Sum of DES embedded items > = 20	1
7	CAARS DSM Hyperactivity *T* score > = 80	1
8	CAARS DSM ADHD Symptoms Total *T* score >=80	1
	Total score	8

5). Subjects received one point for each item meeting these criteria with a maximum total score of 8. The total EI scores returned by each group were significantly different ($F_{(4.583)} = 37.1$, $p < .001$). The average score for the Honest Reporters on this Index was .25 (SD = .8; range 0–4); the Clinical Control group on this Index was .54 (*SD* = 1.1), with a range from 0 to 6. The average score for the ADHD participants was .75 (*SD* = 1.2), with a range from 0 to 6. These groups' scores were not significantly different from one another. By contrast, post hoc testing confirmed that the Instructed to Feign group (Mean = 2.6, SD = 2.4, range: 0–8) and the Suspected Exaggeration group (Mean = 1.4, SD = 1.6, range: 0–6) returned significantly higher mean scores on the Exaggeration Index than did the other groups ($p < .001$) with the Instructed to Feign group scoring higher than those suspected of exaggerating.

Table 6. Positive (PPV) and Negative Predictive Value (NPV) for the exaggeration index (EI) as a function of cut score and base rate of feigning.

		Base rate							
		15.1% (Current study)				20%		30%	
EI cut value	Correct classification Rate	Sensitivity	Specificity	PPV	NPV	PPV	NPV	PPV	NPV
>0	.73	.69	.74	.32	.93	.40	.90	.53	.76
>1	.82	.51	.88	.43	.91	.52	.88	.65	.76
>2	.85	.34	.94	.52	.89	.60	.85	.72	.74
>3	.86	.24	.97	.58	.88	.66	.84	.77	.73

The accuracy of diagnostic tests is often evaluated by examining the specificity, sensitivity, positive predictive power (PPV), and negative predictive value (NPV) of the test, with the latter two measures being sensitive to base rate of the condition (non-credible symptom reporting) and the former not. Classification statistics are presented in Table 6. In the present study, the EI has sensitivity of between 24 and 69%, depending on the cut score employed. Specificity of the EI was strong; a score of 3 or more on the EI was almost exclusive to those feigning ADHD (97%) and thus has a low false positive rate. For comparison purposes, statistics for the EI at various base rates and cut scores are provided, along with data for the base rate for feigning in the current study (15.1%).

The other important clinical parameters, PPV and NPV, assist clinicians in determining the likelihood that an individual whose score falls above or below a given cut score actually belongs to the classification group in question. Examining the data, the PPV for the EI ranges from 32 to 77% depending on base rate and cut-score employed, and NPV ranges from 73 to 93%. As shown in Table 6, even using a cut score of greater than 2 results in relatively good classification accuracy. Unlike sensitivity and specificity, PPV and NPV are influenced by the base rate of the condition being investigated. Given that the base rate of malingering ADHD is not known, Table 6 also provides clinicians with PPV and NPV scores for exaggeration base rates of 20 and 30%.

Discussion

The results of the present study emphasize the need to include symptom validity items in self-report inventories. Consistent with other recent studies, the current study demonstrated that those feigning ADHD can do so easily on existing self-report rating scales, endorsing symptoms at levels equal to or greater than those with genuine ADHD. Also apparent is the fact that symptoms of ADHD in general are non-specific and occur in many other clinical groups. Similar to the findings of Suhr, Zimak, et al. (2008), there were students in the clinical control group who returned scores on various CAARS scales that were elevated. As such, it would be difficult to reliably differentiate the symptomatic but honest respondents from those who were exaggerating or endorsing non-credible symptoms based solely on calculated T-scores.

Also of interest was the fact that the Inconsistency Index of the CAARS was of no help in identifying those asked to feign ADHD. This is not surprising, in that the Inconsistency Index measures the degree to which an individual is reporting similar symptoms consistently. One would certainly expect that a student motivated to feign ADHD would be consistent in endorsing symptoms.

The experimental symptom validity items evaluated in this study were not completely successful in producing a workable exaggeration index on their own. While the sum of these added items was able to correctly classify 83.2% of our total sample, the false positive and negative rates using this score alone were unacceptable. Similarly, utilizing *T*-scores of 80 or more on the existing CAARS correctly classified about 85% of the total sample, but again with unacceptable error rates. We were, however, able to identify a series of markers from the E-CAARS to produce an Exaggeration Index with excellent specificity and acceptable sensitivity. This index, comprised of high scores on two of the CAARS indices and the additional symptom validity items included in the E-CAARS was able to accurately identify between 24 and 69% of feigners, depending on cut score chosen while also not falsely accusing honest reporters. Lower sensitivity rates are characteristic of most tests of malingering, in which specificity is set high to minimize the possibility of false positive errors at the expense of sensitivity (Larrabee, 2005). The observed sensitivity levels are consistent with those of the MMPI-2 validity scales and validity indicators predicting malingered neurocognitive dysfunction in a TBI sample reported by Greve, Bianchini, Love, Brennan, and Heinly (2006).

In examining the data, one factor that makes it difficult to develop a highly sensitive index of symptom exaggeration/non-credible reporting to include in a single self-report measure is that different people may exaggerate any combination of the 18 symptoms listed in DSM (both versions IV and V, and research suggest that those asked to feign ADHD employ a wide variety of strategies based on their own ideas about the disorder (see Musso & Gouvier, 2012; for a review). Alfano and Boone (2007, p. 373) have suggested that "Effort in specific populations is best detected by tests designed to address layperson notions of the deficits associated with that population's disorder." This is similar to Osmon, Plambeck, Klein, and Mano (2006) who found that layperson's expectations related to the primary problems present in Dyslexia significantly predicted the type of feigning behavior demonstrated by analog malingerers. These authors suggest that the layperson's general constructs about the cognitive processes involved in a disorder significantly influence their pattern of symptom exaggeration. Given that ADHD symptoms span problems with attention, impulsivity, memory, hyperactivity, and executive functioning deficits, it will likely be difficult to develop a set of symptom validity items that capture exaggeration on one or a combination of these dimensions perfectly. For instance, depending on their understanding of ADHD, an individual might exaggerate on some items but not others of these symptoms, thus allowing for multiple permutations and combinations of symptom endorsement. Similarly, Greve, Bianchini, Mathias, Houston, and Crouch (2002) demonstrated three different approaches used by malingerers in taking the Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993), one of which included performing normally. Nelson et al. (2003) examined the relation between eight different measures of malingering and found only a modest correlation among them, indicating that they are all measuring slightly different aspects of symptom exaggeration. Also problematic is that there are other psychiatric conditions that might predispose a client to overreport or overdramatize symptoms without conscious intention to deliberately malinger (e.g. Borderline Personality Disorder), or to endorse high levels of inattentive-type symptoms due to another, specific disorder (e.g. high levels of dissociation may cause individuals to endorse many Inattentive items on an ADHD checklist, although the cause is not ADHD). Such overreporting, however, would still

interfere with accurate interpretation of scores on an ADHD checklist. It therefore seems likely that one will need a variety of methods in order to detect all cases of non-credible ADHD symptom reporting. Musso and Gouvier (2012) conclude that clinicians should include at least three validity tests in settings where malingered ADHD is likely; the EI would provide clinicians with one additional method of identifying the presence of non-credible symptom reporting.

Consistent with the recent work of Lewandowski et al. (2008), Suhr, Hammers, et al. (2008), and Suhr, Zimak, et al. (2008), the high degree of symptom overlap with other psychiatric conditions shows not only that symptoms of ADHD are non-specific but also that the high variability in neuropsychological performance reported in the ADHD research literature might be better explained by inclusion of individuals incorrectly classified as having ADHD in the subject pool. Given how easily those asked to simulate ADHD could do so, one must also wonder how much of the inconsistency in identifying specific patterns of neuropsychological performance in the ADHD research literature might in fact be better explained by non-credible symptom reporting, as was suggested by Suhr, Hammers, et al. (2008). Our research would support the view that standards for ADHD assessment should include proof that the symptoms are genuine and that the individual was not exaggerating or magnifying their level of impairment. Furthermore, the substantial overlap of symptoms between those with ADHD and the clinical controls speaks to the need to ensure that clinicians adhere to published diagnostic criteria when diagnosing ADHD, as high report of current symptoms in adults is not specific to those with ADHD. As outlined in both DSM-IV and DSM-5, one must also establish early onset and a chronic course for any current symptoms, obtain proof that such symptoms substantially impaired the individual in two or more major life areas, and rule out other possible causes for the reported symptoms. This latter point seems especially salient given the number of clinical controls in the present sample who reported symptoms of ADHD at levels equal to or higher than the actual ADHD students. The demonstrated lack of association between self-reported symptoms of ADHD and actual real-world impairment (Gathje, Lewandowski, & Gordon, 2008; Gordon et al., 2006), coupled with the findings from the present study demonstrates that self-report alone is not sufficient to determine if a person has ADHD.

Limitations and directions for future research

The present study employed, in part, a simulation design. This was done because identification of a feigning criterion group is fairly difficult, as those who exaggerate or feign rarely admit to their actions. While simulation designs are useful and necessary in the early stages of PVT/SVT development (Bianchini et al., 2001), they may not always generalize to real-world situations. As such, the findings presented in this paper need to be replicated in a different sample, perhaps one where all members of the feigning group are clinical subjects identified using criteria such as those suggested by Slick et al. (1999). Further, the EI should not be used in clinical settings until replication has occurred.

It is also possible that the simulated ADHD group did not have the same motivation or access to information as would students undergoing a re-assessment to determine whether accommodations will be provided at the postsecondary level. Given that students at the secondary school level are frequently provided with academic accommodations and supports without requiring a formal diagnosis of a disability (Harrison et al., 2007), it is possible that

such students fear the academic consequences of losing their longstanding accommodations, and may be more savvy regarding the types of deficits expected from persons with ADHD, especially if they have been working around and writing tests with those who really do have disabilities. Future studies should therefore attempt to include a group of students who have specific knowledge of ADHD based on first-hand experience.

It is possible that all students in the Clinical Control and ADHD groups were not as honest as we believed. Although we applied the Slick et al. (1999) criteria and employed commonly used PVTs to help identify level of effort, it may be that the PVTs chosen are not always sensitive to exaggerated or feigned ADHD. Furthermore, some students were given only one stand-alone PVT which may not have been sufficient to identify low effort across hours of testing. We cannot know, for instance, whether those motivated to feign ADHD would necessarily be identified by the well-validated PVTs we employed. Further, as per the Slick et al. recommendations, clients at our center are always warned at the start of the assessment that effort tests are included in the assessment battery; however, Youngjohn, Lees-Haley, and Binder (1999) have argued that such warnings only serve to make potential malingerers more cautious in their approach and therefore potentially less detectable. Future studies should therefore obtain normative data for the E-CAARS from clients with a longstanding history of ADHD or other clinical disorders and even then only after they have first been given a diagnosis to reduce the risk of possible symptom exaggeration.

One final limitation pertains to the items embedded within the questionnaire itself. While these would ideally be incorporated into a new validity scale for the CAARS, the present format requires that clinicians always purchase the original test form to avoid copyright infringement. Further, there is the risk that clients given the E-CAARS to complete at home could easily identify the validity items by doing online searches (see, for instance, Ruiz, Drake, Glass, Marcotte, & van Gorp, 2002). For this reason, clinicians should always ensure that clients complete self-report checklists while at the clinician's office. If not, we run the risk of undermining the efficacy of any validity test, as its discovery can now be disseminated easily via the internet.

In conclusion, the need for a well-validated SVT in ADHD assessment has been demonstrated in a number of recent studies, and the current study indicated that inclusion of validity items in a commonly used self-report scale along with abnormal endorsement pattern on this test can help clinicians identify a pattern of symptom magnification or overreporting that would serve to invalidate the results of ADHD self-report inventories. While using *T*-score cut offs on the CAARS alone did not always identify exaggerated responding, over-endorsement on specific CAARS scales, coupled with additional embedded Symptom Validity Items produced an Exaggeration Index with acceptable classification accuracy. The EI may therefore be used as one of the three recommended validity measures (preferably ones that have minimal correlation with each other so as to capture different domains of exaggeration) employed in an ADHD evaluation to help identify non-credible symptom reporting. This study should be considered as preliminary work only. Future research is required to confirm our findings among larger groups, including more sophisticated malingerers.

Notes

1. Interested readers may obtain a copy of these items from the lead author.
2. Specific instructions given may be obtained from the lead author.

Disclosure statement

No potential conflict of interest was reported by the authors.

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