Psychometric Properties of the Weiss Functional Impairment Rating Scale: Evidence for Utility in Research, Assessment, and Treatment of ADHD in Emerging Adults

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Abstract

Objective: The current study examines psychometric properties of the Weiss Functional Impairment Rating Scale (WFIRS), a measure of adult ADHD-related impairment. It is a self-report questionnaire that provides a metric of overall life impairment and domain-specific dysfunction. **Method:** Using data from a large (*N* = 2,093), multi-institution sample of college students and including a subsample of collateral informants (*n* = 262), a series of analyses were conducted. **Results:** The WFIRS demonstrated robust internal reliability, cross-informant agreement on par or superior to other measures of ADHD symptomatology and impairment, and concurrent validity. The WFIRS was not shown to be uniquely associated with ADHD, as internalizing symptoms also associated with the total and domain scores. **Conclusion:** The use of the WFIRS in identifying ADHD-related impairment in emerging adults appears to be psychometrically supported, and will prove useful to clinicians and researchers. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

impairment, assessment, emerging adults, ADHD

Current international standards for the definition of psychological disorders, including both the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association [APA], 2013) and the International Classification of Diseases (10th edition, ICD-10; World Health Organization [WHO], 1992), generally require that substantial functional impairment be demonstrated for clinical diagnosis. Although clinicians and researchers alike have ready access to numerous "gold-standard" scales and structured interviews that empirically assess the presence of the behavioral and cognitive symptoms of many disorders (e.g., Adler & Cohen, 2004, ADHD; Brown & Barlow, 2014, anxiety; Furukawa, 2010, depression), it seems that measurement of functional impairment is often less precise and more reliant on the subjective judgment of the evaluator (Clinical Global Impression Scale; Guy, 1976). ADHD is a common disorder of childhood (APA, 2013), and evidence is growing that it is also common among emerging adults (18- to 25-year-olds; approximately 5% prevalence rate; Willcutt, 2012), including the subset of emerging adults who are enrolled in college (Weyandt & DuPaul, 2008). However, there seems to be a particular dearth of established self- and other-report scales—first-line measures

for clinical assessment, treatment efficacy, and research—that capture impairment related to ADHD in the latter population, despite calls for just such a diagnostic focus (Sibley, Pelham, Molina, Gnagy, Waxmonsky, et al., 2012). The current study examines the psychometric properties of a widely available yet relatively untested measure of impairment associated with ADHD in emerging adulthood, the Weiss Functional Impairment Rating Scale (WFIRS; Weiss, 2000).

Measurement of Functional Impairment

To be sure, the empirical documentation of certain domains of functional impairment is well established. For instance,

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the historical need for identification of and intervention for intellectual disabilities has spurred the development and revision of several well-established, quantifiable measures of general cognitive ability (i.e., IQ) that are appropriate for use in the general population (Wechsler Intelligence Scales, Wechsler, 2008, 2015; Stanford-Binet Intelligence Scales, Roid, 2003) and with clients with sensory or other physical disabilities (Wechsler & Naglieri, 2006).[1] Adaptive, occupational (i.e., self-care) behavior is another domain along with IQ that serves as a primary diagnostic consideration for intellectual disability, and also is readily measured with widely recognized and trustworthy measures (e.g., Vineland Scales of Adaptive Behavior, Sparrow & Cicchetti, 2005; Scales of Independent Behavior–Revised [SIB-R], Bruininks, Woodcock, Weatherman, & Hill, 1996).

One might argue, however, that intellectual disability is a disorder that is *primarily* defined by degrees of functional impairment (i.e., cognitive and adaptive), and that is not necessarily the case for all disorders. For instance, social anxiety disorder is diagnosed when cognitive (e.g., overestimation of likelihood of rejection), behavioral (e.g., avoidance of novel social situations), and physiological symptoms (e.g., heightened arousal) combine with evident impairment in relational, work, academic, or other domains of life (APA, 2013). Many of the associated symptoms are *internal* in nature, and, therefore, rely on client or participant reports of their experiences. Self-report measures abound that capture such symptoms of social anxiety (e.g., Social Phobia and Anxiety Inventory, Turner, Beidel, Dancu, & Stanley, 1989; Liebowitz Social Anxiety Scale [LSAS], Liebowitz, 1987), but while such measures tap avoidance, an indicator of *possible* impairment (e.g., if one avoids talking to people in authority, one might foreclose the possibility of an appointment to a mid-managerial position), they do not all directly ask questions that facilitate report of *actual* impairment (e.g., "Have you turned down a job or raise due to concerns about public interaction?"). In general, clinicians and researchers have tools at their disposal that are able to very precisely measure the symptoms of most *DSM* and ICD disorders, but the measurement of associated impairment still tends to be relatively imprecise.

Measurement of Functional Impairment in Adults With ADHD

Unfortunately, a consideration of existent treatment literature suggests that quantitative measures of impairment for ADHD in adults of all ages are few and not necessarily well-established or widely employed in research or practice. Treatment outcome studies, which theoretically establish the norms for clinical intervention, have varied in terms of the documentation of impairment. For instance, Wilens, McDermott, Biederman, and Spencer (1999) employed overall adjustment ratings from the Clinical Global Impression (CGI;

National Institute of Mental Health, 1985) and Global Assessment of Functioning (GAF; APA, 1987) in their chart review of adults with ADHD who had completed cognitive therapy. Others (Rostain & Ramsay, 2006; Safren, Otto, et al., 2005; Safren et al., 2010) followed in this vein in their studies of cognitive-behavioral therapy for adults with ADHD, relying primarily on CGI to document degree of impairment and change following treatment. Solanto et al. (2010) utilized measures of functioning that related to the primary goal of their metacognitive therapy, including the On Time Management and Organization and Planning Scale (ON-TOP; Solanto, Marks, Mitchell, Wasserstein, & Kofman, 2008) and the Time Management, Organization, and Planning subscale of the Adult ADHD Investigator Symptom Rating Scale (Spencer et al., 2010). While these measures tap a functional domain that is appropriate given the specific goals of the intervention, unfortunately, psychometric data are not available for either.

Thus, it appears that it is the exceptional study of adult ADHD treatment outcome that includes empirically supported measures of impairment that provide adequate depth and breadth. One such exception is DuPaul et al.'s (2012) randomized controlled trial of lisdexamfetamine (i.e., Vyvanse) in college students with ADHD. That study included the Social Adjustment Scale (SAS; Weissman, 1999) and the Study and Organizational Skills Ratings Scale (SOS-RS; adapted from Glutting, Monaghan, Adams, & Sheslow, 2002) self-reports, both of which have documented and satisfactory psychometric properties. While these measures provide valuable data as to that treatment's efficacy at addressing certain domains of psychosocial impairment, they were still not constructed to tap all of the specific areas of maladjustment that tend to plague individuals with ADHD. While performance across varied social roles is captured by the SAS and academic and organizational behavior by the SOS-RS, other areas of documented ADHD-related impairment such as risky sexual behavior (Flory, Molina, Pelham, Gnagy, & Smith, 2006), vehicular accidents (Barkley, Murphy, DuPaul, & Bush, 2002), and underperformance in work (Johnston, 2002) are not assessed.

This is not to say that measures tailored to the functional impairments young adults with ADHD are likely to encounter are not available. Several such measures have been published and used in basic research on general, psychosocial outcomes associated with individuals in this population. For instance, Barkley and Murphy (2006) published the Current Symptoms Scale (CSS) self- and other-report forms for *DSM*-indexed (*Diagnostic and Statistical Manual of Mental Disorders* [4th ed., text rev.; *DSM-IV-TR*]; APA, 2000) ADHD in adulthood that includes an impairment scale with 10 items that correspond to well-known areas of risk for affected adults. This scale has been shown to have good internal reliability by independent investigators (Fedele, Hartung, Canu, & Wilkowski, 2010). Barkley (2011) has

continued to refine this instrument, recently publishing an expanded, 15-item measure, the Barkley Functional Impairment Scale (BFIS), including extensive and impressive psychometric support and norms established across sexes and adult age ranges. In addition, the Impairment Rating Scale (IRS) is a brief (i.e., six-seven item, one item/domain) measure that was initially validated with parent and teacher reports of children with and without ADHD (Fabiano et al., 2006), but has been adapted for use in adolescents (Evans, Schultz, DeMars, & Davis., 2011) and emerging adults (modified IRS; Sibley, Pelham, Molina, Gnagy, Waxmonsky, et al., 2012), including a self-report for the latter group. In addition to these, a quality of life instrument designed specifically for use with adults with ADHD has been published, the Adult Attention-Deficit/Hyperactivity Disorder Quality-of-Life Scale (AAQol; 29 items; Brod, Johnston, Able, & Swindle, 2006). As quality of life maps closely onto functional impairment and extensive data are reported by both Brod and colleagues and others (Gjervan & Nordahl, 2010) that support its psychometric soundness, the AAQol is worthy of consideration for usage in research and clinical practice with adults with ADHD.

Case for Additional Measures of Impairment in Emerging Adults With ADHD

Other, non-specific measures such as the Longitudinal Interval Follow-Up Evaluation-Range of Impaired Functioning Tool (Leon et al., 1999), WHO Quality of Life Scale (Bonomi, Patrick, Bushnell, & Martin, 2000), and Quality of Life Enjoyment and Satisfaction Questionnaire (Endicott, Nee, Harrison, & Blumenthal, 1993) have been used to document the multifaceted dysfunction that accompanies ADHD in adults (e.g., Combs, Canu, Broman-Fulks, Rocheleau, & Nieman, 2013; Mick, Faraone, Spencer, Zhang, & Biederman, 2008; Safren et al., 2010). However, measures such as the CSS impairment scale, BFIS, modified IRS, and AAQol have empirical support and were all specifically developed to fulfill this purpose. Such measures that are specifically tailored to assess adult ADHD-related impairment seem to be the most appropriate options for researchers and clinicians to meet recent calls for additional focus on the functional impairment criterion (Hartung et al., 2016; Sibley, Pelham, Molina, Gnagy, Waxmonsky, et al., 2012). Unfortunately, each also has its shortcomings that, individually and collectively, signal that the establishment of new, viable alternatives is still a worthy endeavor. Principally, the CSS, BFIS, and the modified IRS are composed of single items that assess dysfunction in each of their six to 15 domains. While these measures have demonstrated reliability and validity (Barkley, 2011; Fedele et al., 2010; Sibley, Pelham, Molina, Gnagy, Waxmonsky, et al., 2012) and

capture functional impairment in a broad sense, it is necessarily the case that little *specific* detail about dysfunction in each area can be gleaned. Furthermore, while the AAQoL does include 29 items in four domains, it does not fully tap into important areas of ADHD-related impairment such as risk-taking behaviors and school difficulties (Barkley et al., 2002; Flory et al., 2006). This limits the overall appreciation of what sorts of problems are precipitated by the symptoms of ADHD in adulthood, and furthermore, to the extent that these may be used in clinical practice, makes tailored interventions to address functional impairment less precise and potentially less effective.

The WFIRS (Weiss, 2000) has been suggested as an alternative for assessing the behavioral and emotional difficulty experienced by adults with ADHD (Surman, 2013). One of the potential advantages of the WFIRS is that it provides relatively abundant detail with regard to the manifestation of impairment. The WFIRS focuses on seven domains that are clinically relevant to ADHD in adulthood, including (a) *family* relations (eight items), (b) *work* adjustment (11 items), (c) *school* performance (11 items), (d) *life skills* (12 items), (e) *self-concept* (five items), (f) *social* functioning (nine items), and (g) *risk*-taking (14 items). Therefore, this 70-item scale taps into many domains of functioning relevant to adults with ADHD, and has the potential to be of great value to clinicians and researchers alike. Unfortunately, while Weiss (2000) indicated in the instructions on the WFIRS adult self-report that "this measure has internal consistency greater than .9 with excellent sensitivity to change, and a higher correlation between symptom change and improvement in ADHD symptoms than any previous measure" (para. 8) and that "details on psychometric validation are in preparation for publication" (para. 11), careful examination of the literature as well as direct consultation with G. Weiss (personal communication, November 7, 2012) indicates that, to date, no published, peer-reviewed studies support the psychometric soundness of this measure.[2]

Current Study

The current study aims to examine the psychometric properties of the WFIRS self-report and a collateral-report form that we adapted (WFIRS-CR, same items and structure as the WFIRS with instructions and item wording to solicit information regarding another adult) to provide evidence for their utility in the identification and treatment of emerging adults with ADHD, using a large population of college students from multiple universities. Specifically, the following research questions will be addressed:

> **Research Question 1:** Internal consistency reliability—Is the internal consistency reliability of the WFIRS self- and collateral-report forms satisfactory?

Research Question 2: Cross-informant reliability—Are the WFIRS self- and collateral-report forms meaningfully associated with each other across subscales?

Research Question 3: Concurrent validity—Is the WFIRS strongly associated with another published measure of ADHD-related impairment (i.e., CSS)? Is the WFIRS associated with a functional measure of impairment (i.e., college grade point average [GPA])?

Research Question 4: Predictive validity—How strongly do WFIRS-SR and WFIRS-CR scores correspond to self-reported ADHD symptoms? How well does the WFIRS differentiate between participants meeting research criteria for *DSM-5* ADHD and those who do not?

Research Question 5: Discriminant validity—Are WFIRS scores more strongly associated with inattention and hyperactivity than with depression, anxiety, and stress?

Method

Participants

Participants in this study were 2,098 undergraduate students enrolled in Appalachian State University (ASU; *n* = 1,160) or the University of Wyoming (UW; *n* = 938). Participants were recruited in two ways: via psychology department research pools and through various campus units (i.e., student health services, counseling centers, psychology training clinics disability support services), the latter in an effort to over-select participants with ADHD. Flyers advertising the study were posted in these units, and emails were sent to students who were receiving disability support services. A description of the research study was provided on the participant pool websites. As is typical in psychology courses, 67% of participants were women (*n* = 1,403), and 33% were men (*n* = 691; four did not specify their sex). Participants ranged in age from 18 to 25 years (*M* = 19.57, *SD* = 1.60) and 28.6% were in their first year of college, 30.8% in their second year, 17.5% third year, 13.5% fourth year, and 9.2% fifth year or beyond. The ethnic composition of the sample was 87.2% European American, 4.0% Hispanic/Latino, 3.2% Asian American, 2.4% African American, 1.5% American Indian, and 1.1% Other. There was no significant difference in the distribution of ethnicity among sites when ethnicity was coded as European American versus non-European American. Of these participants, 346 (16.5%) met a research cutoff for *DSM-5* indexed ADHD (66.3% women): five or more current symptoms of inattention and/or hyperactivity-impulsivity present, with symptoms also reported in childhood, by self-report; and 1,641 did not (66.6% women). Furthermore, of those 346 participants who met our research criteria for elevated ADHD symptomology, the majority (52.3%) reported having received an official diagnosis of ADHD from a mental health professional and having been treated for the disorder (27.5%

currently taking stimulant medication, 29.2% having previously taken stimulant medication, and 32.9% having participated in a psychosocial treatment for ADHD).

Each college student nominated an individual to provide a collateral report on his or her behaviors. These collateral reporters were either parents or peers (i.e., close friend, roommate, or significant other). Of 262 collateral reporters who completed the study, 74.4% were peers (69.6% women), and 25.6% were parents (80.6% mothers).

Measures

Demographic information. College student participants completed a demographics form that included sex, age, ethnicity, college GPA, year in school, and past ADHD diagnosis. Collateral participants also completed a demographics form that included sex, age, and ethnicity.

CSS. This self-report form includes nine *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; APA, 1994) inattention symptoms, nine *DSM-IV* hyperactivity/impulsivity symptoms, and 10 impairment items (Barkley & Murphy, 2006). Impairment items assess the extent to which symptoms of ADHD impact functioning in multiple life areas (e.g., "In my home life with my immediate family," "In any educational activities," and "In my management of my daily activities"). All items require a choice among four responses (i.e., *never or rarely*, *sometimes*, *often*, and *very often*). Cronbach's alpha values for the current sample were .85 for inattention, .82 for hyperactivity, and .92 for impairment.

WFIRS. The WFIRS (Weiss, 2000) covers seven domains of functioning as described previously and consists of 70 items. The standard WFIRS form is completed by the affected individual, and with only slightly modified item wording and instructions regarding target of ratings, it can also serve as a collateral-report form (i.e., our WFIRS-CR). Similar to the ADHD checklists, respondents are asked to indicate how much difficulty they have had in each area using a 4-point scale with responses ranging from *never or not at all* to *very often or very much*.

Depression Anxiety Stress Scale–21 (DASS). The DASS (Henry & Crawford, 2005) is a 21-item scale designed to measure perceived stress, depression, and anxiety. There are seven items on each of these three subscales and the responses are provided using a 4-point scale ranging from *did not apply to me at all* to *applied to me very much or most of the time*. Henry and Crawford (2005) reported excellent internal consistency for the Stress subscale. In the current sample, internal consistency was good to excellent across the three subscales (α = .86-.92).

Procedure

This study was approved by institutional review boards at both universities, and participants completed all measures online. Students who signed up to participate in this study received an email with a hyperlink to the online survey. College students with previous diagnoses of ADHD were allowed to participate regardless of whether they were taking stimulant medication for ADHD. However, those taking medication were asked to respond to survey items based on their non-medicated behavior. The first page of the survey was the informed consent, which included a description of the study, as well as its procedure, duration, risks, benefits, and compensation, and a request to nominate collateral reporters. Each college student participant nominated an individual to provide a collateral report on his or her behaviors and provided an email address to the researchers. Collateral reporters were either parents or peers (i.e., close friend, roommate, or significant other). Collateral reporters received an email with an invitation to participate and a hyperlink to the online collateral survey.

Participants were presented with the measures in a standardized order: demographics form, CSS, WFIRS, and DASS. Similarly, collateral reporters completed other-report versions of each of these measures in the same standardized order. After completing these measures, all participants were presented with a debriefing page with information about whom to contact with questions or concerns about the study.

The survey took approximately 1 hr for participants and collaterals to complete. Participants recruited from the research participant pools received research credit toward a psychology course. A small number of participants ($n = 23$) recruited from various campus units based on having an ADHD diagnosis who volunteered outside of the Psychology Department recruitment system—and, thus, were ineligible to receive research requirement credit—elected to be paid US$20 for completing the study. Collateral reporters also received US$20 for completing the study.

Results

Internal Consistency

First, we examined the internal consistency of the self-report and collateral-report versions of the WFIRS. Cronbach's alpha was calculated for each subscale and for the total score based on self-report and collateral-report. The results are shown in Table 1. For the self-report version, internal consistency for the total score was excellent (.96), and for the subscales, it was good to excellent (.85 to .94). Similarly, for the collateral-report version, internal consistency for the total score was excellent (.97), and for the subscales, it was good to excellent (.84 to .93).

Table 1. Internal Consistency for Self- and Collateral-Report Versions of the WFIRS.

Subscale	Number of items	WFIRS self-report		WFIRS collateral-report	
		Cronbach's α	n	Cronbach's α	n
Family	8	.85	2,045	.84	224
Work	11	.90	2,049	.92	224
School	11	.90	2,034	.91	227
Life skills	12	.89	2,034	.89	219
Self-concept	5	.94	2,048	.93	227
Social	9	.87	2,049	.91	227
Risk	14	.87	2,034	.89	224
Total	70	.96	1,906	.97	208

Note. WFIRS = Weiss Functional Impairment Rating Scale.

Cross-Informant Reliability

Next, we examined the correlations between self-report and collateral-report for each subscale and the total scale on the WFIRS. All of the correlations were statistically significant, and the effect sizes were small ($r = .10$ to .29) to moderate ($r = .30$ to .49; Cohen, 1992). Smaller effect sizes were found for the Work ($r = .15$), Social ($r = .25$), and Risk subscales ($r = .27$), whereas other subscales, including the Total score, produced moderate effects (rs ranged from .30 to .43).

Concurrent Validity

To examine the concurrent validity of the WFIRS, we correlated each of the WFIRS subscales and the total score with another published measure of ADHD-related impairment (e.g., CSS). For the self-report version, all of the correlations were significant (ps < .001), and the effect sizes were large ($r > .50$; Cohen, 1992). Specifically, the correlation between the WFIRS and CSS impairment total scores was .76, and the correlations between the CSS impairment total score and the WFIRS subscales ranged from .53 to .68. Similarly, for the collateral-report (WFIRS-CR) version, all of the correlations were significant (ps < .001) and the effect sizes were large ($r > .50$; Cohen, 1992); the correlation between the WFIRS-CR and CSS impairment was .76, and the correlations between the CSS impairment and the WFIRS-CR subscales ranged from .51 to .69.

As another measure of concurrent validity, we correlated the WFIRS Total score and the WFIRS School subscale with self-reported college GPA. For the self-report version of the WFIRS, both of the correlations were statistically significant (ps < .001). The effect size was small-to-medium for the Total score ($r = -.21$) and moderate for the School subscale ($r = -.33$). For the WFIRS-CR, both of the correlations were also significant, with effect sizes that were close

Table 2. Correlations Between Self-Reported Impairment (WFIRS) and Self-Reported Symptomatology (CSS and DASS).

WFIRS	CSS		DASS		
	Inattention	Hyperactivity	Stress	Anxiety	Depression
	Pearson r	Pearson r	Pearson r	Pearson r	Pearson r
Family	.50[b]	.48[b]	.56[a]	.57[a]	.54[a]
Work	.49[a]	.44[b]	.45[ab]	.42[b]	.43[b]
School	.69[a]	.56[b]	.55[bc]	.52[c]	.56[b]
Life skills	.64[b]	.59[c]	.68[a]	.62[bc]	.65[b]
Self-concept	.51[d]	.45[e]	.67[b]	.60[c]	.76[a]
Social	.53[c]	.51[c]	.63[a]	.59[b]	.64[a]
Risk	.50[a]	.48[ab]	.51[a]	.47[b]	.45[b]
Total	.71[b]	.65[d]	.74[a]	.68[c]	.73[ab]

Note. Across each WFIRS domain, correlations that do not share a common superscript are statistically significantly different (p < .05) according to Steiger's (1980) formula. Ns for CSS correlations ranged from 2,049 to 2,054. Ns for DASS correlations ranged from 2,056 to 2,061. WFIRS = Weiss Functional Impairment Rating Scale; CSS = Current Symptom Scale; DASS = Depression Anxiety Stress Scale–21. All correlations are significant at p < .001 (two-tailed).

Table 3. Correlations Between Collateral-Reported Impairment (WFIRS-CR) and Collateral-Reported Symptomatology (CSS and DASS).

WFIRS-CR	CSS		DASS		
	Inattention	Hyperactivity	Stress	Anxiety	Depression
	Pearson r	Pearson r	Pearson r	Pearson r	Pearson r
Family	.57[b]	.53[b]	.68[a]	.63[ab]	.63[ab]
Work	.55[a]	.46[a]	.54[a]	.55[a]	.53[a]
School	.74[a]	.49[c]	.59[bc]	.49[c]	.61[b]
Life skills	.65[a]	.57[ab]	.65[a]	.55[b]	.64[ab]
Self-concept	.46[c]	.33[c]	.62[b]	.69[ab]	.75[a]
Social	.64[ab]	.59[b]	.73[a]	.56[b]	.62[b]
Risk	.52[a]	.50[a]	.57[a]	.47[a]	.56[a]
Total	.73[ab]	.62[c]	.76[a]	.67[bc]	.75[a]

Note. With each WFIRS domain, correlations that do not share a common superscript are statistically significantly different (p < .05) according to Steiger's (1980) formula. Ns for BCSS correlations ranged from 220 to 224. Ns for DASS correlations ranged from 225 to 227. WFIRS-CR = Weiss Functional Impairment Rating Scale–Collateral Report; CSS = Current Symptom Scale; DASS = Depression Anxiety Stress Scale–21. All correlations were significant at p < .001 (two-tailed).

in comparison with self-reports (Total score $r = -.19$, $p = .006$, School subscale $r = -.28$, $p < .001$).

Predictive Validity

To examine the predictive validity of the WFIRS as a specific measure of ADHD-related impairment, we correlated each WFIRS subscale with the BCSS reports of inattention and hyperactivity. In Table 2, the correlations among the self-reported inattention, hyperactivity, and impairment are shown. All of the correlations were highly significant (ps < .001), and their effects sizes were generally large. The correlation between inattention and the WFIRS total score was .71, and the correlations between inattention and the WFIRS subscale scores ranged from .49 (Work subscale) to .69 (School subscale). The correlation between hyperactivity and the WFIRS total score was .65, and the correlations between hyperactivity and the WFIRS subscale scores ranged from .44 (Work subscale) to .59 (Life Skills subscale).

In Table 3, the correlations among collateral-reported inattention, hyperactivity, and impairment are shown. Again, all of the correlations were highly significant (ps < .001), and the effect sizes were also medium to large. The correlation between inattention and the WFIRS-CR total score was .73, and the correlations between inattention and the WFIRS-CR subscale scores ranged from .46 (Self-Concept subscale) to .74 (School subscale). The correlation between hyperactivity and the WFIRS-CR total score was .62, and the correlations between hyperactivity and the WFIRS-CR subscale scores ranged from .33 (Self-Concept subscale) to .59 (Social subscale).

Diagnostic validity. A series of independent-samples t tests were conducted to examine reported differences in the

mean level of impairment across ADHD and non-ADHD groups (see Table 4). Not surprisingly, as indicated by Cohen's d values, large disparities were seen across all subscales and the Total WFIRS scores. The most substantial effect sizes across the two groups were for the School ($d = 1.52$) and Life Skills ($d = 1.45$) subscales and for the Total reported level of impairment ($d = 1.67$). On average, those in the ADHD group reported significant impairment in close to four life domains, whereas those in the non-ADHD group reported impairment in approximately one. In addition, the percentage of participants in the ADHD group who reported significant impairment was higher compared with the non-ADHD group for all subscales and the Total score. For both groups, participants reported being impaired most often in the domains of School, Life Skills, and Risk. Predictably, the ADHD group evidenced higher levels of impairment across more domains compared with the non-ADHD group.

Discriminant Validity

To examine discriminant validity of the WFIRS as a measure of ADHD-related impairment, we correlated each WFIRS subscale with the DASS reports of stress, anxiety, and depression and compared these correlations with those from the BCSS reports of inattention and hyperactivity. We were interested in determining whether correlations between impairment and one domain of symptomatology (e.g., school impairment and inattention) were significantly stronger than correlations between impairment and another domain of symptomatology (e.g., school impairment and depression). Therefore, we used Steiger's (1980)

Table 4. Differences Between *DSM-5* ADHD and Non-ADHD Groups on WFIRS Self-Report Subscales.

WFIRS subscales	ADHD group (n = 346)		Non-ADHD group (n = 1,641)		t	Cohen's d
	M (SD)	Impaired%	M (SD)	Impaired%		
Family (8 items)	0.75 (0.64)	38.4	0.29 (0.37)	8.6	12.87	1.10
Work (11 items)	0.48 (0.56)	28.9	0.14 (0.27)	4.2	11.25	1.06
School (11 items)	1.07 (0.67)	66.5	0.38 (0.41)	19.0	18.25	1.52
Life skills (12 items)	1.18 (0.67)	77.5	0.48 (0.44)	30.3	18.70	1.45
Self-concept (5 items)	1.57 (0.93)	59.2	0.80 (0.74)	22.5	14.44	1.00
Social (9 items)	0.75 (0.63)	40.8	0.26 (0.35)	8.8	14.03	1.22
Risk (14 items)	0.72 (0.56)	56.1	0.32 (0.33)	22.1	12.95	1.08
Total (70 items)	0.88 (0.49)	79.2	0.35 (0.28)	30.4	19.49	1.67
		3.67 (2.12) domains		1.16 (1.51) domains		

Note. Degrees of freedom ranged from 1,950 to 1,955. Impairment on WFIRS subscales is indicated by two items scored as *often/much* or one scored as *very often/very much* per subscale (as per suggestion of Weiss, 2000; impairment on Total WFIRS is indicated by two or more subscale domains on the WFIRS indicating impairment (per *DSM-5* standard, APA, 2013), and *M* (*SD*) number of impaired domains is also reported. *DSM-5* = Diagnostic and Statistical Manual of Mental Disorders (5th ed.); WFIRS = Weiss Functional Impairment Rating Scale. All *t* tests were *p* < .001.

formula for comparing dependent correlations. The results are shown in Tables 2 and 3 using superscripts.

In Table 2, the correlations among self-reported symptomatology (i.e., inattention, hyperactivity, stress, anxiety, and depression) and self-reported impairment are shown. School and work impairment were most strongly related to inattention. Life skills and social impairment were most strongly related to stress. Self-concept impairment was most strongly related to depression. Family and risk-related impairment were equally strongly related to stress and depression. Thus, the School and Work Impairment subscales showed some discriminant validity as measures of ADHD-related impairment but the other subscales did not.

In Table 3, the correlations among collateral-reported symptomatology (i.e., inattention, hyperactivity, stress, anxiety, and depression) and collateral-reported impairment are shown. The findings were similar to those based on self-report. Again, school and work impairment were most strongly related to inattention. Also similar to self-report, social impairment was most strongly related to stress; however, life skills impairment was equally strongly related to stress and inattention rather than just stress. Similar to the self-report findings, self-concept impairment was most strongly related to depression. Finally, as with self-report, risk-related impairment was equally strongly related to stress and depression; however, family impairment was most strongly related to stress alone rather than stress and depression. Again, the School and Work Impairment subscales showed some discriminant validity as measures of ADHD-related impairment but the other subscales did not.

We also ran multiple regression analyses with all five domains of current symptomatology (i.e., inattention, hyperactivity-impulsivity, depression, anxiety, and stress) predicting each individual WFIRS subscale (i.e., Family, Work, School, Life, Self, Social, and Risk) and total score.[3] For self-report (*n* = 2,043-2,048), we used a relatively conservative alpha value (*p*) of .01 as the cutoff for statistical significance; every one of the symptom domains was found to independently predict the overall WFIRS scale score at this level. Inattention and depression were unique predictors for all seven WFIRS subscales. Next, anxiety and stress were unique predictors for five of seven subscales, each (i.e., all but Self-Concept and Work, Work and School, respectively). Hyperactivity was a unique predictor for only Family, Life, Social, and Risk subscales. Using information from collateral-reports (*n* = 212-214), with *p* < .05[4] as the cutoff for significance, we found that depression and inattention were unique predictors for six of seven subscales, each (i.e., all but Work, Self, respectively). Next, stress also emerged as a unique predictor for five of seven subscales (i.e., all but Work and School). These three independent variables were the only ones to independently predict the overall WFIRS-CR score. Hyperactivity and anxiety were unique predictors for just two subscales (i.e., School and Self-Concept, Family and Work, respectively). Further detail regarding these analyses is available in Table 5.

Discussion

With few validated and multi-purpose assessment tools that are specifically designed to tap multiple domains of impairment related to ADHD in adulthood available in the published literature, we sought in the current study to systematically evaluate the suitability of the WFIRS (Weiss,

Table 5. Summary of Multiple Regression Analyses for Self- and Collateral-Reports of Symptoms (CSS and DASS; Predictors) and WFIRS Subscales (Outcome Variables).

	WFIRS self-report														
	Family		Work		School		Life skills		Self-concept		Social		Risk		Total	
R^2	.390		.293		.536		.581		.604		.493		.329		.711	
	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*
IA	.14	<.001	.28	<.001	.53	<.001	.29	<.001	.12	<.001	.12	<.001	.19	<.001	.33	<.001
HI	.12	<.001	.08	.018	−.002	.924	.08	.001	.005	.819	.12	<.001	.14	<.001	.10	<.001
Depression	.23	<.001	.17	<.001	.24	<.001	.27	<.001	.59	<.001	.36	<.001	.09	.004	.34	<.001
Anxiety	.10	.001	.07	.038	.09	.001	.09	<.001	−.04	.104	.09	.002	.09	.008	.09	<.001
Stress	.15	<.001	.05	.182	−.03	.380	.17	<.001	.17	<.001	.14	<.001	.18	<.001	.15	<.001

	WFIRS collateral-report														
	Family		Work		School		Life Skills		Self-Concept		Social		Risk		Total	
R^2	.553		.416		.623		.549		.612		.592		.396		.740	
	β	*p*	β	*p*	β	*p*	β	*P*	β	*p*	β	*p*	β	*p*	β	*p*
IA	.20	.009	.37	<.001	.69	<.001	.28	<.001	.11	.116	.27	<.001	.14	.125	.37	<.001
HI	−.02	.787	−.04	.642	−.23	.002	.10	.221	−.25	.001	−.01	.855	.12	.197	−.04	.468
Depression	.18	.037	.08	.399	.23	.003	.28	.001	.29	<.001	.22	.006	.32	.001	.32	<.001
Anxiety	.19	.034	.28	.006	.006	.944	.001	.990	.14	.080	−.07	.411	−.10	.330	.06	.385
Stress	.31	<.001	.07	.488	.15	.061	.21	.016	.50	<.001	.45	<.001	.25	.015	.29	<.001

Note. Anxiety, Depression, and Stress are subscales of the DASS Scale (Henry & Crawford, 2005). CSS = Current Symptom Scale; DASS = Depression Anxiety Stress Scale–21; WFIRS = Weiss Functional Impairment Rating Scale; IA = ADHD inattentive scale score, CSS (Barkley & Murphy, 2006); HI = ADHD hyperactive-impulsive BCSS scale score.

2000) for such purposes. Data from self- and collateral-reports were considered, with the majority of the latter stemming from peers. Overall, across informants, the internal consistency of the WFIRS and its domain scales was shown to be robust, suggesting that they are measuring cohesive constructs. In addition, simple examination of the item content supports face validity, in that the life domains that are targeted are well established as problematic in the ADHD population (e.g., school, work, family/social relations, risk-taking). Examination of the concordance between self- and collateral-informants also suggests that there is acceptable agreement regarding an individual's degree of life impairment across these domains, generally on par with that seen between parents and teachers on another questionnaire measure related to ADHD impairment in adolescents (*r* = .32; IRS, Fabiano et al., 2006) and substantially superior to that achieved between parents and their adolescent offspring (*r* = .08; Sibley, Pelham, Molina, Gnagy, Waschbusch, et al., 2012). Furthermore, when we compared reports by emerging adults themselves with those of their collateral informants across the WFIRS and another established measure of ADHD impairment in adults (CSS; Barkley & Murphy, 2006), we found very good agreement, and higher scores on the WFIRS total and school domain

scales were associated with lower current GPA in this college student sample, bolstering the case that the WFIRS offers a concurrently valid option for the assessment of ADHD-related impairment in emerging adults.

Subsequent analyses aimed to further substantiate suitability of the WFIRS as an impairment measure and also to test the degree of its specificity to ADHD-related impairment. Across informants, scores on the WFIRS and its subscales were highly correlated with both hyperactive-impulsive and inattentive symptoms (as captured by the CSS). It is perhaps somewhat unsurprising, then, that there was a clear differentiation between the group identified as ADHD-positive and their non-affected peers, with the former uniformly scoring much higher on total and all domain-specific WFIRS scales. What makes this finding all the more salient is that prior research suggests that young adults with ADHD tend to underreport their symptomatology, whereas those without ADHD over-endorse (Sibley, Pelham, Molina, Gnagy, Waxmonsky, et al., 2012); as such, clear distinction between those with and without ADHD on an impairment measure is much desired, and realized here.

Generally speaking, these findings support the reliability and validity of the WFIRS and that it could productively find a place in the measurement toolbox of clinicians and

researchers alike, working with emerging adult clients (or participants) with ADHD. Despite this positive note, the reader must be clear in his or her understanding that the WFIRS is *not* uniquely diagnostic of ADHD. The data, yielded by analyses focused on discriminant validity, indicated that the WFIRS as a whole, and in its domain areas, relates substantially to internalizing symptoms (i.e., depression, anxiety, stress) in addition to those of ADHD. In fact, in this sample of emerging adult college students, internalizing symptoms seem to be equally relevant to WFIRS impairment, in sum and across most domains, as ADHD-related inattention, and generally better predictors than hyperactivity-impulsivity. An exception to this trend may exist in school-related impairment, where inattention, across informants, was most strongly correlated; this falls in line with prior research indicating that inattention represents a potentially greater liability to adults with ADHD in school and in life in general (Barkley, Murphy, & Fischer, 2008; Weyandt & DuPaul, 2008), at least in comparison with hyperactivity. Hyperactivity, in fact, has been shown to typically be fading and less germane to the diagnosis of ADHD in affected individuals even by adolescence (Sibley, Pelham, Molina, Gnagy, Waschbusch, et al., 2012), and its relatively weak prediction of impairment, when controlling for inattention and internalizing problems, is therefore not shocking here.

There may be several rationales for why one should not interpret this apparent relative lack of ADHD-specificity in the WFIRS's assessment of impairment as a weakness of the instrument, per se. First, and most notably, there is no indication in the literature that anxiety, depression, or ADHD—diverging symptoms notwithstanding—necessarily impair individuals in different ways. In fact, all of these disorders have been shown to be *generally impairing* across adult domains: social, work, school, and daily living. Second, ADHD is often comorbid with internalizing conditions (Barkley et al., 2008), such that in clinical ADHD cases and related empirically supported therapies, there is a focus on ameliorating cognitive and behavioral patterns such as negative and pessimistic thinking (e.g., Safren, Perlman, et al., 2005; Solanto et al., 2011). Clients with ADHD, in fact, have been noted to be especially appreciative of therapy techniques that reduce stress and anxiety (Eddy, Canu, Broman-Fulks, & Michael, 2015). All in all, ADHD and internalizing symptoms are often intertwined in affected children and adults, and, as such, clinically, when working with or studying the ADHD population, it is important to capture impairment related to all present symptoms. In assessment, this helps the clinician and the researcher, alike, to get an accurate picture of current distress to discern clinical from "normal" conditions and to triage cases, when necessary. Furthermore, as successful treatment, life experiences, or simple time may change either externalizing or internalizing problems (or both), later follow-up should

capture changes in impairment that relate across symptomatology. In sum, the evidence herein suggests that the WFIRS measures adult life impairment related to psychopathology, broadly speaking. As such, it might find broader use than in the relatively narrow ADHD assessment domain. However, within this narrower area, the data presented herein suggest that the school scale of the WFIRS may be most telling as an indicator for ADHD in college students, as it was more strongly related to inattention, across informants, as compared with the other four symptom areas.

While not strictly the focus of the current investigation, some comment on the trends in the data with regard to the large observed differences in impairment between those emerging adults in the ADHD and non-ADHD groups is merited here. As noted previously, these clearly fit with the overall literature suggesting that even those who fare well enough in school (and life in general) to be admitted to 4-year university programs, as was the case in our ADHD group herein, experience far more impairment during their college years than their non-diagnosed peers (Norwalk, Norvilitis, & MacLean, 2009). According to these data, as a group, those with ADHD are not spared such impairment in *any* domain of life. The largest divergences occur in the school and life skills domains, again agreeing with prior findings (e.g., Barkley, Murphy, & Fischer, 2008; Frazier, Youngstrom, Glutting, & Watkins, 2007; Kuriyan et al., 2013), suggesting the possibility that the scaffolding that many successful high school students with ADHD receive in their studies and home life may have the unintended consequence of delaying acquisition of self-management skills that are necessary for independence and success in college. It also may be that college itself, with its mix of higher level academic demands, sudden freedom, and markedly broader responsibilities, represents a unique challenge even to these otherwise successful ADHD probands. It is also interesting to note that the highest *raw* impairment in both groups was in self-concept. To a degree, this fits with the typical developmental challenges of the late adolescent and emerging adult periods, which in particular are marked by struggles with self-identity and pressure to establish independence in the "grown-up" world (Arnett, 2004), yet the large difference noted between ADHD and non-ADHD also reflects the state of the literature that suggests those with ADHD—even those in the "high-functioning" college student population—characteristically have a more negative self-view than other peers (Canu & Carlson, 2007; Dan & Raz, 2015; Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005).

Limitations and Future Directions

While we believe that the data speak clearly herein toward the WFIRS's suitability for the assessment of impairment related to ADHD in adulthood, certain limitations of the current study should be noted. First, the sample that we

have utilized here is limited to college students, and also to those in emerging adulthood. Our data, therefore, cannot speak directly to the use of the WFIRS in mature adults, and reported findings and conclusions should be interpreted with some caution for non-student emerging adults. In a similar vein, the sample is mainly European American and majority female, and further investigation in more diverse samples is a clear future direction. Still, our findings do provide support for use of the WFIRS in college settings beyond strictly ADHD clientele, given its apparently robust associations to both internalizing and externalizing symptoms. This might also reflect the reality of ADHD as it is experienced by many who are affected, as comorbidity with depression and anxiety disorders is common (Kessler et al., 2006). However, despite the fact that clinical cases may more often than not present with ADHD and comorbidity, we did not select or control for this; therefore, it is difficult in interpreting ADHD versus non-ADHD group WFIRS differences to know whether they are due to ADHD symptomatology, internalizing problems, or both.

We also observed a limitation of the Work subscale in the current sample. Specifically, no participant in the current study chose the *not applicable* option for these items. Yet, approximately 40% of college students work either full- or part-time while attending college (National Center for Education Statistics, 2013). When participants did not mark *not applicable* and instead marked *never or not at all*, by force we interpreted this as participants indicating experiencing no impairment at work; however, given the national statistic regarding college student employment, it is probable that a minority in this sample erroneously marked the latter on Work items. While it is unclear what the overall effect of this had on the data presented (e.g., rate of impairment in work should not be higher, but the *non*-impairment of some is due to voluntary unemployment, not success on the job), it is clear that this pattern should be taken into consideration in interpreting the results regarding this scale. Future iterations of the WFIRS might productively include special instruction with the work scale, particularly when used with emerging adults, which clarify that *not applicable* is the correct choice if the person has not recently or ever been employed.

Other future directions include those that potentially extend and support the utility of the WFIRS beyond simple generalization to broader populations. For instance, we classified "impairment" for the purposes of this article as Weiss (2000) described in the instrument instructions. However, there is no published data that specifically support the suggested clinical cutoffs. Future study of these cutoffs using well-defined clinical samples is indicated. In addition, while collateral-report data for a subsample were considered in our evaluation of the WFIRS, the bulk of the current findings rely on self-reported data collected via web-based survey, which do not provide the same reassurance regarding response

validity as face-to-face clinical assessment. As such, future studies of or utilizing the WFIRS would benefit from examining its utility and psychometric properties when administered in person in clinical settings, perhaps even in an adapted interview form. Furthermore, fine-tuned analysis of which WFIRS impairment items are most telling for college students and other adults diagnosed with ADHD might help clinicians and researchers to focus more specifically in both treatment and assessment. Relatedly, the WFIRS form states that it has "excellent sensitivity to change" (Weiss, 2000, p. 1), and many elements at the surface seem like they may excel at detecting short-term improvements, such as might be expected with psychosocial or pharmacological treatment. The School, Work, and Life Skills items seem worded particularly well to this end (e.g., *problems completing assignments, problems with being late, problems keeping up with household chores*), whereas other scales (e.g., Social, *problems keeping friends*; Self-Concept, *feeling frustrated with yourself*) might reasonably be expected to change only upon long-term follow-up, if ever. As noted by Surman, Hammerness, Pion, and Faraone (2013), adaptive impairment is rarely evaluated in clinical intervention trials in as detailed a fashion as the WFIRS allows. The specific evaluation of the WFIRS as a measure of treatment efficacy in such research is indicated, and could help to better establish its utility therein. Finally, prospective study of impairment as indicated by the WFIRS and its relation to college retention and graduation, success in work endeavors, and other domains of life functioning is also warranted.

Conclusion

The findings of the current study support the use of the WFIRS as a measure of impairment related to ADHD in emerging adults, most specifically college students. The instrument demonstrated excellent internal reliability across self- and collateral-reports, and examination of these diverging perspectives also indicated good interrater reliability. Concurrent validity was supported by robust associations with both a published measure of ADHD impairment (Barkley & Murphy, 2006) and the real-life measure of college GPA. ADHD and non-ADHD groups of adequate size were well differentiated on the WFIRS, as indicated by large differences in total score and on each of the WFIRS domain scales. While the WFIRS did not demonstrate clear divergent validity in analyses examining its relation to internalizing symptoms (i.e., there were robust associations with depression, anxiety, and stress, in addition to ADHD), this may not be expected given the general nature of life impairment as related to psychopathology, and will not in itself pose grave issues in clinical assessment, where comorbidity is more a rule than an exception. In sum, we highly recommend that clinicians and researchers alike adopt the WFIRS as an assessment tool for adult clients. Besides its psychometric

soundness, the instrument is more detailed than alternatives, offering several life domain scales with several impairment items each that can readily assist in treatment planning and enrich data achieved in research.

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Notes

1. Caution is merited in relation to the assessment of clients from ethnic and cultural minority groups, wherein even estimates of cognitive ability and impairment have been shown to be imperfect (Sattler, 2008).
2. Sadek (2014) indicated in his clinician's guide that the Weiss Functional Impairment Rating Scale (WFIRS) has been shown to have moderate convergent and discriminating validity, and that a total score change of 13 on the instrument can be considered a threshold for significant clinical improvement. However, there is no reference cited, and, given personal communication with the WFIRS author (see above), there is no way to infer sample characteristics and generalizability. One must conclude that Sadek's statistics are derived from unpublished data.
3. Tolerance and variance inflation factor (VIF) collinearity diagnostics were evaluated for each multiple regression analysis using established criteria (Hair, Anderson, Tatham, & Black, 1995) and were well within recommended boundaries (i.e., VIF < 10, tolerance > .1).
4. This traditional standard for statistical significance was employed here, as opposed to the more stringent alpha of .01 with self-report, to conserve analytic power with the diminished *n* of collateral data.

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