Changes in College Student Endorsement of ADHD Symptoms across *DSM* Edition

Elizabeth K. Lefler[1] · Anne E. Stevens[2] · Anna M. Garner[1] · Judah W. Serrano[2] · Will H. Canu[3] · Cynthia M. Hartung[2]

Abstract

Changes were made in *DSM-5* to address the criticism that ADHD symptoms in *DSM-IV* were not developmentally appropriate for adults. Specifically, parenthetical examples were added to symptoms, and the symptom threshold was lowered. ADHD diagnosis in college students in particular is a growing concern. It was hypothesized that changes to the ADHD symptoms across *DSM* editions would result in higher symptom endorsement rates in this group. To this end, 3877 college students rated their own ADHD symptoms using *DSM-IV* and *DSM-5* symptom wording. College students with a past diagnosis of ADHD ($n = 435$) endorsed slightly more symptoms with the updated *DSM-5* wording (an additional 0.41 ADHD symptoms). In addition, 5.2% more college students met the new, lowered *DSM-5* symptom threshold as compared to the older *DSM-IV* threshold. Changes to *DSM-5* Criterion A for ADHD increase symptom endorsement and the number of college students eligible for a diagnosis.

Keywords ADHD · College students · *DSM-IV* · *DSM-5* · Criteria · Symptoms

Attention-deficit/hyperactivity disorder (ADHD) is recognized in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (*DSM-5*; American Psychiatric Association [APA] 2013) as a neurodevelopmental disorder distinguished by a persistent pattern of inattention, hyperactivity/impulsivity, or both. One criticism of its predecessor, the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*; APA 1994), was that the diagnostic symptoms for ADHD may not have been developmentally appropriate for older adolescents or adults (e.g., runs and climbs excessively; Bell 2011; Fedele et al. 2010; McGough and Barkley 2004). In fact, it has been understood for some time that the symptoms of ADHD included in the *DSM-IV* were developed with and for school-aged boys (Barkley et al. 2008; Lahey et al. 1994). However, ADHD is now known to be a lifelong disorder that impacts all sexes and

genders (APA 2013; Barkley et al. 2008). Indeed, approximately half of individuals diagnosed with ADHD in childhood continue to meet criteria in adulthood (Wilens et al. 2002), up to two-thirds do not meet full diagnostic criteria but have significant ADHD-related impairment (Faraone et al. 2006), and still others are late-identified (i.e., receive their initial diagnosis in adulthood). The ADHD and Disruptive Behaviors Disorders Workgroup for *DSM-5* set out to make changes to the criteria and symptoms of ADHD, in part to reflect the understanding of ADHD as a disorder that affects adults (Coghill and Seth 2011).

In terms of diagnostic utility in older adolescents and adults, the *DSM-IV* ADHD symptoms were criticized for not capturing the heterogeneity and fluidity of the disorder across the lifespan, potentially making diagnostic assessment in this group difficult (Coghill and Seth 2011; Sibley and Kuriyan 2016; Sibley and Yeguez 2018). More specifically, the *DSM-IV* ADHD symptoms did not include information on how the disorder affects adults, relied on symptom clusters derived from studies of children, and did not include behavioral characteristics specific to adults (Bell 2011). Thus, the *DSM-5* symptoms were changed slightly to address some of the perceived limitations of the *DSM-IV* (Epstein and Loren 2013; Sibley and Kuriyan 2016).

It is important to study even slight changes to *DSM* criteria because of the impact these changes may have. Other disorders in the *DSM* have undergone empirical scrutiny when their

✉ Elizabeth K. Lefler
  elizabeth.lefler@uni.edu

1 Department of Psychology, University of Northern Iowa, 1078 Bartlett Hall, Cedar Falls, IA 50614-0505, USA

2 Department of Psychology, University of Wyoming, Laramie, WY, USA

3 Department of Psychology, Appalachian State University, Boone, N.C., USA

symptoms or categories or diagnostic thresholds changed between *DSM-IV* and *DSM-5*. For instance, Flament et al. (2015) noted that the prevalence of 'full threshold' eating disorders more than doubled with the changes that took place between *DSM-IV* and − 5 (which included the addition of binge eating disorder). Conversely, when post-traumatic stress disorder (PTSD) was similarly studied, Kilpatrick et al. (2013) found that prevalence rates decreased from *DSM-IV* to −5, and Claassen-van Dessle et al. (2016) reported that the *DSM-5* threshold was twice as difficult to meet as the *DSM-IV* threshold for somatoform/somatic symptom disorder. Given the wide fluctuations caused by changes to the *DSM* criteria, it follows to carefully study these changes. In fact, when Matte et al. (2015) studied the *DSM* changes to ADHD in a sample of 18- and 19-year-olds, they found a 27% increase in prevalence with the introduction of the *DSM-5* changes.

Changes to ADHD Criterion A in *DSM-5*

For the purposes of the current study, the changes to Criterion A are central. Criterion A, which includes the 18 individual ADHD symptoms and the symptom threshold, was changed a) to include parenthetical examples for a majority of the symptoms to better reflect the disorder in adolescents and adults, and b) to require the presence of only 5 symptoms (instead of 6) in either the inattention or hyperactivity/impulsivity domains for those 17 years and older (APA 2013; Epstein and Loren 2013). Notably, the core meaning of the 18 symptoms (and two symptom domains; inattention and hyperactivity/impulsivity) was retained, but the parenthetical behavioral examples of 14 of the symptoms were modified or added. As three examples, the parenthetical example "paying bills" was added to the core symptom "is often forgetful in daily activities;" the example "reviewing lengthy papers" was added to the core symptom "often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort;" and the example "cannot wait for turn in conversation" was added to the core symptom "often blurts out an answer before a question has been completed" in an attempt to make the symptoms more appropriate for older adolescents and adults (APA 2013, p. 59–60). It should be noted that some researchers have suggested a change to the core symptoms themselves, not just the parenthetical examples, and have proposed entirely new symptoms for adults (Barkley et al. 2008; Fedele et al. 2010). For example, some new symptoms specific to adult behaviors that have been suggested include "procrastinate or put off doing things until the last minute" and "have difficulties managing my money or credit cards" (Barkley et al. 2008, p. 195–199). These symptoms could have been added as core ADHD symptoms in the *DSM* for adults; however, *DSM-5* ADHD Criterion A was amended in a decidedly more conservative way.

Sibley and Kuriyan (2016) examined the impact of the changes to *DSM* symptom wording in a sample of 78 6th and 9th grade children (71% male; 66% Hispanic; all with combined or predominantly hyperactive/impulsive presentations). These 11- to 15-year-old children and adolescents underwent thorough diagnostic assessments for ADHD (i.e., structured clinical interviews, parent and teacher ratings of symptoms and impairment). The dependent variables were parent ratings on both *DSM-IV* and *DSM-5* iterations of the 18 ADHD symptoms. Parent ratings of ADHD increased by an average of 1.15 symptoms (across all 18 symptoms) when moving from the *DSM-IV* wording to the *DSM-5* wording, and this change was most pronounced for the inattention symptoms (Sibley and Kuriyan 2016). Thus, the parenthetical wording changes led to increased symptom endorsement by parents in a group of 11- to 15-year-olds. Sibley and Yeguez (2018) extended this research with a group of 10- to 16-year-old children and adolescents (70% male and 77% Hispanic) who also had well characterized ADHD. The results from this 2018 study showed a 0.57 symptom endorsement increase in parent ratings of inattention when moving from *DSM-IV* wording to *DSM-5* wording, but no statistically significant increase impulsivity (Sibley and Yeguez 2018).

For individuals 17 years of age and older, there is also a need to consider the symptom threshold change in Criterion A in addition to the parenthetical wording changes. That is, it is important to fully understand the implications of changing the diagnostic threshold from 6 symptoms to 5 symptoms for those 17 years and older. These concurrent changes (i.e., changes to both the wording of the symptoms via parenthetical additions *and* the diagnostic threshold) make it difficult to ascertain the diagnostic impact of either of the changes individually. If *DSM-5* Criterion A turns out to be more appropriate for adults, it could be that the added parenthetical examples for 14 symptoms made the difference, or that the lowered threshold was the catalyst. On the other hand, making both of these changes at once might prove to have been an overcorrection if unnecessary overdiagnosis occurs. The current paper will add to the growing effort to determine the effect of these *DSM* changes for ADHD in adults.

ADHD in Emerging Adulthood

Accurate diagnosis of ADHD in *emerging adulthood* (18–25 years; Arnett 2000) may be of particular importance, given the impairment caused by the disorder and the unique challenges during this stage of life (e.g., increased social independence, increased financial independence, the demands of higher education or a new career). Emerging adulthood is distinguished by continued brain development especially as related to executive functioning, unique environmental contexts (Arnett 2000), and vulnerability to comorbid

psychological disorders (e.g., anxiety, depression) which are common during this developmental period, especially for individuals with a history of ADHD (Meinzer et al. 2013). Emerging adults may be at heightened risk for late-identified ADHD due to the increased executive functioning demands, as well as the set of social, romantic, academic, and occupational impairment that they face (Barkley 2015).

One subset of emerging adults are those who are enrolled in college. These young adults are tasked with executive functioning demands such as attending lectures, writing papers, reading long articles/books, staying organized, and planning ahead; all of these are difficult for people with ADHD (Lefler et al. 2016). While these academic tasks are similar to what might have been experienced in high school, the challenge is amplified because higher education is a period of increased independence, less structured time, and heightened rigor. Thus, developmentally appropriate diagnosis of ADHD during the college years may be of particular importance, given the well-documented academic impairment in this group (Advokat et al. 2011; Barkley et al. 2008; Barkley 2015; Rabiner et al. 2008) and the availability of academic accommodations which may provide some relief (DuPaul et al. 2017). It is true that a majority of children with ADHD do not go on to attend a 4-year university (approximately 70% do not; Kuriyan et al. 2013); but for those who do, there is marked impairment.

Hartung et al. (2019) conducted a study of emerging adult college students to examine the impairment students face when they have elevated ADHD symptoms. They found that there is not a significant difference in impairment across college students who endorse 4, 5, or 6 symptoms of inattention or hyperactivity (via *DSM-IV* wording; Hartung et al. 2019). That is, students endorsing 5 symptoms did not endorse significantly more impairment than students endorsing 4 symptoms, suggesting that the symptom cutoff of 5 might not be particularly valid for differentiating those who may or may not qualify for a diagnosis, especially given the executive function demands of college. In fact, Barkley and others have suggested that a cutoff of 4 symptoms would be optimal for adults (Barkley et al. 2008; Hartung et al. 2019; Vitola et al. 2017). Therefore, because significant impairment may begin at 4 symptoms of ADHD in college students (a technically sub-threshold level), and because the *DSM-5* introduced changes to Criterion A, the current study is designed to take a step toward better understanding the impact of these changes in college-enrolled emerging adult men and women.

Sex Differences in ADHD

Sex differences in emerging adults with ADHD are also important to understand. A meta-analysis of the prevalence of ADHD suggested that the male preponderance observed worldwide in children is not as pronounced in adulthood (Willcutt 2012). Specifically, Willcutt (2012) reported a 2.3 male:1 female ratio in children, but a 1.6 male:1 female ratio in adults. Further, there is some evidence that emerging adult women in college may have higher rates of ADHD symptoms and related impairment than their male counterparts (Fedele et al. 2012). The reasons for this change are not well understood. In addition, there is a growing body of evidence suggesting that the pattern of ADHD comorbidity differs for men and women with the disorder. For example, Anastopoulos et al. (2018) found that emerging adult women with ADHD were more likely than their male counterparts to have a comorbid diagnosis, and particularly depression and anxiety. These sex differences in comorbid diagnoses may impact men and women differentially, and therefore suggest the need for additional study. Finally, it has been suggested that all studies of psychopathology examine issues of sex and gender where possible to avoid the problem of gender-neutral research (Hartung and Lefler 2019; Howard et al. 2017); ADHD is not immune from this problem.

Current Study

In sum, ADHD criterion A was changed in some important ways in the most recent iteration of the *DSM*. These changes need to undergo empirical scrutiny so that researchers and clinicians can better understand the diagnostic implications. This should be done with various samples of individuals with ADHD, including emerging adults enrolled in college who have many ADHD-related impairments. Sibley and Kuriyan (2016) and Sibley and Yeguez (2018) found increased ADHD symptom endorsement from *DSM-IV* to *DSM-5* wording in children and adolescents, Matte et al. (2015) found an increased prevalence from *DSM-IV* to −5 in emerging adults, and Hartung et al. (2019) found some support for a lowered diagnostic threshold given the impairment faced by college students exhibiting sub-threshold ADHD symptoms. We aim to add to this body of work by examining ADHD symptom endorsement via *DSM-IV* and *DSM-5* ratings in a large sample of emerging adult college students.

More specifically, the aim of the current study is to assess how the changes in *DSM-5* ADHD symptom wording may impact symptom endorsement among college student men and women via self-report, and how this in turn may impact potential diagnostic identification given the lowered symptom threshold. Based on the findings of Sibley and Kuriyan (2016) and Sibley and Yeguez (2018), Hypothesis 1 is that emerging adult college students will endorse more symptoms on the *DSM-5* iteration of the ADHD symptoms than the *DSM-IV* iteration of these symptoms. To expand on this, Hypothesis 2 states that the 14 ADHD symptoms which received additional parenthetical examples will be endorsed at higher rates via the

DSM-5 wording than the *DSM-IV* wording, and that this will be most pronounced in the inattention symptoms (i.e., Hypothesis 2 is a symptom-by-symptom analysis). Additionally, because the symptom threshold was lowered from 6 to 5 symptoms from *DSM-IV* to *DSM-5*, Hypothesis 3 is that significantly more college students will meet the *DSM-5* symptom cutoff as compared to the *DSM-IV* symptom cutoff. Next, Hypothesis 4 states that significant impairment will begin at 4 symptoms of ADHD for college students. This hypothesis is based on the findings of Hartung et al. (2019), and will help us understand whether the changes to ADHD Criterion A help accurately identify college students with significant impairment. Finally, biological sex was considered in these analyses as sex differences in adult ADHD have been documented (Fedele et al. 2012), and it is important to consider sex in psychopathology research (Hartung and Lefler 2019).

Method

Participants

Participants were 3877 undergraduate students from four universities in the Rocky Mountain, Midwest, and Mid-Atlantic regions of the United States. These participants were from two waves of a large multi-site college ADHD study. Participants reported their biological sex (64.9% female, 35.0% male, 0.1% intersex), gender identity (64.3% female, 35.0% male, 0.6% non-binary/gender fluid/queer, 0.1% transgender), and age ($M = 19.18$ years; $SD = 1.36$). The sample was 82.5% White, 5.6% Hispanic/Latino, 4.8% Asian/Asian American, 2.6% African American, 2.6% Biracial, 0.6% American Indian or Pacific Islander, and the remaining participants elected not to report. No exclusionary criteria were set, apart from restricting the age range to 18–25 years.

In addition to this full sample, a sub-sample was used for some of the analyses in the current study. Specifically, those who self-reported a lifetime diagnosis of ADHD were included in this sub-sample. This *past ADHD* group was used because in a high-functioning community sample such as this (i.e., college-enrolled emerging adults), psychopathology symptom endorsement in general, as well as ADHD symptom endorsement in particular, is low. This past ADHD group ($n = 435$) included 11.2% of the full sample. The biological sex of the past ADHD sub-sample did not differ from the full sample (63.9% female; $\chi^2 = .557[2, n = 3852], p = .757$). However, as anticipated, the past ADHD sub-sample had significantly higher current ADHD symptoms ($M = 6.94$ symptoms versus $M = 2.15$ symptoms; $t[3850] = 25.76, p < .001$) and significantly higher average impairment ($M = 0.66$ impairment rating versus $M = 0.39$ impairment rating; $t[3848] = 14.92, p < .001$) than the full sample. To be clear, these were retrospective self-reports of a past ADHD diagnosis; the methodology of the current study did not allow for full evidence-based diagnostic assessments. Nevertheless, as can be seen, this group did indeed display elevated current ADHD symptomology and impairment.

Procedures

The study was approved by the Institutional Review Board of record for this multisite study. College student participants were recruited through web-based participant management systems at each of the four universities as part of a larger study (only relevant measures are described herein). Participants earned research participation points for their psychology courses. Students voluntarily agreed to participate; they gave informed consent online, and were then directed to an online survey platform on which they completed a number of questionnaires. They completed the *DSM* symptoms sets in a counterbalanced fashion via this online platform.

Measures

Demographics Form Participants reported their biological sex, gender identity, age, race/ethnicity, and other demographic information.

DSM-IV Symptoms (APA 1994) A self-report checklist was created based on the exact wording of the 18 ADHD symptoms in the *DSM-IV* (APA 1994). Participants rated their current ADHD symptoms using this scale: 0 (*never/rarely*), 1 (*sometimes*), 2 (*often*), or 3 (*very often*). Symptoms were counted as endorsed if the participant indicated that it occurred *often* or *very often* (i.e., symptom count). In the current study, internal consistency reliability was excellent for inattention ($\alpha = .93$) and good for hyperactivity/impulsivity ($\alpha = .88$).

DSM-5 Symptoms (APA 2013) A self-report checklist was created based on the exact wording of the 18 ADHD symptoms in the *DSM-5* (APA 2013), including the added parenthetical clarifications. Participants rated their current ADHD symptoms using this scale: 0 (*never/rarely*), 1 (*sometimes*), 2 (*often*), or 3 (*very often*). Symptoms were counted as endorsed if the participant indicated that it occurred *often* or *very often* (i.e., symptom count). In the current study, internal consistency reliability was excellent for inattention ($\alpha = .93$) and good for hyperactivity/impulsivity ($\alpha = .88$).

Weiss Functional Impairment Rating Scale (Weiss 2000) The Weiss Functional Impairment Rating Scale (WFIRS) is a 70-item self-report measure of impairment in 7 domains of life (i.e., family, work, school, life skills, self-concept, social, and risk). Participants rate whether or not they are experiencing impairment on a 4-point scale ranging from *never or not at all*

(0) to *often or very much* (3). The WFIRS is a good measure of impairment in college students (Canu et al. 2016), with excellent internal consistency reliability in past studies (Hartung et al. 2019). In the current study, internal consistency reliability was also excellent; $\alpha = .96$.

Results

Data Preparation

ADHD symptom counts were used for the current analyses. A symptom was coded as endorsed if the participant marked that it occurred *often* or *very often*, and coded as not endorsed if the participant marked *never* or *sometimes*. Symptom counts were used because the research question in the current study concerns diagnostic thresholds, and thus symptom endorsement is key. Thus, participants could endorse 0 to 9 inattention symptoms, and 0 to 9 hyperactivity/impulsivity symptoms. For the WFIRS, a total mean was calculated. A WFIRS mean could range from 0 (indicating no impairment) to 3 (indicating maximum impairment on every single item). Several effect sizes will be reported herein given the various analyses used: generalized eta squared (hypothesis 1; Bakeman 2005), odds ratios (hypothesis 2), Cramer's *v* (hypothesis 3), and eta squared (hypothesis 4). Effect size magnitude will be reported per Cohen (1988) standards (Lakens 2013). In addition, as mentioned above, some analyses were conducted with the entire sample ($N = 3877$), whereas others were conducted only with a sub-sample of participants who endorsed a past ADHD diagnosis ($n = 435$). The sample used in each analysis is indicated.

Hypothesis Testing

Hypothesis 1 To test the first hypothesis, that ADHD symptom endorsement would increase from *DSM-IV* to *DSM-5*, three within-subjects, repeated-measures ANOVAs were conducted
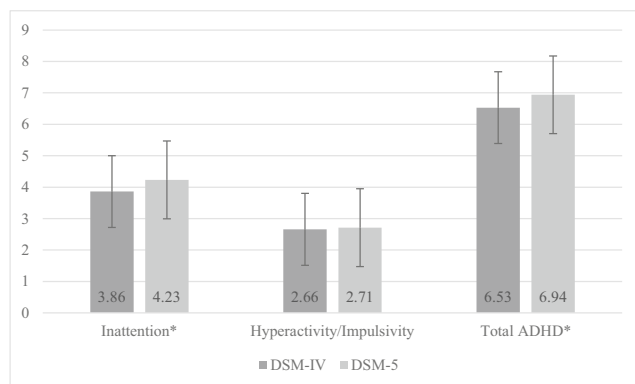

Fig. 1 ADHD symptom endorsement change by DSM edition; past ADHD sub-sample (n = 435) Note. * indicates a significant difference

with only the past ADHD sub-sample ($n = 435$; Fig. 1). The full sample was not used for these analyses because a majority of the full sample reported 0 or 1 total symptoms of ADHD,[1] whereas the past ADHD sample showed more variability in symptom counts. *DSM* edition was used as the repeated measure, and one ANOVA each was conducted for: (a) inattention symptoms only, (b) hyperactivity/impulsivity symptoms only, and (c) total ADHD symptoms (i.e., both inattention and hyperactivity combined). The hypothesis was supported for inattention, such that symptom endorsement increased from $M_{DSM-IV} = 3.86$ to $M_{DSM-5} = 4.23$ ($F(1, 434) = 10.72$, $p = .001$, $\eta_g^2 = .003$ [small]). The hypothesis was not supported impulsivity/impulsivity. Symptom endorsement increased from $M_{DSM-IV} = 2.66$ and $M_{DSM-5} = 2.71$ but this was non-significant ($F(1, 434) = 0.34$, $p = .560$). Finally, the hypothesis was supported for total ADHD symptoms, such that total symptom endorsement increased from $M_{DSM-IV} = 6.53$ to $M_{DSM-5} = 6.94$ ($F(1, 434) = 5.99$, $p = .015$, $\eta_g^2 = .002$ [small]; see Fig. 1).

These analyses were also conducted using Mixed ANOVAs with *DSM* edition as the within-subjects factor and biological sex as the between-subjects factor to test for sex differences. Biological sex was not significant in the Mixed ANOVA, suggesting that the above results with both men and women (i.e., the repeated measures ANOVAs with 435 participants) are the most appropriate analyses to report.

Hypothesis 2 Next, Sibley and Kuriyan (2016) and Sibley and Yeguez (2018) also found differences across individual ADHD symptoms, with odds ratios ranging from 4.67 to 11.00. For the current study, symptom-by-symptom endorsement between *DSM-IV* and *DSM-5* editions were similarly compared, and it was hypothesized that the 14 individual symptoms which received additional parenthetical examples in *DSM-5* would be endorsed at a higher rate via *DSM-5* wording. Using McNemar's chi-square tests, we examined whether participants with a self-reported past diagnosis of ADHD ($n = 435$) endorsed particular symptoms at different rates (i.e., *DSM-IV* Inattention Symptom 1 compared to *DSM-5* Inattention Symptom 1, and so on).

When compared to the *DSM-IV* endorsement rate, five *DSM-5* inattention symptoms were endorsed at significantly higher rates than their *DSM-IV* counterparts. Specifically, *DSM-5* Inattention Symptoms 1 (i.e., often fails to give close attention to details; $p = .005$), 2 (i.e., often has difficulty sustaining attention in tasks or play activities, $p < .001$), 3 (i.e., often does not seem to listen when spoken to directly; $p = .033$), 4 (i.e., often does not follow through on instructions; $p = .045$), and 7 (i.e., often loses things necessary for tasks or activities; $p = .042$) were endorsed significantly more

---

[1] When the full sample ($N = 3877$) was used to test this hypothesis, the results were non-significant.

Table 1 Symptom-by-Symptom Endorsement Rates by DSM Edition in the Past ADHD Sample (*n* = 435)

Inattention Symptoms	DSM-IV (%)	DSM-5 (%)	χ^2	*p* value	OR
1. Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities **(e.g., overlooks or misses details, work is inaccurate).**	40.0	46.4	7.76	.005*	1.46
2. Often has difficulty sustaining attention in tasks of play activities **(e.g., has difficulty remaining focused during lectures, conversations, or lengthy reading).**	50.1	62.3	20.96	< .001*	1.58
3. Often does not seem to listen when spoken to directly **(e.g., mind seems elsewhere, even in the absence of any obvious distraction).**	31.0	35.9	4.49	.033*	1.38
4. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace **(e.g., starts tasks but quickly loses focus and is easily sidetracked).**	32.9	37.6	4.01	.045*	1.36
5. Often has difficulty organizing tasks and activities **(e.g., difficulty managing sequential tasks; difficulty keeping materials and belongings in order; messy, disorganized work; has poor time management; fails to meet deadlines).**	44.0	46.5	1.05	.305	–
6. Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (e.g., schoolwork or homework; **for older adolescents and adults, preparing reports, completing forms, reviewing lengthy papers).**	49.5	48.6	0.09	.769	–
7. Often loses things necessary for tasks or activities (e.g., school materials, pencils, books, tools, **wallets, keys, paperwork, eyeglasses, mobile telephones).**	32.6	37.0	4.10	.042*	1.39
8. Is often easily distracted by extraneous stimuli **(for adolescent and adult, may include unrelated thoughts).**	61.2	63.0	0.53	.466	–
9. Is often forgetful in daily activities **(e.g., doing chores, running errands; for older adolescents and adults, returning calls, paying bills, keeping appointments).**	46.5	46.7	0.00	1.00	–
Hyperactivity/Impulsivity Symptoms	DSM-IV (%)	DSM-5 (%)	χ^2	*p* value	OR
1. Often fidgets with or taps hands or feet or squirms in seat.	61.4	61.6	0.00	1.00	–
2. Often leaves seat in situations when remaining seated is expected (e.g., leaves his or her place in the classroom, **in the office or other workplace**, or in other situations that require remaining in place).	13.2	16.4	3.52	.059	–
3. Often runs about or climbs in situations where it is inappropriate (Note: In adolescents or adults, may be limited to feeling restless).	14.6	17.1	1.69	.193	–
4. Often unable to play or engage in leisure activities quietly.	20.2	17.6	1.64	.200	–
5. Is often "on the go," acting as is "driven by a motor" **(e.g., is unable to be or uncomfortable being still for extended time, as in restaurants, meetings; may be experienced by others as being restless or difficult to keep up with).**	36.0	36.7	0.05	.826	–
6. Often talks excessively.	42.1	40.7	0.36	.550	–
7. Often blurts out an answer before a question has been completed **(e.g., completes people's sentence; cannot wait for turn in conversation).**	24.4	27.7	3.02	.081	–
8. Often has difficultly waiting his or her turn **(e.g., while waiting in line).**	26.0	26.7	0.06	.807	–
9. Often interrupts or intrudes on others (e.g., butts into conversations, games, **or activities; may start using other people's things without asking or receiving permission; for adolescents and adults, may intrude into or take over when others are doing).**	29.8	27.9	0.91	.341	–

Note. OR = odds ratio. * = *p* < .05. **Bold** wording represents the wording additions made between *DSM-IV* and *DSM-5* (APA, 2013, p. 59–60)

often when compared to the comparable *DSM-IV* symptoms; see Table 1 for summary of endorsement rates by *DSM* edition. All 5 of these symptoms are among the 14 total that received new parenthetical examples in *DSM-5*. Odds ratios for these significant differences in inattention symptom endorsement ranged from 1.36 to 1.58 (small). As for individual hyperactivity/impulsivity symptoms, no significant differences emerged from the chi-square comparisons (Table 1).

These McNemar's chi-square tests were also conducted separately for men and women with a self-reported past diagnosis of ADHD. Interestingly, when this was done for men, only one symptom was rated significantly differently from *DSM-IV* to *DSM-5*. Specifically, Inattention Symptom 2 was endorsed more often with the *DSM-5* wording ($p = .027$) for men. On the other hand, when women were analyzed, six individual symptoms were rated significantly more frequently with the *DSM-5* wording: Inattention Symptoms 1, 2, 3, and 4 (respectively, $p = .040$, <001, .027, and .013); as well as Hyperactivity Symptoms 3 (i.e., often runs about or climbs, $p = .024$) and 7 (i.e., often blurts out an answer, $p = .006$). These additional two hyperactivity/impulsivity symptoms are also among the 14 symptoms that received new parenthetical examples in *DSM-5*. Please note that the lack of significance for men might be due to low power (Faul et al. 2007); thus, the results presented in Table 1 are not broken down by sex (tables with analyses by sex available upon request).

Hypothesis 3 To test the third hypothesis, that significantly more college students would meet the *DSM-5* cutoff of 5 symptoms (with the *DSM-5* wording) as compared to the *DSM-IV* cutoff of 6 symptoms (with the *DSM-IV* wording), we first calculated the percent of individuals in the entire sample ($N = 3877$) who met each *DSM* edition threshold, and conducted a Pearson chi square test. This chi square test was conducted for the percent of the entire sample who met *any* ADHD symptom threshold for *DSM-IV* versus −5 (i.e., those who met the threshold for inattention or hyperactivity/impulsivity or both). The percent of the sample who endorsed any ADHD *DSM* symptom threshold increased from 10.5% ($n = 406$; with the *DSM-IV* wording and cutoff of 6) to 15.7% ($n = 607$; with the *DSM-5* wording and cutoff of 5). This

change is statistically significant, $\chi^2 = 1391.47$ (1, $N = 3877$), $p < .001$, *Cramer's v* = .599 (large). It is important to note that not all of these individuals would necessarily go on to meet full diagnostic criteria (i.e., age of onset, duration, impairment); only symptom count was assessed in these chi square tests. Symptom cutoffs are necessary but not sufficient for diagnosis.

In addition to this chi square test, to further analyze the third hypothesis we calculated the percent of individuals in the full sample ($N = 3877$) who would meet the symptom cutoffs of 4, 5, or 6 symptoms with *DSM-IV* and *DSM-5* wording, for any ADHD presentation (Table 2). This helps disentangle the two simultaneous changes made to ADHD Criterion A because each change can be viewed separately.

The data presented in Table 2 were also calculated separately for men and women. The percent of women endorsing ADHD symptoms was uniformly numerically larger than the percent of the full sample, and the percent of men was uniformly numerically smaller than the percent of the full sample. However, chi square tests revealed that none of these differences were statistically significant, suggesting that the data in Table 2 is an accurate depiction of the data across biological sex (tables with analyses by sex available upon request).

Hypothesis 4 Finally, we were interested in determining whether the *DSM-5* wording changes impacted the ability of the symptoms to predict impairment in the entire sample ($N = 3877$). To this end, we compared total impairment mean scores at different levels of symptom endorsement via *DSM-5* wording. As was done by Hartung et al. (2019) with *DSM-IV* symptom wording, we conducted one-way ANOVAs with the two ADHD symptom dimensions (i.e., inattention and hyperactivity/impulsivity) predicting total WFIRS impairment, but as worded in the *DSM-5*. As was done by Hartung et al., we divided the full sample into those with low ADHD endorsement (i.e., 0–2 symptoms), high ADHD endorsement (i.e., 7–9 symptoms), and those with 3, 4, 5, and 6 as separate groups, resulting in 6 symptom endorsement groups. We hypothesized that significant impairment would begin at 4 symptoms for college students.

Table 2 Percent of the Full Sample (N = 3877) Who Meet Various Symptom Thresholds by DSM-IV and − 5 Wording

| Symptom Threshold | DSM-IV ADHD (any presentation) | | DSM-5 ADHD (any presentation) | |
	%	*n*	*%*	*n*
≥ 6	10.5	406	11.5	446
≥ 5	14.5	564	15.7	607
≥ 4	20.1	779	21.2	822

Note. This does not constitute a full diagnosis, as it does take other diagnostic criteria into account (i.e., age of onset, multiple settings, impairment, etc.). Symptoms thresholds are necessary but not sufficient for a diagnosis

Chi square tests comparing all percentages in this table were uniformly statistically significant at $p < .001$

Table 3 WFIRS Impairment Means by DSM-5 Inattention Symptoms (N = 3877)

Number of Symptoms	n	WFIRS Total Impairment	
		M	(SD)
0–2	2952		(.01)
		.31[a]	
3	216		(.02)
		.61[b]	
4	196		(.00)
		.75[c]	
5	125		(.03)
		.78[c]	
6	98		(.03)
		.79[c]	
7–9	284		(.02)
		.94[d]	

Note. WFIRS = Weiss Functional Impairment Rating Scale. WFIRS Impairment responses ranged from 0 to 3. Means without common superscripts are significantly different (p < .05) from one another

The inattention ANOVA was significant, $F(5, 3865) = 346.88$, $p < .001$, $\eta^2 = .310$ (large). The results of the Tukey's post hoc comparisons can be seen in Table 3. As predicted, mean impairment was not significantly different for participants who endorsed 4, 5, or 6 symptoms; however, those who endorsed 3 symptoms demonstrated statistically significantly less impairment than those with higher symptom endorsement.

When this analysis was run separately for men and women, the results were quite similar to the full sample. For men, impairment increased significantly at 4 symptoms, and 4 symptoms elicited statistically the same amount of impairment as any higher level of symptom endorsement. However, 3 symptoms and 6 symptoms were also statistically similar.

Table 4 WFIRS Impairment Means by DSM-5 Hyperactivity/Impulsivity Symptoms (N = 3877)

Number of Symptoms	n	WFIRS Total Impairment	
		M	(SD)
0–2	3230		(.01)
		.35[a]	
3	214		(.02)
		.69[b]	
4	142		(.03)
		.74[b]	
5	108		(.03)
		.75[b,c]	
6	65		(.04)
		.94[c,d]	
7–9	112		(.03)
		.94[d]	

Note. WFIRS = Weiss Functional Impairment Rating Scale. WFIRS Impairment responses ranged from 0 to 3. Means without common superscripts are significantly different (p < .05) from one another

For women, impairment is the same at 3 and 4 symptoms of inattention, and 4 symptoms of inattention elicited statistically the same level of impairment as 5 and 6 symptoms (a table with analyses by sex available upon request).

Likewise, the hyperactivity/impulsivity ANOVA was significant, $F(5, 3865) = 183.15$, $p < .001$, $\eta^2 = .192$ (large). The results of the Tukey's post hoc comparisons can be seen in Table 4. Mean impairment was not significantly different for participants who endorsed 3, 4, or 5 hyperactivity symptoms (see Table 4 for details).

When this analysis was run separately for men and women, the results were quite similar to the full sample. For men, impairment increased significantly at 3 symptoms of hyperactivity, and 3 symptoms elicited statistically similar impairment as 4 and 5 symptoms. For women, impairment increased significantly at 3 symptoms of hyperactivity, and 3 symptoms elicited statistically similar impairment as 4, 5, and 6 symptoms (a table with analyses by sex available upon request).

Discussion

The results of the current study suggest that college students with a self-reported past diagnosis of ADHD endorse slightly more symptoms of ADHD when responding to *DSM-5* symptom wording than *DSM-IV* symptom wording. This was a small but significant increase in overall symptom endorsement (i.e., just under an additional half a symptom), suggesting that the parenthetical examples added for 14 of the 18 ADHD symptoms may have improved the utility of *DSM* ADHD symptoms for this emerging adult population. Further, when the symptoms were examined individually in our past ADHD sample, five inattention symptoms in particular (i.e., inattention symptoms 1, 2, 3, 4, & 7) were endorsed more frequently via *DSM-5* wording than *DSM-IV* wording. Interestingly, when men and women were analyzed separately, women also showed increased endorsement of two hyperactivity/impulsivity symptom (i.e., hyperactivity symptoms 3 & 7). On the whole, these changes are perhaps not as stark as for other *DSM* disorders that underwent wholesale categorical changes (such as the addition of a new category of eating disorder which contributed to a doubling of the overall eating disorder prevalence rate; Flament et al. 2015), but are nonetheless important.

The findings of these first two sets of analyses supported our first two hypotheses and are similar to findings in samples of adolescents with ADHD (i.e., Sibley and Kuriyan 2016; Sibley and Yeguez 2018). The Sibley papers reported larger symptom endorsement increases (i.e., 1.15 symptom increase overall or .57 increase in inattention, versus our .41 overall symptom increase), but also had samples of mainly adolescent boys with higher symptomology. Thus, all participants in these previous samples were adolescents with confirmed

ADHD, whereas our past ADHD sample was only defined by retrospective self-report. In addition, the larger differences found in the adolescent samples (Sibley and Kuriyan 2016; Sibley and Yeguez 2018) were based on parent-report of ADHD symptoms, whereas the current sample was based on self-report only. This difference is notable because variations across reporters has long been documented in the diagnosis of ADHD (Burns et al. 2003), and in particular, some evidence suggests that collateral-reports of adult ADHD symptoms might be more accurate than self-reports (Sibley et al. 2012). Therefore, it is important that the current findings be confirmed (or disconfirmed) with collateral reports in the future.

Moreover, because the current sample was entirely drawn from emerging adults enrolled in college, they might represent a high functioning subset of those with ADHD. Thus, perhaps it makes sense that the current sample of college students did not show as much movement between *DSM-IV* and − *5* as the samples of adolescents (Sibley and Kuriyan 2016; Sibley and Yeguez 2018) because the current sample reported relatively low levels of symptomology (leaving less room for movement between *DSM* versions). However, when examining the added parenthetical examples in *DSM-5*, they certainly *seem* more relevant for emerging adult college students as compared to younger adolescents (e.g., "reviewing lengthy papers," APA 2013, p. 59), suggesting that the *DSM-5* updates should have been more impactful in the current sample than in the Sibley samples. In addition, the adolescent samples were predominantly boys whereas the current sample was primarily women; it is possible that some of the noted differences between the Sibley findings and those herein are due to this differential sex ratio across studies. More research is certainly warranted to understand the implications of the changes to the ADHD symptoms in adults.

Like Sibley and Yeguez (2018), who found an increase for inattention but not hyperactivity across *DSM* editions in parent-ratings of adolescents, and Vitola et al. (2017) who found that adult ADHD is largely comprised of inattention, we similarly found the most change in self-reported inattention symptoms (with the exception of 2 hyperactivity symptoms in women). As for the lack of movement in the hyperactivity/impulsivity symptoms: it could be that even with the added parenthetical statements, the symptoms are simply more appropriate and valid for children. On the other hand, this could be a floor effect, as endorsement rates for the hyperactivity symptoms were quite low regardless of edition (see percentages in Table 1). Thus, the current findings suggest that the added parenthetical statements to the inattention symptoms in *DSM-5* were successful insofar as they slightly increase endorsement by college students.

Next, as hypothesized (i.e., Hypothesis 3), significantly more emerging adult college students met the symptom threshold of 5 symptoms (i.e., the new *DSM-5* cutoff) versus 6 symptoms (i.e., the old *DSM-IV* cutoff). These results did not change significantly when the analyses were conducted separately by biological sex. Overall, 5.2% more college students from our entire sample ($N = 3877$) met the *DSM-5* symptom threshold of 5 with *DSM-5* wording, as compared to the *DSM-IV* symptom threshold of 6 with *DSM-IV* wording (for any ADHD presentation). However, this analysis takes both *DSM-5* ADHD Criterion A changes into account simultaneously: both the added parenthetical wording changes and the symptom threshold changes. It is important to also understand each of these changes in isolation.

To this end, the percentages in Table 2 demonstrate the separate impact of the *DSM-5* Criterion A wording changes versus the threshold change. As can be seen in Table 2, the change to the symptom cutoff (i.e., the change lowering the symptom cutoff from 6 symptoms to 5) was more impactful than the parenthetical wording changes. For instance, the proportion of the full sample who would meet any ADHD threshold increased from 10.5% to 14.5% (a change of 4%) when moving from a 6-symptom threshold to a 5-symptom threshold with constant *DSM-IV* wording. Conversely, when keeping a 6-symptom threshold but changing the parenthetical wording only increases endorsement from 10.5% to 11.5% (a change of 1%). As noted above, when both changes (i.e., symptom threshold and parenthetical wording) are made simultaneously, the proportion increases from 10.5% to 15.7% (a change of 5.2%).

Essentially, the symptom threshold change was much more impactful than the parenthetical wording changes. To be sure, this does not mean that 5% more college students will (or should) be diagnosed; just that this additional proportion of college students are *eligible* for a diagnostic assessment. As stated above, the symptom threshold is necessary but not sufficient for a diagnosis. Of course, an evidence-based, multi-informant, multi-method diagnostic assessment with an emphasis on impairment is the appropriate way to render a diagnosis of ADHD (Ramsay 2015). Nonetheless, the symptom cutoff change from 6 symptoms to 5 across *DSM* editions does increase the number of college students who might be referred for this type of evidence-based assessment.

It is important to reiterate here that the changes to *DSM-5* ADHD Criterion A were conservative. As has been discussed, Criterion A changes from *DSM-IV* to −5 included both additional parenthetical examples and a threshold change for older adolescents and adults (APA 2013). However, Barkley et al. (2008) had suggested a wholesale change to the core symptoms themselves. That is, instead of trying to make the symptom "runs about or climbs in situations where it is inappropriate" relevant for adults as was done for *DSM-5*, Barkley et al. (2008) would have replaced that core symptom with something like "drives at excessive speeds" (p. 193). This broader, more sweeping change remains an option for *DSM-6* ADHD Criterion A. In addition, it is possible that the added parenthetical statements could be improved to be more fitting/

relevant for older adolescents and adults. More research is certainly warranted regarding how to best categorized adult ADHD.

Implications for Diagnosis

There are at least two ways to interpret the concurrent changes that took place in ADHD Criterion A for *DSM-5*. First, it could be suggested that these changes are positive as more college students may be eligible for an ADHD diagnosis. That is, because they are endorsing a total of almost an additional half symptom with the changes to the wording, *and* they now only need to endorse 5 symptoms rather than 6, in essence a person is now approximately 1.5 symptoms "closer" to the diagnostic threshold. This could be considered an improvement, as impairment is quite high in this population even when individuals endorse fewer than the required 5 symptoms of ADHD. Indeed, Hypothesis 4 focused on this issue. We found that impairment significantly increased for college students with 4 symptoms of inattention, and with just 3 symptoms of hyperactivity/impulsivity. This finding suggests that a lowered diagnostic threshold is justified given the increased impairment seen in individuals with even a few ADHD symptoms in the college setting. Notably, the presence of even 3 symptoms of hyperactivity/impulsivity in college students increases impairment significantly, which might suggest that an emerging adult with several symptoms from this domain has a more severe manifestation of ADHD.

Second, on the other hand, it could be argued that the *DSM-5* Criterion A changes to both symptom wording and the diagnostic cutoff at the same time was an overcorrection. That is, because the symptom wording changes increase endorsement by approximately half an ADHD symptom, and the threshold change lowers the necessary number of symptoms from 6 to 5, perhaps the cutoff for older adolescents and adults was lowered too much, and will result in overdiagnosis. Overdiagnosis is certainly considered to be a problem by some (e.g., Paris et al. 2015). However, Sciutto and Eisenberg (2007) note that overdiagnosis becomes a problem only when false positives greatly outnumber false negatives, which they concluded is not the case for ADHD. Indeed, these authors concluded that because of the well-documented under identification of girls with ADHD, there might be an *under-diagnosis* problem in some populations (Sciutto and Eisenberg 2007). It follows, then, that given the similar under identification of ADHD in adults as in girls, overdiagnosis in this population may not be of much concern. Conversely, stimulant misuse on college campuses is a growing concern (Hartung et al. 2013), and could be impacted if more college students are eligible for an ADHD diagnosis.

Our position is that, if used cautiously (such as with evidence-based assessment [Ramsay 2015] and checks on invalid or exaggerated responses [e.g., Bunford et al. 2017]), the

changes to *DSM-5* ADHD Criterion A are positive for emerging adult college students. We base this opinion on the high levels of impairment faced by college students with elevated ADHD symptoms (Barkley 2015; Hartung et al. 2019), and the improvements that can be made when appropriate interventions are in place (DuPaul et al. 2017). That is, the benefit of appropriate identification of college students with elevated ADHD symptoms *and* significant impairment outweighs the potential risk of overdiagnosis, especially because this problem can be limited with good evidence-based diagnostic assessment procedures.

Limitations and Future Directions

The findings of this study should be understood in the context of its limitations. The participants in this study did not undergo a thorough, evidence-based diagnostic assessment. In fact, their overall ADHD endorsement was quite low in the entire sample. Even our past ADHD group was defined only by retrospective self-report of a previous ADHD diagnosis. Thus, this was a community sample of relatively high-functioning emerging adults enrolled in 4-year colleges, and even those with a previous ADHD diagnosis, by virtue of being enrolled in college, were high-functioning. Further, our sample was limited to students enrolled in psychology courses; they were mostly female, mostly white, and mostly from the U.S. Insofar as this is representative of the U.S. college population, results are at least somewhat generalizable therein. However, these results should not be assumed to generalize to other groups. Future researchers should aim to fill in these gaps so that we can better understand the implications of the changes that were made to the ADHD diagnostic nosology. Next, our study was limited to self-report surveys. We attempted to gather collateral reports from our college student sample (i.e., reports from their parents or other significant individuals), but were largely unsuccessful. We continue to strive to collect this corroborating data so we can examine other-report in addition to self-report, as there is some evidence that self-report of ADHD symptoms, even by adults, can be difficult to interpret (Du Rietz et al. 2016). Next, we considered only WFIRS overall impairment for our hypothesis on impairment; it might be that impairment is more specific to certain domains (e.g., school work), or even individual items. Thus, a more specific examination of impairment is warranted.

Overall Conclusion

Our data suggest that the changes made to *DSM-5* ADHD Criterion A will make it slightly "easier" for college-enrolled emerging adults, who experience significant functional impairment, to meet the diagnostic threshold for this disorder. The combination of slight wording changes to 14 of the 18

symptoms (which made a small impact), and the lowering of the symptom cutoff from 6 symptoms to 5 (which made a bigger impact) will increase the number of college students who are eligible for an ADHD diagnosis. Thus, we urge clinicians to use caution and *emphasize impairment and collateral reports* in the diagnostic process to avoid potential over-diagnosis. However, we feel that the benefits of catching more true positive cases of ADHD in college outweighs the risks of overdiagnosis, given the high impairment in this group.

Compliance with Ethical Standards

Ethical Approval   All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent   Informed consent was obtained from all individual participants included in the study.

Conflict of Interest   Elizabeth K. Lefler declares that she has no conflict of interest. Anne E. Stevens declares that she has no conflict of interest. Anna M. Garner declares that she has no conflict of interest. Judah W. Serrano declares that she has no conflict of interest. Will H. Canu declares that he has no conflict of interest. Cynthia M. Hartung declares that she has no conflict of interest.

References

Advokat, C., Lane, S. M., & Luo, C. (2011). College students with and without ADHD: Comparison of self-report of medication usage, study habits, and academic achievement. *Journal of Attention Disorders, 15*, 656–666. https://doi.org/10.1177/1087054710371168.

American Psychiatric Association (APA). (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington DC: Author.

American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington DC: Author.

Anastopoulos, A. D., DuPaul, G. J., Weyandt, L. L., Morrissey-Kane, E., Sommer, J. L., et al. (2018). Rates and patterns of comorbidity among first-year college students with ADHD. *Journal of Clinical Child & Adolescent Psychology, 47*, 236–247. https://doi.org/10.1080/15374416.2015.1105137.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist, 55*, 469–480. https://doi.org/10.1037/0003-066X.55.5.469.

Bakeman, R. (2005). Recommended effect size statistics for repeated measures designs. *Behavior Research Methods, 37*, 379–384.

Barkley, R. A. (2015). *Attention deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York, NY: Guilford.

Barkley, R. A., Murphy, K. R., & Fischer, M. (2008). *ADHD in adults: What the science says*. New York, NY: Guilford.

Bell, A. S. (2011). A critical review of ADHD diagnostic criteria: What to address in the DSM-V. *Journal of Attention Disorders, 15*, 3–10. https://doi.org/10.1177/1087054710365982.

Bunford, N., Wymbs, B. T., Dawson, A. E., & Shorey, R. C. (2017). Childhood maltreatment, emotional Lability, and alcohol problems in young adults at-risk for ADHD: Testing moderation and moderated moderation. *Journal of Psychoactive Drugs, 49*, 316–325. https://doi.org/10.1080/02791072.2017.1325031.

Burns, Walsh, & Gomez. (2003). Convergent and discriminant validity of trait and source effects in ADHD-inattention and hyperactivity/impulsivity measures across a 3-month interval. *Journal of Abnormal Child Psychology, 31*, 529–541.

Canu, W. H., Hartung, C. M., Stevens, A. E., & Lefler, E. K. (2016). Psychometric properties of the Weiss functional impairment rating Scale: Evidence for utility in research, assessment, and treatment of ADHD in emerging adults. *Journal of Attention Disorders*. https://doi.org/10.1177/1087054716661421.

Claassen-van Dessle, N., van der Wouden, J. C., Dekker, J., & van der Horst, H. E. (2016). Clinical values of DSM-IV and DSM-5 criteria for diagnosing the most prevalent somatoform disorders in patients with medically unexplained physical symptoms (MUPS). *Journal of Psychosomatic Research, 82*, 4–10. https://doi.org/10.1016/j.jpsychores.2016.01.004.

Coghill, D., & Seth, S. (2011). Do the diagnostic criteria for ADHD need to change? Comments on the preliminary proposals of the *DSM-5* ADHD and disruptive behavior disorders committee. *European Child and Adolescent Psychiatry, 20*, 75–81. https://doi.org/10.1007/s00787-010-0142-4.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Du Rietz, E., Cheung, C. H. M., McLoughlin, G., Brandeis, D., Banaschewski, T., et al. (2016). Self-report of ADHD shows limited agreement with objective markers of persistence and remittance. *Journal of Psychiatric Research, 82*, 91–99. https://doi.org/10.1016/j.jpsychires.2016.07.020.

DuPaul, G. J., Dahlstrom, H. I., Gormley, M. J., Fu, Q., Pinho, T. D., & Banerjee, M. (2017). College students with ADHD and LD: Effects of support services on academic performance. *Learning Disabilities Research & Practice, 32*, 246–256. https://doi.org/10.1111/ldrp.12143.

Epstein, J. N., & Loren, R. E. A. (2013). Changes in the definition of ADHD in *DSM-5*: Subtle but important. *Neuropsychiatry, 3*, 455–458. https://doi.org/10.2217/npy.13.59.

Faraone, S. V., Biederman, J., & Mick, E. (2006). The age-dependent decline of ADHD: A meta-analysis of follow-up studies. *Psychological Medicine, 36*, 159–165. https://doi.org/10.1017/S003329170500471X.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175–191.

Fedele, D. A., Hartung, C. M., Canu, W. H., & Wilkowski, B. M. (2010). Potential symptoms of ADHD for emerging adults. *Journal of Psychopathology and Behavioral Assessment, 32*, 385–396. https://doi.org/10.1007/s10862-009-9173-x.

Fedele, D. A., Lefler, E. K., Hartung, C. M., & Canu, W. H. (2012). Sex differences in the manifestation of ADHD in emerging adults. *Journal of Attention Disorders, 16*, 109–117. https://doi.org/10.1177/1087054710374596.

Flament, M. F., Bucholz, A., Henderson, K., Obeid, N., Naras, D., et al. (2015). Comparative distribution and validity of DSM-IV and DSM-5 diagnoses of eating disorders in adolescents from the community. *European Eating Disorders Review, 23*, 100–110. https://doi.org/10.1002/erv.2339.

Hartung, C. M., & Lefler, E. K. (2019). Sex and gender in psychopathology: *DSM–5* and beyond. *Psychological Bulletin, 145*, 390–409. https://doi.org/10.1037/bul0000183.

Hartung, C. M., Canu, W. H., Cleveland, C. S., Lefler, E. K., Mignogna, M. J., Fedele, D. A., Correia, C. J., Leffingwell, T. R., & Clapp, J. D. (2013). Stimulant medication use in college students: Comparison of appropriate users, misusers, and nonusers. *Psychology of Addictive Behaviors, 27*, 832–840. https://doi.org/10.1037/a0033822.

Hartung, C. M., Lefler, E. K., Canu, W. H., Stevens, A. E., Jaconis, M., LaCount, P., Shelton, C. R., Leopold, D. R., & Willcutt, E. G.

(2019). *DSM-5* and other symptom thresholds for ADHD: Which is the best predictor of impairment in college students? *Journal of Attention Disorders, 23*, 1637–1646. https://doi.org/10.1177/1087054716629216.

Howard, L. M., Ehrlich, A. M., Gamlen, F., & Oram, S. (2017). Gender-neutral mental health research is sex and gender biased. *The Lancet Psychiatry, 4*, 9–11. https://doi.org/10.1016/S2215-0366(16)30209-7.

Kilpatrick, D. G., Resnick, H. S., Milanak, M. E., Miller, M. W., Keyes, K. M., & Friedman, M. J. (2013). National estimates of exposure to traumatic events and PTSD prevalence using DSM-IV and DSM-5 criteria. *Journal or Traumatic Stress, 26*, 537–547. https://doi.org/10.1002/jts.21848.

Kuriyan, A. B., Pelham, W. E., Molina, B. S. G., Waschbusch, D. A., Gnagy, E. M., et al. (2013). Young adult educational and vocational outcomes of children diagnosed with ADHD. *Journal of Abnormal Child Psychology, 41*, 27–41. https://doi.org/10.1007/s10802-012-9658-z.

Lahey, B. B., Applegate, B., McBurnett, K., Biederman, J., Greenhill, L., et al. (1994). DSM-IV field trials for attention deficit hyperactivity disorder in children and adolescents. *The American Journal of Psychiatry, 151*, 1673–1685. https://doi.org/10.1176/ajp.151.11.1673.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. Frontiers in psychology. Retrieved from https://doi.org/10.3389/fpsyg.2013.00863

Lefler, E. K., Sacchetti, G. M., & Del Carlo, D. I. (2016). ADHD in college: A qualitative analysis. *ADHD Attention Deficit and Hyperactivity Disorders, 8*, 79–93. https://doi.org/10.1007/s12402-016-0190-9.

Matte, B., Anselmi, L., Salum, G. A., & Kieling, C. (2015). ADHD in DSM-5: A field trial in a large, representative sample of 18- to 19-year old adults. *Psychological Medicine, 45*, 361–373. https://doi.org/10.1017/S0033291714001470.

McGough, J. J., & Barkley, R. A. (2004). Diagnostic controversies in adult attention deficit hyperactivity disorder. *American Journal of Psychiatry, 161*, 1948–1956. https://doi.org/10.1176/appi.ajp.161.11.1948.

Meinzer, M. C., Lewinsohn, P. M., Pettit, J. W., Seeley, J. R., Gau, J., Chronis-Tuscano, A., & Waxmonsky, J. G. (2013). Attention deficit/hyperactivity disorder in adolescence predicts onset of major depressive disorder through early adulthood. *Depression and Anxiety, 30*, 543–553. https://doi.org/10.1002/da.22082.

Paris, J., Bhat, V., & Thombs, B. (2015). Is adult ADHD being overdiagnosed? *Canadian Journal of Psychiatry, 60*, 324–328. https://doi.org/10.1177/070674371506000705.

Rabiner, D. L., Anastopoulos, A. D., Costello, J., Hoyle, R. H., & Swartzwelder, H. S. (2008). Adjustment to college in students with ADHD. *Journal of Attention Disorders, 11*(6), 689–699. https://doi.org/10.1177/1087054707305106.

Ramsay, J. R. (2015). Psychological assessment of adults with ADHD. In R. A. Barkley (Ed.), *ADHD: A Handbook for Diagnosis and Treatment* (4th ed., pp. 475–500). Guilford.

Sciutto, M. J., & Eisenberg, M. (2007). Evaluating the evidence for and against the overdiagnosis of ADHD. *Journal of Attention Disorders, 11*, 106–113. https://doi.org/10.1177/1087054707300094.

Sibley, M. H., & Kuriyan, A. B. (2016). *DSM-5* changes enhance parent identification of symptoms in adolescents with ADHD. *Psychiatry Research, 242*, 180–185. https://doi.org/10.1016/j.psychres.2016.05.036.

Sibley, M. H., & Yeguez, C. E. (2018). The impact of *DSM-5* A-criteria changes on parent ratings of ADHD in adolescents. *Journal of Attention Disorders, 22*, 83–91. https://doi.org/10.1177/1087054714526040.

Sibley, M. H., Pelham, W. E., Molina, B. S., Gnagy, E. M., Wasmonsky, J. G., et al. (2012). When diagnosing ADHD in young adults emphasize informant reports, DSM items, and impairment. *Journal of Consulting and Clinical Psychology, 80*, 1052–1061. https://doi.org/10.1037/a0029098.

Vitola, E. S., Bau, C. H. D., Salum, G. A., & Horta, B. L. (2017). Exploring DSM-5 ADHD criteria beyond young adulthood: Phenomenology, psychometric properties and prevalence in a large three-decade birth cohort. *Psychological Medicine, 47*, 744–754. https://doi.org/10.1017/S0033291716002853.

Weiss, M. D. (2000). Weiss functional impairment rating scale (WFIRS) self-report. Vancouver, Canada: University of British Columbia. Retrieved from naceonline.com/AdultADHDtoolkit/assessmenttools/wfirs.pdf.

Wilens, T. E., Biederman, J., & Spencer, T. J. (2002). ADHD across the lifespan. *Annual Review of Medicine, 53*, 113–141. https://doi.org/10.1146/annurev.med.53.082901.103945.

Willcutt, E. G. (2012). The prevalence of DSM-IV attention-deficit/hyperactivity disorder: A meta-analytic review. *Neurotherapeutics, 9*, 490–499. https://doi.org/10.1007/s13311-012-0135-8.