

Self-Reported ADHD Symptoms Among College Students: Item Positioning Affects Symptom Endorsement Rates

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Abstract:

Objective: The effect of manipulating item positioning on self-reported ADHD symptoms was examined. We assessed whether listing DSM-IV ADHD symptoms serially or interspersed affected (a) the correlation between ADHD symptoms and (b) the rate of symptom endorsement. **Method:** In Study 1, an undergraduate sample (n = 102) completed a measure that listed DSM-IV ADHD symptoms serially and a measure that interspersed DSM-IV ADHD items among non-ADHD symptoms. In Study 2, a separate undergraduate sample (n = 240) completed a measure that listed DSM-IV ADHD symptoms serially and another ADHD measure that interspersed DSM-IV ADHD items among non-DSM-IV ADHD items. **Results:** Item positioning did not affect the correlation between symptoms, but did reveal a significant bias in the rate of symptom endorsements. **Conclusion:** These findings suggest that there is significant variability in ADHD symptom endorsements resulting from item positioning. This effect has implications for clinical assessment and epidemiological research of ADHD among college students.

Keywords: ADHD | hyperactivity-impulsivity | inattention | self-report | college students

Article:

ADHD is defined by the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV; American Psychiatric Association, 1994) as comprised of separate but related symptom dimensions of inattention and hyperactivity-impulsivity. Follow-up studies of children and adolescents diagnosed with ADHD demonstrate that these symptoms and related impairment often persist into adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002). Such persistence into adulthood has a number of negative consequences in economic, occupational, social, and academic domains (Barkley, Murphy, & Fischer, 2007; Faraone et al., 2000).

As ADHD in adulthood has been increasingly recognized, the assessment and functioning of ADHD among college students has received increasing attention as well (e.g., Gordon, 2000; Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999; McKee, in press; Norvilitis, Ingersoll, Zhang, & Jia, 2008; Richards, Rosén, & Ramirez, 1999). Indeed, the prevalence rate for college

students with ADHD is approximated to be 4% (DuPaul et al., 2001; Heiligenstein, Conyers, Berns, & Smith, 1998). Accurate diagnosis of this group is paramount to ensure appropriate academic intervention, treatment services, and prevalence estimates. Reilley (2005) reviewed guidelines for the empirically based assessment of ADHD among this population. These guidelines include documenting current ADHD symptom endorsements (i.e., symptoms that occur “often” or “very often” in the past six months).

Although assessment of current symptoms among children and adolescents typically rely on parent and teacher ratings, assessments among adults and college students frequently rely on self-report (Murphy & Adler, 2004). Self-reported ADHD symptoms are frequently assessed with measures containing face valid DSM-IV items. For example, the ADHD Rating Scale-IV (ADHD-RS; DuPaul, Power, Anastopoulos, & Reid, 1998) and the Current Symptoms Scales (Barkley & Murphy, 1998) alternate presentation of nine DSM-IV inattentive and nine hyperactive-impulsive items (see Murphy & Gordon, 2006, and Rösler et al., 2006, for summaries of self-report ADHD rating scales used among adult samples). Administration of such measures is common in assessing ADHD symptoms among college students (Reilley, 2005).

Studies of adult ADHD frequently indicate high correlations between self-reported inattentive and hyperactive-impulsive symptom dimensions. For example, Mitchell and Nelson-Gray (2006) reported a correlation of .72 using the ADHD-RS with a college student sample. However, participants who rate themselves as high on one symptom dimension may be more likely to endorse the other dimension due to the sequential presentation of ADHD symptoms. In other words, the correlation pattern of DSM-IV ADHD symptoms among college students could be an artifact of ADHD item positioning. Clarifying this relationship is important in research examining the dimensional distribution of these traits and how they relate to one another. This issue is also relevant given that some measures of adult ADHD symptoms list the DSM-IV symptoms serially (e.g., ADHD-RS) while others list ADHD symptoms interspersed among non-DSM-IV items (e.g., Conners Adult ADHD Rating Scale [CAARS]; Conners, Erhardt, & Sparrow, 2000).

In addition, it is unclear whether item positioning affects the endorsement rate of self-reported symptoms. The DSM-IV requires the endorsement of six or more inattentive or hyperactive-impulsive symptoms as occurring “often” or “very often.” If the positioning of items affects the number of symptoms endorsed, then this could impact the rate at which ADHD is diagnosed using such rating scales. This issue is relevant since, as mentioned above, this item positioning manipulation (i.e., listing symptoms serially or interspersed) is already part of widely administered ADHD self-report measures. Also, any differences in symptom rate endorsements that vary as a function of item positioning would inform prevalence rate estimates of ADHD among adults, which typically rely on self-reported symptom endorsements (see Barkley, 2006, pp. 99-101 and 106 for a review).

The present studies examined the effect of item positioning on self-reported DSM-IV ADHD symptoms among college students. Specifically, we examined whether presentation format impacts (a) the correlation between inattentive and hyperactive-impulsive dimensions and (b) the rate of ADHD symptom endorsement. To our knowledge, there is no empirical research that addresses these questions. We chose to assess a continuum of ADHD symptoms given recent findings that support dimensional models of ADHD (e.g., Frazier, Youngstrom, & Naugle, 2007). In Study 1, we compared participants’ self-report of ADHD symptoms on the ADHD-RS and a modified format in which the items were interspersed among non-ADHD items (i.e., items

assessing other forms of psychopathology). The ADHD-RS was chosen because it lists DSM-IV symptoms sequentially. In Study 2, we conducted a similar study in which we administered the ADHD-RS, but compared it to a measure specifically created and widely used to assess ADHD symptoms among adults that intersperses DSM-IV ADHD symptoms among non-DSM ADHD items (i.e., the CAARS).

Study 1

Method

Participants

Participants were 102 undergraduate students enrolled in introductory psychology courses (age $M = 19.6$, $SD = 2.2$). The majority of the sample was female (55%) and White (75%), consistent with university demographics. Fifteen participants reported a previous diagnosis of ADHD by a mental health professional.

Materials

ADHD-RS. The ADHD-RS (DuPaul et al., 1998) contains the 18 DSM-IV items that assess symptoms on a 4-point scale (0 = Never/Rarely, 1 = Sometimes, 2 = Often, 3 = Very often). This scale can yield two types of scores: symptom endorsements and symptom severity. To calculate symptom endorsements, each “2” or “3” rating is considered one symptom endorsement. The total number of “2” or “3” ratings is summed to create a total symptom endorsement score. Thus, since there are nine inattentive and nine hyperactive-impulsive symptoms, scores range from 0 to 9 for both sets of symptoms. Symptom severity scores are calculated by summing ratings ranging from 0 to 3 for inattention and hyperactivity-impulsivity. Symptom severity scores can range from 0 to 27 for both inattention and hyperactivity-impulsivity. Internal consistency for inattentive and hyperactive-impulsive subscales was good in the current sample ($\alpha = .83$ and $.82$, respectively). **Modified ADHD measure.** Participants also completed a modified ADHD measure (mADHD) created for this study. This measure contained the ADHD-RS items interspersed at random within the Symptom Checklist- 90–Revised (SCL-90-R; Derogatis, 1994). The SCL- 90-R contains items assessing several categories of psychiatric symptoms including anxiety, depression, and psychotic symptoms. The instructions, response scale, and order of ADHD items were the same for both measures. Internal consistency for inattentive and hyperactive-impulsive subscales for the current sample was good ($\alpha = .87$ and $.79$, respectively).

Procedure

Participants volunteered for the study through a Web-based enrollment system and received course credit. There were no exclusionary criteria. They completed both ADHD measures in small groups. The measures were separated by other non-ADHD questionnaires requiring approximately 45 min to complete. The order of the ADHD-RS and mADHD was counterbalanced.

Results

To assess if inattentive and hyperactive-impulsive severity scores vary as a function of presentation format, the correlation between inattentive and hyperactive-impulsive severity scores within the mADHD and ADHD-RS were computed and compared. Correlations between inattentive and hyperactive-impulsive severity scores did not differ between the mADHD ($r = .73, p < .001$) and the ADHD-RS ($r = .65, p < .001$) based on Fisher's r to z transformation ($z = -1.08, ns$). The high correlation between these symptom scales in prior studies cannot be attributed to the close proximity of the items.

Paired samples t -tests were conducted to assess if inattentive or hyperactive-impulsive symptom endorsement rates were different between both measures. Table 1 indicates that the mean number of inattentive and hyperactive-impulsive symptom endorsements (i.e., "often" or "very often") was significantly greater on the ADHD-RS than the mADHD. Thus, self-reported ADHD symptom endorsements varied as a function of item positioning. Participants tended to report nearly one additional symptom on the ADHD-RS for both inattentive and hyperactive-impulsive symptoms. A difference in one symptom, as discussed below, can be critical in making an ADHD diagnosis based on DSM-IV criteria. This pattern was similar when symptom severity scores were considered.

Table 1
Mean Rate of ADHD Symptom Endorsement and Symptom Severity in Study 1

	ADHD-RS	mADHD	$t(101)$
Symptom endorsement			
IA	2.63 (2.36)	1.68 (2.14)	6.20*
HI	2.40 (2.08)	1.39 (1.55)	6.65*
Symptom severity			
IA	9.92 (5.58)	7.76 (5.27)	6.63*
HI	8.78 (5.40)	6.20 (4.13)	7.32*

Note: Standard deviations listed in parentheses. IA = inattentive symptoms; HI = hyperactive-impulsive symptoms; ADHD-RS = ADHD Rating Scale; mADHD = modified ADHD measure.

* $p < .001$, two-tailed.

Discussion

The findings in Study 1 indicate that although the relationship between inattentive and hyperactive-impulsive ADHD symptoms do not vary as a result of presentation format (i.e., serial vs. interspersed), total symptom endorsements and symptom severity scores are higher when ADHD symptoms are presented serially than if they are interspersed among non-ADHD items.² These findings suggest that ADHD self-report assessments among college samples can be affected by the presentation format of items. This is noteworthy given that an ADHD diagnoses necessitates a report of current symptoms and that assessments into adulthood rely more heavily on self-report (Murphy & Adler, 2004). In addition, this could affect college student ADHD prevalence estimates that rely on self-report rating scales.

These findings have clear clinical implications for the assessment of ADHD among college students— presentation format of ADHD items may artificially affect symptom endorsement rates. However, the current study was composed of a relatively small sample. In

addition, given that this study is exploratory, we chose to assess if our findings would replicate in a larger sample. Finally, it is unclear if these findings would be consistent when comparing the ADHD-RS with another widely administered adult ADHD measure that does not list DSM-IV ADHD items serially.

Study 2

In Study 2, we compared participants' self-report of ADHD symptoms on the ADHD-RS and the CAARS (Conners et al., 2000) to assess (a) the consistency of our findings with a larger sample and (b) whether these findings are consistent when ADHD symptoms are assessed with an ADHD measure that does not list DSM-IV ADHD items serially. In comparison to the mADHD administered in Study 1, the CAARS intersperses DSM-IV ADHD items among non-DSM-IV ADHD items. Based on the results from Study 1, we predicted that the correlation between inattentive and hyperactive-impulsive symptoms would not differ between both measures of ADHD symptoms. We also predicted that ADHD symptom endorsements would be significantly higher on the ADHD-RS since it lists ADHD symptoms serially. However, a competing hypothesis is that ADHD symptoms would be higher in a measure that lists DSM-IV ADHD items among non-DSM-IV ADHD items because it establishes an ADHD response style.

Method

Participants

Participants were 240 undergraduate students enrolled in introductory psychology courses (age $M = 19.3$, $SD = 3.5$). The majority of the sample was female (62%) and White (62%), consistent with university demographics. Nineteen participants reported a previous diagnosis of ADHD by a mental health professional.

Materials

ADHD-RS. As in Study 1, the ADHD-RS was administered. Internal consistency for inattentive and hyperactive-impulsive subscales ranged from acceptable to good for the current sample ($\alpha = .82$ and $.78$, respectively).

CAARS. The CAARS (Conners et al., 2000) is a 66-item self-report measure of ADHD in adults. Response options are on a 4-point scale and range from not at all true to very much true. Among its scales, the CAARS yields symptom scales based on the DSM-IV criteria for ADHD (i.e., inattention and hyperactivity-impulsivity), which are interspersed among non-DSM-IV ADHD items. Internal consistency for inattentive and hyperactive-impulsive subscales ranged from acceptable to good for the current sample ($\alpha = .84$ and $.74$, respectively).

Procedure

The procedure was the same as the procedures for Study 1.

Results

Correlations between inattentive and hyperactive-impulsive severity scores did not differ between the CAARS ($r = .60, p < .001$) and the ADHD-RS ($r = .66, p < .001$)³ based on Fisher's r to z transformation ($z = 1.09, ns$). Consistent with Study 1, the high correlation between inattentive and hyperactive-impulsive symptoms cannot be attributed to the close proximity of the items.

Paired samples t -tests were also conducted to assess if inattentive or hyperactive-impulsive symptom endorsements were different between both measures. Table 2 indicates that the mean number of symptom endorsements (i.e., "often" or "very often") were significantly greater on the CAARS than on the ADHD-RS for inattentive symptoms, but not hyperactive-impulsive symptoms. Thus, as in Study 1, self-reported inattentive ADHD symptom endorsements varied as a function of item positioning. However, hyperactive-impulsive symptoms did not statistically differ. This pattern was similar when symptom severity scores were considered.

Table 2
Mean Rate of ADHD Symptom Endorsement and Symptom Severity in Study 2

	ADHD-RS	CAARS	$t(239)$
Symptom endorsement			
IA	1.61 (1.99)	2.21 (2.34)	5.90*
HI	2.03 (1.91)	2.08 (1.79)	0.57
Symptom severity			
IA	7.58 (4.73)	9.12 (5.05)	7.09*
HI	8.14 (4.69)	8.29 (4.33)	0.70

Note: Standard deviations listed in parentheses. IA = inattentive symptoms; HI = hyperactive-impulsive symptoms; ADHD-RS = ADHD Rating Scale; CAARS = Conners Adult ADHD Rating Scale.

* $p < .001$, two-tailed.

Discussion

There were two primary goals in the current studies. First, we assessed the impact of manipulating the positioning of DSM-IV ADHD symptoms on the correlation between the two main symptom dimensions of ADHD (i.e., inattention and hyperactivity-impulsivity). Second, we assessed the impact of this manipulation on ADHD symptom endorsements.

Across two separate samples, the correlational relationship between inattentive and hyperactive-impulsive ADHD symptoms was not affected by item positioning. According to our findings, the relationship between both sets of symptoms is highly correlated among college students and this relationship is not an artifact of the sequential positioning of these items. This finding is consistent with theories of ADHD that propose that poor sustained attention (a form of inattention) is secondary to hyperactivity-impulsivity, and thus both sets of symptoms should be highly correlated (e.g., Sagvolden, Johansen, Aase, & Russell, 2005).

The second purpose of this study was to assess the impact on ADHD symptom endorsements. In Study 1, both inattentive and hyperactive-impulsive symptom endorsements

were significantly higher when DSM-IV ADHD symptoms were presented sequentially than when they were interspersed among non-ADHD symptoms. In Study 2, we replicated that ADHD symptom endorsements are significantly impacted by item positioning in a larger sample. However, only inattentive symptoms were higher. In addition, in contrast to Study 1, inattentive ADHD symptom endorsements were higher on the measure that interspersed the DSM-IV ADHD items (i.e., the CAARS), not the measure that listed these items sequentially (i.e., the ADHD-RS). Although DSM-IV ADHD items were interspersed among the CAARS as in the modified ADHD measure in Study 1, the CAARS intersperses DSM-IV ADHD items among non-DSM-IV ADHD items (instead of symptoms of other psychiatric disorders).

From a general psychometric literature standpoint, it is not surprising that item ordering effects emerged. In addition, this is not problematic when norm-based scoring for each measure is used. However, the DSM-IV symptom cutoff is a reference for both the CAARS and ADHD-RS when calculating symptom endorsements. Therefore, the current findings are applicable in terms of using these scales to establish DSM-IV symptom counts. Based on the findings from both studies, DSM-IV ADHD symptom endorsement rates seem to be higher when these symptoms are listed among ADHD symptoms, but not other psychiatric symptom items. Perhaps, responding to ADHD items in the context of many other ADHD items, whether sequentially or interspersed among non-DSM-IV ADHD items, establishes an ADHD response style. This response style is disrupted when non-ADHD items are listed among ADHD items. Regardless, most notably among these findings is that inattentive ADHD symptom endorsements significantly varied between two widely administered measures of ADHD symptoms among college students.

The finding that inattentive symptoms vary as a function of item positioning has important implications both for clinical diagnosis and epidemiological research. For instance, symptom endorsements are required for making a DSM-IV diagnosis of ADHD, meaning that one additional symptom may have substantial implications in clinical practice among college student samples. Six or more inattentive or hyperactive-impulsive symptoms are required to meet partial diagnostic criteria for ADHD. In Study 1, for example, more participants reached the inattentive symptom threshold on the ADHD-RS (11 participants) than on the mADHD (8 participants). This pattern was more pronounced for hyperactive-impulsive symptoms (9 participants on the ADHD-RS versus 2 participants on the mADHD). Murphy and Barkley (1996) recommended lowering the hyperactive-impulsive symptom threshold for adults to 4 to correspond with statistical and developmental deviance. Twenty-six participants met this modified cutoff on the ADHD-RS compared to only 10 on the mADHD. In epidemiological research, prevalence rates likely increase if only ADHD symptoms are assessed (i.e., additional DSM-IV diagnostic criteria are not assessed, such as age of onset or functional impairment). For example, in one study, the prevalence estimate dropped from 16.1% to 6.8% when the impairment criterion for ADHD was added (Wolraich, Hannah, Baumgaertel, & Feurer, 1998). However, any prevalence rate estimate that includes self-report of current ADHD symptom endorsements should be cautioned because of the effect of item positioning on DSM symptom counts reported in the current studies. The current findings are particularly relevant to the two widely used clinical measures administered in Study 2. This is particularly relevant since most prevalence estimates of ADHD in adulthood are based on self-report (Barkley, 2006). However, as we mention below, our data do not indicate which presentation format is most accurate. Overall, this illustrates that diagnostic status and prevalence rate estimates can be influenced by

an extraneous factor such as presentation format and can yield a clinically meaningful effect when using self-report measures.

The current findings from these exploratory studies should be interpreted in light of several limitations. First, although presentation format affects symptom endorsements, this study cannot determine which presentation format from the ADHD-RS and CAARS, for example, produces more accurate self-reports. Future studies should examine the correspondence of self-reports with diagnostic interviews and indices of functional impairment to elucidate this issue. Second, this study was composed of a college sample, thus limiting the direct generalizability of our findings to clinical ADHD groups. Future studies should test if these findings generalize to adult clinical groups as well. Third, in line with our latter limitation, our sample was predominantly female, whereas the gender proportion in self-referred clinical samples is more balanced (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004). Future studies that assess the generalizability of our findings with a clinical sample should address this gender issue as well. Finally, although we assessed one necessary aspect of ADHD assessment among adults (i.e., assessment of current symptoms), additional necessary components for diagnosing ADHD were not addressed. For example, future studies should also assess the effect of item positioning on report of childhood symptoms since childhood onset is a criterion for diagnosis in adulthood. In addition, future studies should address if the current findings generalize to other reporters of current ADHD symptoms. Despite these limitations, our results are relevant and applicable to addressing issues among college students and ADHD. Primarily, our findings indicate that among college students seeking an ADHD assessment or in studies that estimate prevalence rates, the presentation of ADHD symptoms is likely to have a significant impact on symptom endorsements. Though only two widely administered ADHD rating scales were used in the current studies, our findings extend to other ADHD measures for adults. For example, the Adult Self-Report Scale (Adler, Kessler, & Spencer, 2003), Current Symptoms Scales (Barkley & Murphy, 1998), and the ADHD Diagnostic Checklist (Rösler et al., 2004) also list DSM-IV symptoms serially and would be predicted to yield similar results as the ADHD-RS.

While rating scales are useful for gathering self-report information about ADHD symptoms, the current results provide further evidence that caution should be employed when administering them for diagnostic and prevalence rate estimate purposes among college students. Accordingly, clinicians should consider the limitations of their tools and avoid reliance solely on self-report rating scales. A thorough assessment of adult ADHD requires gathering information from multiple sources using multiple methods (Knouse & Safren, in press). Future studies administering self-report adult ADHD measures among college students should also consider the inattentive and hyperactive-impulsive dimensions' predictive validity and possible associations with other symptoms and traits (Knouse et al., 2008).

Notes

1. The correlations between inattentive and hyperactive-impulsive items followed the same trend when symptom endorsement scores, as opposed to symptom severity scores, from both measures were considered; that is, $r = .66$ ($p < .001$) for inattentive and hyperactiveimpulsive symptoms endorsements on the mADHD, while $r = .56$ ($p < .001$) on the ADHD-RS. These correlations were not statistically different ($z = -1.13$).
2. Although we report that both symptom endorsement and symptom severity scores were statistically different within groups in Study 1 and Study 2, we focus our interpretation on

symptom endorsement ratings since this scoring procedure is more likely to be conducted in clinical settings and in research estimating prevalence rates.

3. The correlations between inattentive and hyperactive-impulsive items followed the same trend when symptom endorsement scores, as opposed to symptom severity scores, from both measures were considered; that is, $r = .51$ ($p < .001$) for inattentive and hyperactive-impulsive symptoms endorsements on the CAARS, while $r = .60$ ($p < .001$) on the ADHD-RS. These correlations were not statistically different ($z = 1.06$).

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