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ADHD and College Students: Exploratory and Confirmatory Factor Structures With Student and Parent Data

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Exploratory factor analyses (EFAs) and confirmatory factor analyses (CFAs) were used to investigate the structure of the Student Report Inventory (SRI) and Parent Report Inventory (PRI) of the College Attention-Deficit/Hyperactivity Disorder (ADHD) Response Evaluation. The sample was composed of 1,080 college students and their parents and was stratified by ethnicity, gender, ability level, age, grade, region of residence, and psychoeducational classification status. Results varied according to the information source (self-report vs. parent). EFA uncovered and CFA confirmed 3 distinct and reliable dimensions for student reports: Inattention, Hyperactivity, and Impulsivity. By contrast, EFA and CFA uncovered a reliable 2-dimension structure for the parent-report data. Factor structures replicated across genders (3 factors for the SRI, and 2 factors for the PRI). Results are discussed in terms of the divergence of structures.

Individuals with an attention-deficit/hyperactivity disorder (ADHD) are likely to have lifelong problems (Barkley, 1990; Barkley, Fischer, Smallish, & Fletcher, 2002; Biederman et al., 1998; Fergusson, Lynskey, & Horwood, 1997; Loeber, Green, Lahey, Frick, & McBurnett, 2000). It was previously thought that ADHD symptoms subsided in adolescence (e.g., Eisenberg, 1966), but prospective, longitudinal studies have shown otherwise. For example, among 6- to 12-year-old ADHD children who were followed for 10 to 25 years, nearly two thirds continued to manifest at least one of the disabling symptoms of ADHD (e.g., inattention, hyperactivity, impulsivity) as adolescents and adults (Gittelman, Mannuzza, Shenker, & Bonagura, 1985; Weiss & Hechtman, 1993). Additionally, adults with ADHD had obtained less formal education and/or lower ranks while in high school (Barkley et al., 2002; Mannuzza, Gittelman-Klein, Bessler, Malloy, & LaPadula, 1993) and were more likely to experience adverse family functioning, other psychiatric illnesses, substance abuse, and trouble with the law (Barkley, Fischer, Edelbrock, & Smallish, 1990; Barkley et al., 2002; Biederman, 2003; Biederman et al., 1998; Klein & Manuzza, 1991; Peterson, Pine, Cohen, & Brook, 2001).

By contrast, about one third of adults with a history of ADHD had positive outcomes. Although some symptoms remained, problems were not present to a significant degree. Most were employed, and many sought training and/or education beyond high school. Therefore, it is not surprising to find that individuals with ADHD are entering colleges and universities in record numbers (Latham, 1995; Richard, 1995). Estimates suggest 1% to 4% of the college population has ADHD (DuPaul et al., 2001; Heiligenstein, Conyers, Berns, & Smith, 1998; Weyandt, Linterman, & Rice, 1995). However, the figures are only rough estimates because no study used a nationally representative sample (Glutting, Monaghan, Adams, & Sheslow, 2002).

Less is known about ADHD at the college level than with children or adults (DuPaul et al., 2001; Heiligenstein et al., 1998; Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999). Moreover, there is reason to believe that outcomes obtained for children with ADHD may not hold for college students (Glutting, Monaghan, et al., 2002; Heiligenstein et al., 1998). College students with ADHD are likely to have (a) higher ability levels, (b) greater academic success during primary and secondary school, and (c) better compensatory skills than individuals with ADHD from the general population. College students with ADHD also experience a different set of stressors than adults with the condition who do not seek postsecondary training. In particular, they must adapt to the academic challenges and demands that accompany a college education. Therefore, college students with ADHD may constitute a distinct subset of individuals with the disorder.

Factor Structure of ADHD

Inadequate knowledge about ADHD at the college level is compounded by methodological issues (Spencer, Biederman, Wilens, & Faraone, 1994). Primary among them is that no psychopathology originating in childhood has undergone as much renaming and reconceptualizing as ADHD (Gomez, Harvey, Quick, Scharer, & Harris, 1999). Different organizations of ADHD

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symptoms can be found in each of the last three revisions of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM*) of the American Psychiatric Association. Beginning with the third edition of the *DSM* (*DSM–III*; American Psychiatric Association, 1980), ADHD was theorized to include three interrelated factors: Inattention, Hyperactivity, and Impulsivity. Later, the factors were believed to be so interrelated that the revised edition of the *DSM–III* (*DSM–III–R*; American Psychiatric Association, 1987) collapsed ADHD to a single dimension. The most recent revision of the *DSM*, the fourth edition (*DSM–IV*; American Psychiatric Association, 1994), portrays ADHD as containing two dimensions (Inattention and Hyperactivity/Impulsivity), with elevated performance on both dimensions indicating the presence of a combined ADHD type.

Changes in the *DSM–IV*'s definition were partially the result of factor analyses of teacher, parent, and clinician ratings of ADHD (Frick et al., 1994; Lahey et al., 1994; McBurnett, Lahey, & Pfiffner, 1993). A substantial number of factor analyses supported a two-factor structure for both clinic-referred and community-based samples of children (Bauermeister, Alegria, Bird, Robio-Stipec, & Canino, 1992; Burns et al., 1997; Collett, Crowley, Gimpel, & Greenson, 2000; DuPaul, 1991; Holland, Gimpel, & Merrell, 1998; Lahey et al., 1994; Molina, Smith, & Pelham, 2001; Pelham, Gnagy, Greenslade, & Milich, 1992; Wolraich, Hannah, Pinnock, Baumgaertel, & Brown, 1996). By contrast, a smaller number of studies obtained a three-factor structure that conformed to the *DSM–III* model of ADHD, that is, Inattention, Hyperactivity, and Impulsivity (Gomez et al., 1999; Pillow, Pelham, Hoza, Molina, & Stulz, 1998).

Factor Structure of ADHD at the College Level

The above investigations focused on children. As a result, each relied on either teacher or parent ratings and did not incorporate self-reports because of age limitations that could affect the ability of children to comprehend the nature of their problems and/or reasons for the assessment (Edelbrock, 1988; McDermott, 1986). Furthermore, with only a few exceptions (Holland et al., 1998; Molina et al., 2001; Pillow et al., 1998), the factor analyses relied on orthogonal (i.e., uncorrelated) rotations even though it is recognized that ADHD dimensions correlate substantially (DuPaul, 1991; Pelham et al., 1992; Pillow et al., 1998).

It is interesting that, despite an upsurge of ADHD on college campuses, only three studies examined the factor structure of ADHD among postsecondary students. DuPaul et al.'s (2001) notable study sampled 799 undergraduates from the United States. Dependent variables were self-report data and comprised students' responses to 24 items, 18 of which were taken from the 18 ADHD criteria in the *DSM–IV*. An exploratory factor analysis (EFA) with oblique rotation uncovered a two-factor structure corresponding to the ADHD organization in the *DSM–IV*. The structure replicated across genders and for undergraduates from New Zealand (n = 213). However, it did not hold for older students from Italy (n = 197), where four factors were obtained. In the second investigation, Smith and Johnson (1998) used self-report data from 1,524 students. Items comprised the 18 ADHD criteria in the *DSM–IV*. Both an EFA and a confirmatory factor analysis (CFA) supported the two-factor structure in the *DSM–IV*, with the structures replicating across genders. Most recently, Span, Earleywine, and Strybel (2002) used self-reports, and a CFA was completed with a sample of 262 undergraduates. The CFA was then repeated with a second sample of 237 students. In this study, too, items came from the 18 ADHD criteria in the *DSM–IV*. Each analysis supported a three-factor structure similar to the one found in the *DSM–III*.

The present study further tests assumptions underlying the assessment of ADHD at the college level. The investigation expands understanding in three ways. First, a basic tenet of assessment is that cross-informant methods are likely to be more encompassing and accurate (Achenbach, McConaughy, & Howell, 1987; Meyer et al., 2001). Therefore, the current study uses student self-report data as well as parent-report data to increase the ecological validity of outcomes. Second, no prior study used either EFA or CFA with parent data. Third, the current investigation goes well beyond criteria in the *DSM–IV* and includes 44 items in the student self-report measure and 30 items in the parent-report measure.

Method

Measures

Methods exist for the assessment of ADHD with adults. The earliest was the Wender Utah Rating Scale (WURS), which attempts to establish the presence of ADHD by having adults describe their own behavior as children (Wender, 1995; Wender, Reimherr, & Wood, 1981). Some normative data are available, and WURS scores were able to distinguish adults with ADHD from normal controls and individuals with agitated depression (Wender, 1995). Despite its value in promoting the study of ADHD in adulthood, the WURS has been criticized because of its (a) association with older (*DSM–III*) criteria for ADHD and (b) inclusion of symptoms such as "hot temper" and "stress intolerance" that may confound ADHD with other adult conditions and opposition defiance disorder (Conners et al., 1999; Kane, Mikalac, Benjamin, & Barkley, 1990). Two other tools for assessing ADHD in adults include Conners' Adult ADHD Rating Scales (Conners, Erhardt, & Sparrow, 1999) and the Brown Attention-Deficit Disorders Scales (Brown, 1996). Although useful, these instruments were not designed specifically for college students.

All data in the present investigation come from the standardization sample of the College ADHD Response Evaluation (CARE; Glutting, Sheslow, & Adams, 2002). The CARE can be used for two purposes, depending on an examiner's background and training. Its primary use is by postsecondary disability service providers, whose background may not be in assessment. For these professionals, the CARE can be applied for screening purposes to identify college students who are at risk for ADHD. Alternatively, examiners with appropriate training can use the CARE as part of a comprehensive ADHD assessment.

The CARE encourages consensual validity because its assessments include conormed student and parent measures: the Student Response Inventory (SRI) and the Parent Response Inventory (PRI). Results may be interpreted with reference to general national norms for college students or to gender-specific norms. Each instrument is described below.

SRI. The SRI is a 44-item self-rating scale; 18 items come directly from criteria in the *DSM–IV*. The SRI is relatively brief, taking less than 10 min to complete.

A problem can occur when item development is limited to criteria found in popular classification systems, such the *DSM–IV* (Kline, 1988; McDermott, 1994). Criteria (i.e., items) changed with each successive revision of the *DSM*. Furthermore, the *DSM–IV* criteria have been criticized for not being developmentally sensitive to variations that take place with ADHD among adolescents and adults (Barkley, 1998). The SRI, by contrast, goes beyond the *DSM–IV* and includes a variety of age-appropriate correlates of ADHD. Item development was heavily influenced by mental health professionals experienced in working with ADHD students at the college level. Postsecondary disability service providers, college counselors, psychologists, and psychiatrists with appropriate knowledge and background were interviewed and asked to write items. Results were then obtained from an EFA conducted during item tryout ($N = 680$). The SRI item pool was finalized only after mental health professionals reviewed the EFA output and agreed about the types of phenomena they thought were important to the diagnosis and treatment of ADHD at the postsecondary level.

Overuse of negative statements is another disadvantage of many ADHD measures. Seeing only negatively worded items, students may assume they are expected to find something wrong with themselves. The CARE was constructed to balance negatively worded items with positively worded items that reduce bias. Twenty-two percent of the SRI's items are positively worded, and the remaining 78% are negatively worded. Furthermore, although it is essential to learn whether college students have ADHD, it is equally important to understand the circumstances and settings in which problems take place. Contextual knowledge of how, when, and where ADHD phenomena occur can provide valuable insights for tailoring interventions (Danforth, Barkley, & Stokes, 1991; Shapiro & Skinner, 1990; Waschbusch, Kipp, & Pelham, 1998). Consequently, 48% of the SRI's items are couched in specific contexts related to college life. Settings used by the SRI include studying and doing homework, sitting through lectures, answering questions, taking notes, taking exams, completing class assignments, keeping (or not keeping) a daily calendar, writing (or not writing) down assignments, remembering to bring pencils or pens to class, watching TV, interacting during mealtimes, and engaging in leisure activities.

For each item, students indicate whether they agree, disagree, or are undecided about how an item's content applies to their day-to-day life. This format differs from that in some ADHD measures, in which symptoms are rated by 4-point scaling (e.g., *not at all*, *just a little*, *pretty much*, *very much*). The SRI's use of a neutral or middle-point alternative is consistent with findings that forced-choice systems (e.g., 4-, 6-, or 8-point ratings) result in less response discrimination on personality measures, with raters systematically collapsing the two middle alternatives into a single neutral category (Glutting & Oakland, 1993; McKelvie, 1978; Tseng, 1983). Attempts to attain precision by adding a large number of options with a neutral alternative (e.g., 5-point scaling) can also lead to inaccurate responses (McDermott, 1986). This situation arises when raters do not make subtle choices imposed by the item format (e.g., differentiating between the gradations *strongly agree* and *agree*). Likert scaling was attempted with the CARE, but the methodology was abandoned when item-tryout analyses revealed that approximately 10% of respondents failed to use all five points.

PRI. The majority of postsecondary students with ADHD are referred because of difficulties in attention, concentration, and behavioral regulation. These very same problems might also affect their responses to questionnaires. Compounding the problem of response distortion is the fact that ADHD students have been found to underreport key symptoms (Fischer, Barkley, Fletcher, & Smallish, 1993; Hinshaw, Henker, & Whalen, 1984; Youngstrom, Loeber, & Stouthamer-Loeber, 1999). The net effect is that an ADHD assessment that relies solely on self-reports runs certain risks and may under- or overreport clinically important phenomena. Therefore, following well-established findings in the child psychopathology literature (Achenbach et al., 1987; Bird, Gould, & Staghezza, 1992; Loeber, Green, Lahey, & Stouthamer-Loeber, 1989), we hypothesized that parent ratings might be as effective as, if not more accurate and predictive than, the self-ratings of college students.

The PRI was developed to supplement and enhance data supplied by students on the SRI. The PRI is an objective rating scale completed by a student's parent. It contains 30 items, 18 of which come directly from ADHD criteria in the *DSM–IV*. The PRI takes 5 to 10 min to complete and uses the same item format as the SRI, with parents indicating whether they agree, disagree, or are undecided about how an item's content applies to their child.

Although the assertion is controversial (Wender, 1995), the *DSM–IV* mandates that ADHD symptoms must be present by age 7 (American Psychiatric Association, 1994). Parents are in a better position to recall the behavior of their offspring as children. Therefore, the PRI asks parents to frame the duration and history of symptoms of their children using the following retrospective framework: "Please give an opinion about what your son/daughter was like when he or she was IN ELEMENTARY SCHOOL (APPROXIMATELY 5–8-YEARS OLD)." The PRI's use of historical circumstances also helps examiners clarify whether a student's difficulties are persistent or whether they are a reaction to stressful events that took place more recently.

The PRI's initial item pool was developed from input from professionals working with ADHD students at the college level. The PRI avoids problems associated with the overuse of negative wording as well as problems with response sets, because 41% of its items are positively worded and the other 59% are negatively worded. Likewise, 43% of the PRI's items were placed in developmental situations common to the experiences of children (e.g., doing homework, sitting still during meals, completing chores).

Diagnostic Validity

The CARE's manual (Glutting, Sheslow, & Adams, 2002) presents studies that examined external validity. One study evaluated diagnostic validity. It used receiver operator characteristic curves calculated between students with ADHD ($n = 58$) and nonclassified contemporaries ($n = 1,022$). To be eligible for placement in the ADHD group, individuals had to have (a) been administered a parent or teacher rating scale during the last 3 years for which the ADHD score was at least 1.5 standard deviations above the national mean (i.e., a score at or above the 92nd percentile), (b) received a clinic or school diagnosis of *DSM–IV* ADHD during high school, (c) received academic services for ADHD during high school (e.g., extra time during examinations, resource room help, note-taking assistance), and (d) been found eligible for continued academic assistance during college by the student disability services unit on their campus.

The receiver operator characteristic analyses were all statistically significant ($ps < .001$). Therefore, areas under the curve (AUCs) were interpreted. Values ranged from .71 to .82 for the SRI and from .77 to .94 for the PRI. The AUC is a measure of effect size. Values between .50 and .59 represent low diagnostic accuracy (i.e., a small effect size), values between .60 and .65 indicate medium accuracy, and values between .66 and 1.00 denote high accuracy (Rice & Harris, 1995). Every AUC for the SRI and for the PRI exceeded the critical value for a large effect size.

A benefit of AUCs is that they are easy to understand. For instance, the lowest (i.e., least accurate) AUC for the CARE was .71. This value means that if a student with ADHD and a student without ADHD were chosen randomly and compared, then 71% of the time college students with ADHD would obtain a higher (i.e., more pathological) score. Therefore, in this one study, results show that the CARE possesses fairly high levels of diagnostic accuracy.

Procedure

A network of postsecondary service providers was used to identify colleges and universities willing to participate in the CARE's standardization. Informed consent procedures were approved by all participating institutions. Students and parents were asked in person to complete the SRI or PRI, and the ratings were obtained either at the time of new student orientations (at most, 2 months prior to the beginning of the fall semester) or when families brought their students to college (the beginning of the fall semester). Respondents were informed that all questionnaires were confidential but not anonymous, so that it would be possible to track students. At the request of participating institutions, response rates were not monitored directly. Nevertheless, the participation rate approximated 35% on the basis of the number of returned questionnaires. Each student completed the SRI, and one of the parents completed the PRI. Norms were obtained in two stages: 1999 (n = 460) and 2000 (n = 620). More parents than students returned ratings. Participants were included in the standardization sample only when ratings were obtained from both a student and a corresponding parent. More mothers than fathers completed ratings.

Sample

Most individuals with ADHD are identified with the disorder prior to late adolescence (Barkley, 1998; Robin, 1998). Consequently, the CARE's standardization sample was intentionally confined to freshmen so that its norms would be sensitive to the postsecondary age at which students are most likely to seek ADHD services. The sample ranged from 17 through 22 years of age. The average age was 18.7 years (SD = 0.7 years).

The CARE's standardization model explicitly accounted for age, ethnicity, gender, and ability level. Geographic region and classification status (i.e., the presence or absence of ADHD) were not explicit stratification variables, but they were monitored. Geographic region was not included as a stratification variable because a college's location can be independent of student origin. The sample included students enrolled in degree programs at colleges and universities on the Northeast, Mid-Atlantic, Northwest, and Southwest corridors of the United States. No colleges or universities took part from the South. Nevertheless, families (students and parents) came from 38 states, including the southern states of Florida, Georgia, Kentucky, Louisiana, North Carolina, South Carolina, and Tennessee.

With respect to classification status, 5.5% (n = 58) of the students had been previously diagnosed with ADHD, and another 3.6% (n = 39) reported having a learning disability (LD). Participants were placed in the ADHD cohort according to the procedure described earlier. Placement in the LD category was less formal and occurred when student and parent reports both agreed that the student had a history of LD.

Weighting was used to stratify the CARE's sample according to three variables: gender, ethnicity, and ability level. Slightly more women (53.8%) than men (46.2%) attend postsecondary programs (Barbett & Korb, 1997). Nevertheless, the CARE's standardization sample was weighted to equivalence on gender. Five categories of race–ethnicity served as strata (i.e., Anglo, Black, Hispanic, Asian, and other). Weighting for race–ethnicity was based on demographic data available from the National Center for Educational Statistics Fall Enrollment Survey for students attending 4-year colleges and universities throughout the United States (Barbett & Korb, 1997).

The *Guide to the Assessment of Test Session Behavior for the WISC–III and WIAT* (GATSB; Glutting & Oakland, 1993) is an observation system that was conormed with the standardization sample of the Wechsler Intelligence Scale—Third Edition (WISC–III; Wechsler, 1991). The GATSB provides a factor-based inattentiveness scale, and it showed a meaningful relationship with ability level (average r = .21 to the WISC–III full scale IQ). Of greater note is that, during development, IQ was the most important stratification variable affecting GATSB ratings of inattentiveness (Glutting & Oakland, 1993). Therefore, in light of this information and the fact that colleges explicitly select on the basis of SAT scores, ability level constituted a critical stratification variable for the CARE.

Weighting on ability level was based on data from the Educational Testing Service for the SAT for the years corresponding to the CARE's standardization (College Board, 2000). Respective means and standard deviations for the standardization sample versus the national average were as follows: composite SAT total score (M = 522, SD = 66, vs. M = 522, SD = 111), SAT Verbal scale score (M = 517, SD = 72, vs. M = 520, SD = 110), and SAT Quantitative scale score (M = 527, SD = 77, vs. M = 524, SD = 112). The comparisons reveal that, with the exception of mild range restrictions, mean ability levels for the sample corresponded to their national values.

Data Analyses

The standardization data were randomly divided into two subsamples. One sample had 539 participants, and the other had 540 (1 participant had missing data). The two samples were essentially equivalent in terms of gender, ethnicity, SAT total, and scores on all the parcels (all ps > .10, two-tailed). A coin toss determined which sample was used for the EFA versus the CFA. The sample of 540 was used for the EFA of the SRI and the CFA of the PRI, and the sample of 539 was used to cross-validate the results of the EFA on the SRI as well as to perform the initial EFA of the PRI.

Item factoring versus miniscales. Outcomes can be inaccurate or unreplicable when EFAs directly analyze item scores (Gorsuch, 1997). In fact, the problem is so severe that some measurement authorities recommend against direct item factoring (e.g., Nunnally & Bernstein, 1994). Multiple procedures have been advanced to overcome the limitations of exploratory item factoring. Among the methods are nonlinear factor analysis (Steinberg & Jorgensen, 1996), the application of CFA in an exploratory manner (Muthen & Muthen, 1998), and the collapsing of items into miniscales (Gorsuch, 1983, p. 294; see also Fabrigar, Wegener, MacCallum, & Strahan, 1999; Jöreskog, 1993). Researchers achieve miniscale analysis by adding several item scores together into meaningful groupings that produce larger variances, which alleviates problems associated with the constricted variances in item scores (Gorsuch, 1997; Zwick, 1987). Thereafter, traditional methods of EFA are applied. An advantage of the miniscale approach is that CFA can be used as an independent, second-stage strategy to support or disconfirm results from the EFAs. This cannot be done when CFA is first used in an exploratory manner.

EFA performed on the entire sample with item-level data suggested a three-factor solution with the SRI and a two-factor solution with the PRI (on the basis of Cattell's, 1966, scree test and the minimum average partials method). Items loading on a particular factor during the first-stage, direct-item EFA of the SRI and PRI served as the basis for forming miniscales. Because item scores in the SRI and PRI range from 0 to 2 (2 = *agree*, 1 = *undecided*, and 0 = *disagree*), miniscales were constructed in groups of three to four items so that score ranges in each miniscale would vary from 0 to 6–8 points. (Gorsuch, 1983, recommended that one form miniscales by grouping items so that the minimum score range varies from 0 to 4–6 points.) Thus, placement of items in miniscales was based on results from direct item factoring and was not influenced by a priori theoretical expectations, which is a common drawback to miniscale factoring (Zwick, 1987). In addition, each miniscale was constructed so items possessing high endorsement rates (i.e., item difficulties [p values]) were included in the same miniscale as items possessing low p values. Thereby, difficulty levels were approximately equal across all miniscales, and the procedure decreased the probability of the EFAs identifying difficulty factors—the most common problem in item factoring (Gorsuch, 1997; Nunnally & Bernstein, 1994; Zwick, 1987). Simultaneously, the procedure prevented the placement of several higher loading (i.e., stronger) items from the direct item factoring together with a lower loading (weaker) item. Because two different empirical criteria—endorsement rates and item factor loadings—dictated the composition of miniscales, it was possible for these scales to form contrary to theory. Thus, the factor analyses provided a test of whether the data conformed to prevailing theoretical models of ADHD.

Determining the number of factors. The utility of each EFA solution was evaluated against the following criteria for factor retention: The accepted configuration (a) accounted for 50% or more of the total variance, (b) satisfied Cattell's (1966) scree test, (c) met the requirements of Glorfeld's (1995) extension of parallel analysis (PA), and (d) showed the lowest minimum average partial correlation (MAP). PA was developed by Horn (1965) and compares obtained eigenvalues against those generated from random data. Components were kept when their eigenvalues were larger than those from the 95th percentile in multiple simulations using random data. MAP was introduced by Velicer (1976) and examines off-diagonal partial correlations. The average of these correlations is calculated, and components are retained when the averaged square partial correlation reaches its lowest value. Results from several studies demonstrate that MAP and PA methods provide the two best criteria for determining the correct number of factors to accept (Buja & Eyuboglu, 1992; Glorfeld, 1995; Velicer, Eaton, & Fava, 2000; Zwick & Velicer, 1986).

Results

Comparison of the Two Subsamples

Results are presented separately for the SRI and the PRI. Several types of factor extraction (principal-axis factoring, maximum likelihood) and rotation (varimax, direct oblimin) were used during EFAs with the SRI and PRI. Results were essentially equivalent. To save space, EFA findings are limited to results from the miniscale analysis completed via principal axis factor analysis with promax rotation. This system provided the most parsimonious coverage of the data and had the added benefit of supplying correlations among the retained factors. EFA findings for each instrument (SRI, PRI) are followed by CFA results, also completed with miniscales.

EFA of the SRI

The miniscales analysis revealed that a three-factor solution for the SRI was best. MAP and scree criteria both suggested that three factors be retained for rotation, but PA suggested a two-factor solution. This pattern of results suggests that a three-factor solution is likely if the results appear interpretable. The three retained factors accounted for 60.9% of the total variance in the SRI. Table 1 displays the rotated pattern matrix for these three factors. The third column of Table 1 shows endorsement rates (i.e., p values) for the miniscales entering the analysis. The p values were balanced across miniscales expected to load on a particular factor; thus, the placement of items within a miniscale was not affected by theoretical bias. Table 1 reveals that every miniscale showed only one salient pattern coefficient (i.e., at least .40).

Each of the three factors was interpreted according to the magnitude and meaning of its salient pattern coefficients. The first factor was characterized by items describing low levels of vigilance, alertness, and sustained attention along with high levels of distractibility. Consequently, the first factor was named Inattentiveness. The second factor was defined by items describing inappropriate levels of activity, feelings of restlessness, fidgeting, and unnecessary body movements, so this factor was named Hyperactivity. Finally, the third factor suggested a configuration of thoughts and behaviors characterized by the inability to delay or defer gratification, inhibit responses, and wait for instructions before responding. As a result, the third factor was named Impulsivity.

Cronbach's (1951) coefficient alpha was used to estimate internal-consistency reliability for the three factors: .82, .87, and .77 for Inattentiveness, Hyperactivity, and Impulsivity, respectively. Reliabilities were greater than the .70 criterion recommended by leading measurement textbooks (e.g., Allen & Yen, 1979; Thorndike, 1982) and comparable to levels reported for other ADHD scales used with adolescents and adults (cf. Brown, 1996; Conners, Erhardt, & Sparrow, 1999). In addition, we evaluated the relative independence of scores among the SRI's three scales by comparing correlations among the rotated factors as well as examining the correlations among the three scale scores. The highest associations were between the Inattentiveness and Hyperactivity scales and the Hyperactivity and Impulsivity scales (rs = .47) and indicated that, at a minimum, 76% of the variance in each scale was independent of scores from the other two scales. The Inattentiveness and Impulsivity scales correlated .46.

CFA of the SRI

The three-factor solution indicated by the EFA was cross-validated on the half of the sample held out from the EFA. The replication sample was also used to test one-factor (all parcels loading onto a general ADHD factor, similar to the *DSM–III–R* model) and a two-factor (Hyperactivity and Impulsivity combined as one factor, and Inattention constituting the second factor, as per *DSM–IV*) model using CFA. This provides a more restrictive test of the SRI's underlying factor structure than does EFA by explicitly modeling the nature of relations among the variables and their hypothesized latent dimensions. Several measures of fit exist for evaluating the quality of CFA models, each developed under a somewhat different theoretical framework and focusing on different components of fit (Browne & Cudeck, 1993; Hu & Bentler, 1995). For this reason, it is generally recommended that multiple measures be considered to highlight different aspects of fit (Tanaka, 1993). Given the well-known problems with chi-square as a stand-alone measure of fit (Hu & Bentler, 1995; Kaplan, 1990), use of this statistic was limited to testing differences among nested models (e.g., one-factor vs. two-factor vs. three-factor model comparisons).

The goodness-of-fit index (GFI), adjusted GFI, Tucker–Lewis index (TLI), comparative fit index (CFI), root-mean-square error of approximation (RMSEA), and parsimony GFI are reported for each model. These four measures generally range between .00 and 1.00, with larger values reflecting better fit. Traditionally, values of .90 or greater are interpreted as evidence of models that fit well (Bentler & Bonett, 1980). However, the more recent literature suggests that better fitting models produce values around .95 (Hu & Bentler, 1995). By contrast, smaller RMSEA values support better fitting models, with values of .05 or less indicating good fit (Browne & Cudeck, 1993). Finally, the Akaike information criterion and expected cross-validation index are two fit indices that indicate the likelihood of the present model replicating on an independent sample of data; for both measures, lower scores indicate better fit. All models were estimated with the software program AMOS (Arbuckle & Wothke, 1999) via maximum-likelihood estimation on covariance matrices derived from standard scores.

Measures of fit for the one-, two-, and three-factor CFA models are presented in Table 2. The three-factor solution fit best, with all three-factor model fit measures exceeding those for the one- and two-factor models. Moreover, there was a statistically significant reduction in chi-square when we moved from the two-factor model to the three-factor model, $\Delta\chi^2(2) = 274.01$, $p < .001$, and when we moved from the one-factor model to the two-factor model, $\Delta\chi^2(1) = 419.96$, $p < .001$. Thus, results from the CFA align with those from the EFA analysis to show that the three-factor solution best accounted for the structure and organization of constructs

Table 1
Promax Pattern Coefficients and Confirmatory Factor Analysis Loadings for Student Report Miniscales

Miniscale no.	Items in each miniscale	Hypothesized factor of miniscale	Miniscale *p* value	Factor loading 1	Factor loading 2	Factor loading 3
1	I daydream in class.	Inattentiveness	.28	.69		
	I find it difficult staying tuned in with tasks like this questionnaire.			.68		
	I am good at organizing activities.[a]					
2	I make careless mistakes on homework, exams, and other activities.	Inattentiveness	.29	.52		
	I often lose things necessary for school tasks or activities.			.64		
	I rush through assignments or projects just to get them done.					
3	I start out doing one thing and end up doing something else.	Inattentiveness	.29	.67		
	When oral assignments are given, I write them down correctly.[a]			.69		
	I notice important details in an assignment.[a]					
4	My class notes are borrowed.[a]	Inattentiveness	.29	.75		
	I avoid, dislike, or am reluctant to engage in school tasks that require sustained mental effort.			.62		
	I am known for getting things done on time.[a]					
5	I get lost in my thoughts.	Inattentiveness	.29	.65		
	I am known as someone who can be expected to be "on time."[a]			.70		
	I am forgetful in daily activities.					
6	I can get down to work easily.[a]	Inattentiveness	.29	.69		
	I find myself borrowing pen, pencil, or paper in class.			.70		
	I rush through assignments or projects just to get them done.					
7	So I do not forget things, I keep a daily calendar or assignment book.[a]	Inattentiveness	.30	.68		
	I get all of the things done I need to during the week.[a]			.54		
	I think things through before deciding.					
8	I fidget with my hand or feet and squirm in my seat.	Hyperactivity	.45		.97	
	I have difficulty remaining seated.				.87	
	When seated some part of me is moving.					
9	I move some part of my body while doing seatwork.	Hyperactivity	.46		.80	
	I feel "squirmy."				.88	
	I am easily distracted by extraneous stimuli.					
	"Restless" is a word that describes me.					
10	I fiddle with things near where I am standing.	Hyperactivity	.45		.81	
	When watching TV, eating, or studying, I'm moving or fidgeting.				.81	
	It's easy for me to stay seated for a whole class lecture.[a]					
11	My thoughts race quickly from one thing to the next, and there's no stopping them.	Impulsivity	.26			.46
						.72
	I do not seem to listen when spoken to directly.					
	I have difficulty engaging in leisure time activities.					
12	I make running commentaries on activities taking place around me.	Impulsivity	.25			.68
	I get into arguments more than other people.					.65
	I blurt out answers before questions have been completed.					
	I make unusual vocal noises.					
13	I am patient when waiting my turn.[a]	Impulsivity	.27			.63
	I talk out of turn to others.					.65
	I interrupt people's conversations or activities.					
14	I talk excessively.	Impulsivity	.45			.92
	I hum, make noises, or talk too loudly.					.70
	I start to answer questions while the other person is still talking.					

Note. $N = 1{,}079$, randomly divided into two samples used for principal-axis factoring extraction exploratory factor analysis with promax rotation ($n = 540$) and confirmatory factor analysis of the hypothesized structure ($n = 539$). Pattern coefficients greater than or equal to .40 are considered salient. Interpretation was simplified through the presentation of only salient coefficients for the exploratory factor analysis. All nonzero loadings from the confirmatory factor analysis model are presented. In the factor loadings, the first coefficient given is the promax pattern coefficient, and the second is the confirmatory factor analysis factor loading. The miniscale *p* value represents the averaged difficulty level of items in the miniscale. Thus, if a miniscale contained three items with *p* values that showed 22% of respondents answered *agree,* 20% of respondents answered *agree,* and 18% of respondents answered *agree,* the *p* value for the miniscale would equal .20 (i.e., [.22 + .20 + .18]/3). Test items from *The College ADHD Response Evaluation (CARE),* by J. Glutting, D. Sheslow, & W. Adams. Copyright 2002 by Wide Range, Inc. Reproduction of items for test use is prohibited. Reprinted with permission.
[a] Questions stated in the affirmative were reverse coded for all analyses—that is, agree (0 points), undecided (1 point), and disagree (2 points).

measured by the SRI. Table 1 presents the standardized factor loadings from the CFA, which are consistently close to the promax pattern coefficients from the other sample.

According to Kline (1998), good measurement models demonstrate moderate to high factor loadings (convergent validity) and factor correlations that are not unreasonably high (less than .85; discriminant validity). In this context, discriminant validity pertains to factor distinctiveness. As can be seen in Table 1, all factor loadings were appreciable, ranging from .59 to .89. In addition, a separate, multigroup CFA found that the three-factor structure

Table 2
One-, Two-, and Three-Factor CFA Model Fit Statistics for Student Report

Goodness of fit	One-factor model	Two-factor model	Three-factor model
df	77	76	74
χ^2	921.758	501.801	227.792
GFI	.749	.858	.941
AGFI	.658	.804	.916
TLI	.682	.838	.940
CFI	.731	.865	.951
RMSEA	.143	.102	.062
AIC	977.76	559.80	289.79
ECVI	1.817	1.041	0.539

Note. The sample used was the cross-validation sample of 539 participants held out of the initial exploratory factor analysis. CFA = confirmatory factor analysis; GFI = goodness-of-fit index; AGFI = adjusted GFI; TLI = Tucker–Lewis index; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; AIC = Akaike's information criterion; ECVI = expected cross-validation index.

replicated across genders: $\chi^2(189, N = 1{,}079) = 487.70$, GFI = .94, CFI = .95, RMSEA = .040.

EFA of the PRI

The EFAs were repeated for miniscales developed for the PRI using the randomly drawn sample of 539. PA, MAP, and scree criteria strongly indicated that two factors be retained for rotation. Consequently, two factors that accounted for 62.4% of the total variance of the PRI were retained. Because three factors appeared interpretable for the SRI, we also examined a three-factor solution for the PRI. The third factor had an unrotated eigenvalue of only .591, and after rotation only one parcel showed a loading greater than .20 (pattern coefficient = .42).

The two retained factors were interpreted according to the size of salient pattern coefficients. Table 3 displays the rotated pattern matrix for the two factors. Every miniscale showed only one salient pattern coefficient. Column 2 in Table 3 lists the specific items loading on each factor. The first dimension was defined by items portraying restless behavior, fidgeting, impatience, interrupting other people, and the inability to inhibit responses. As a result, the factor was termed Hyperactivity/Impulsivity. The second dimension was characterized by items describing poor organization, inability to follow through on instructions, forgetfulness, and low levels of vigilance and sustained attention. Therefore, the factor was named Inattentiveness. Unlike findings for the SRI, the PRI's two-factor solution showed a strong resemblance to the current two-factor model of ADHD in the *DSM–IV*. Internal-consistency reliability estimates for the two factors were .85 and .86, respectively. Furthermore, the relation between the PRI's two factors ($r = .48$ for the factors, and $r = .44$ for the two observed scale scores) was moderate and indicated that examiners can interpret the two scores separately because 77% of their variance is independent.

CFA of the PRI

CFA was used to cross-validate the results of the EFA on the sample ($n = 540$) held out from the exploratory analyses. CFA also evaluated the fit of one-factor and three-factor models for the PRI. Measures of fit for the CFA models are presented in Table 4. Preference was clearly indicated for the two-factor solution, with all two-factor model fit measures exceeding those for the one-factor model. Moreover, there was a statistically significant reduction in chi-square when we moved from the one-factor model to the two-factor model, $\Delta\chi^2(1) = 723.32$, $p < .001$. Conversely, there was no significant improvement in fit when we moved from a two- to a three-factor model, and some of the cross-validation indices actually degraded with the more complicated three-factor model. Thus, results from the CFA analysis aligned with those from the EFA analysis to show that a two-factor solution best accounted for the structure and organization of constructs measured by the PRI.

The preferred two-factor model is presented in Table 3, along with its standardized values. As illustrated, all factor loadings were appreciable, ranging from .59 to .83. Last, a multigroup CFA also found that the two-factor structure replicated across genders: $\Delta\chi^2(89) = 324.84$, GFI = .94, adjusted GFI = .93, CFI = .95, RMSEA = .050.

Comparison of Student and Parent Reports

Student and parent reports on the CARE showed moderate correlations. Student and parent Inattentiveness scales correlated .32, and the parent Hyperactivity/Impulsivity scale correlated .28 with the student Impulsivity and .23 with the student Hyperactivity scale (all ps $< .0005$, two-tailed). Contrary to previous findings with younger samples, the college students actually reported significantly higher levels of concerns than did their parents. Using paired t tests to compare the average item score for parents versus students, we found that students reported more concerns about inattentiveness (student $M = 0.42$ vs. 0.24 for parents), $t(1079) = 15.70$, $p < .0005$. Similarly, the student means for Hyperactivity ($M = 0.70$) and Impulsivity ($M = 0.35$) were both significantly higher than the parent report of hyperactive and impulsive symptoms ($M = 0.25$), ts$(1079) = 25.58$ and 8.88, respectively.

Discussion

The present study evaluated construct (factorial) validity for ADHD ratings obtained at the college level. Both student and parent reports were examined. Two earlier investigations found ADHD factors among college students that corresponded to the *DSM–IV*'s organization: (a) Inattentiveness and (b) Hyperactivity/Impulsivity (DuPaul et al., 2001; Smith & Johnson, 1998). By contrast, a third study found a three-factor solution analogous to the one offered in the *DSM–III*: (a) Inattentiveness, (b) Hyperactivity, and (c) Impulsivity (Span et al., 2002). All three prior studies used student self-reports.

In the present study, parent-reported symptoms aligned well with the *DSM–IV*'s organization. An EFA using a random draw of half of the sample uncovered two factors: Inattention and Hyperactivity/Impulsivity. This structure was supported through CFA on the other half of the sample, and the factors replicated by gender. Reliability estimates for the two parent-report factors were appreciable (Inattention = .85, Hyperactivity/Impulsivity = .86). In addition, the correlation between the two factors ($r = .48$, or .44

Table 3
Promax Pattern Coefficients and Confirmatory Factor Analysis Loadings for Parent Reported Miniscales

Miniscale no.	Items in each miniscale	Hypothesized factor of miniscale	Miniscale *p* value	Factor loading 1	Factor loading 2
1	Seemed "on the go" or acted as if "driven by a motor."	Hyperactive/Distractible	.19	.56	
	Listened well when spoken to directly.[a]			.65	
	Had difficulty engaging in leisure activity.				
	People inside and outside the family called him/her "hyper."				
2	Interrupted people's conversations or activities.	Hyperactive/Distractible	.15	.77	
	"Restless" is a word that described my child.			.85	
	Demonstrated patience and self-control.[a]				
	Fidgeted with hand or feet or squirmed in seat.				
3	Talked excessively.	Hyperactive/Distractible	.15	.72	
	Ran around or climbed things in stores or when visiting friends.			.73	
	Barged into groups, conversations, or situations not meaning to be offensive.				
4	Easy for him/her to stay seated.[a]	Hyperactive/Distractible	.15	.80	
	When questions or comments were being made, he/she was already talking.			.80	
	Had very good control of his/her temper.[a]				
5	Blurted out answers before questions had been completed.	Hyperactive/Distractible	.15	.70	
	Sat still during meals.[a]			.80	
	Patient when waiting his/her turn.[a]				
6	Left things until the last minute.	Inattentiveness	.16		.79
	Followed directions given by teachers or parents.				.76
	Followed through on instructions and finished projects or assignments.[a]				
	School assignments were remembered and necessary material brought home.[a]				
7	Made "careless" mistakes on homework, exams, or other activities.	Inattentiveness	.14		.73
	Not aware he/she was being spoken to; seemed in a "fog."				.77
	Finished school assignments independently.[a]				
	Got ready for school in the morning on his/her own.[a]				
8	Easily distracted by extraneous stimuli.	Inattentiveness	.15		.65
	Once started, could get through most homework independently.[a]				.73
	Avoided, disliked, or was reluctant to engage in tasks that required mental effort.				
9	Once started, he/she finished simple chores without reminders.[a]	Inattentiveness	.14		.68
	Seemed "spacey" or "out of it" in social interactions.				.72
	Had difficulty sustaining attention during tasks or leisure activities.				
10	Good at organizing tasks or activities.[a]	Inattentiveness	.14		.84
	Often lost things necessary for tasks or activities (e.g., school assignments, pencils, books).				.77
	Forgetful in daily activities.				

Note. $N = 1{,}079$, randomly divided into two samples used for principal-axis factoring extraction exploratory factor analysis with promax rotation ($n = 540$) and confirmatory factor analysis of the hypothesized structure ($n = 539$). Pattern coefficients greater than or equal to .40 are considered salient. Interpretation was simplified through the presentation of only salient coefficients for the exploratory factor analysis. All nonzero loadings from the confirmatory factor analysis model are presented. The miniscale *p* value represents the averaged difficulty level of items in the miniscale. Thus, if a miniscale contained three items with *p* values that showed 22% of respondents answered *agree,* 20% of respondents answered *agree,* and 18% of respondents answered *agree,* the *p* value for the miniscale would equal .20 (i.e., [.22 + .20 + .18]/3). In the factor loadings, the first coefficient given is the promax pattern coefficient, and the second is the confirmatory factor analysis factor loading. Test items are from *The College ADHD Response Evaluation (CARE),* by J. Glutting, D. Sheslow, & W. Adams. Copyright 2002 by Wide Range, Inc. Reproduction of items for test use is prohibited. Reprinted with permission.
[a] Questions stated in the affirmative were reverse coded for all analyses—that is, agree (0 points), undecided (1 point), and disagree (2 points).

between observed scores) was moderate and suggested a high level of score independence.

The *DSM–IV*'s definition of ADHD is partly the result of factor analyses of parent data (e.g., Bauermeister et al., 1992; DuPaul et al., 2001; Frick et al., 1994; Lahey et al., 1994). These studies were conducted at the time sons and daughters were children and, because of age limitations, did not incorporate children's self-reports. Parents in the current study were asked to recall behavior at the time their son or daughter attended elementary school. This procedure made offspring in the current study similar in age to the range used in other studies. Therefore, the obtained two-factor solution was expected.

Findings based on self-report did not uphold the *DSM–IV*'s organization of ADHD. The findings also failed to align with two prior factor analyses of self-reported ADHD at the college level (DuPaul et al., 2001; Smith & Johnson, 1998) but did align with results from a third analysis (Span et al., 2002). The current EFA suggested three self-report factors: Inattention, Hyperactivity, and

Table 4
One-, Two-, and Three-Factor CFA Model Fit Statistics for Parent Report

Goodness of fit	One-factor model	Two-factor model	Three-factor model
df	35	34	33
χ^2	776.483	53.165	52.556
GFI	.670	.980	.981
AGFI	.482	.968	.968
TLI	.633	.990	.990
CFI	.715	.993	.992
RMSEA	.198	.032	.033
AIC	816.483	95.165	96.556
ECVI	1.515	0.177	0.179

Note. Sample ($n = 540$) was the cross-validation sample held out of the initial exploratory factor analysis. CFA = confirmatory factor analysis; GFI = goodness-of-fit index; AGFI = adjusted GFI; TLI = Tucker–Lewis index; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; AIC = Akaike's information criterion; ECVI = expected cross-validation index.

Impulsivity. This structure closely parallels the three-factor model of ADHD in the *DSM–III*. Each of the three factors showed reasonable reliability estimates (Inattention = .82, Hyperactivity = .87, Impulsivity = .77). The three-factor organization was also confirmed through a CFA on an independent sample and again by gender. In addition, moderate correlations between the three factors (highest $r = .47$) indicated that each dimension represents a distinct, albeit correlated, aspect of ADHD symptomatology.

The difference between student and parent results is not surprising. Prior investigations with parents and adolescents showed low agreement about attention problems (Rohde et al., 1999). Parent- and student-report results for the current sample showed moderate correlations (*r*s = .23–.32 for similar constructs), which is consistent with or slightly larger than expected for parent–youth agreement about attention problems and externalizing behaviors (Achenbach, 1991; Achenbach et al., 1987; Achenbach & Rescorla, 2001).

The divergence in student structures cannot be attributed to the informant. The three prior studies, as well as the current investigation, used self-reports. The differences also cannot be due to age, ability level, or sample size, because all four investigations examined individuals attending college and used large sample sizes, each of which included 400 or more participants. Likewise, factoring methods may not fully account for the discrepancies. Two studies used EFA, and three used CFA. Moreover, one of the former studies, as well as the current investigation, used both EFA and CFA. However, it is worth noting that the present study is the first in this content area to use what methodologists agree are the most accurate decision rules for determining the number of factors: PA (Glorfeld, 1995; Horn, 1965) and the MAP method (Velicer, 1976). Prior investigations have relied on algorithms (maximum-likelihood estimation chi-square and derivative fit indices, or the Kaiser criterion of retaining eigenvalues greater than 1.0) that have demonstrated a tendency to retain too many factors (Velicer et al., 2000). It would be valuable to reanalyze prior data sets using PA and MAP to see whether these more conservative and accurate methods consistently suggest a two-factor structure.

It remains an open question whether a two- or a three-factor model best accounts for student-reported ADHD. A small number of studies using adolescent self-reports found a three-factor structure similar to the one obtained here (Gomez et al., 1999; Pillow et al., 1998). However, the most plausible reason why the current study obtained a three-factor solution relates to its extensive sampling of impulsivity content. The three earlier studies used either 18 items, 1 for each ADHD criterion in the *DSM–IV* (Smith & Johnson, 1998; Span et al., 2002), or 24 items, 18 of which came directly from the *DSM–IV* (DuPaul et al., 2001). These items were used to define the entire content domain of ADHD. Yet only three of the *DSM–IV*'s ADHD criteria evaluate impulsivity. The SRI, conversely, augments domain sampling by going beyond the *DSM–IV*. Mental health professionals who work with college students with ADHD developed items appropriate to the specific contexts and demands of college life (e.g., studying and doing homework, sitting through lectures, answering questions, taking exams, completing projects on time). As a result, the SRI uses 13 items to sample impulsivity content. This is over four times more than the three criteria in the *DSM–IV*. Therefore, the emergence of an Impulsivity factor may be a consequence of the current study including developmentally appropriate items that provide a more thorough assessment of impulsivity content.

The majority of constructs used to describe child adjustment and well-being are tied to observable behaviors (Edelbrock, 1988; McDermott, 1986). Such objective phenomena are usually evaluated through ratings completed by knowledgeable adults (e.g., parents and teachers). It may be the case that symptoms associated with impulsivity become more internalized and concealed by the time individuals reach college age. If so, an Impulsivity factor is less likely to emerge when ADHD ratings are obtained from parents, friends, or employers. Alternatively, hyperactivity and impulsivity may serve as a single construct in childhood because self-monitoring skills have not developed fully (Span et al., 2002). For these reasons, self-reported impulsivity levels not only are useful but also may be necessary to obtain a full understanding of ADHD at the college level.

Results were unexpected for specific criteria in the *DSM–IV*. Although 15 of the 18 items in the student-report analysis loaded on their hypothesized factor, 3 items were problematic. Two *DSM–IV* items theoretically should have loaded on the Inattentiveness dimension but showed appreciable pattern coefficients on the Hyperactivity factor (i.e., "I am easily distracted by extraneous stimuli," and "I do not seem to listen when spoken to directly"). Likewise, the item "I talk excessively" was expected to load on Hyperactivity but instead loaded on the Impulsivity factor. These three items were previously found to be problematic during an EFA of the *DSM–IV*'s criteria (cf. Glutting, Sheslow, & Adams, 2002). Thus, findings for specific items align with results from above to suggest that, by themselves, the *DSM–IV* criteria may be insensitive to the developmental expression of how, when, and where ADHD occurs with college students.

Outcomes from the current study need to be replicated and extended. One limitation of the study is that only 5% of the sample was known to have ADHD. Current factor structures obtained with both students and parents need to be further explored with clinical samples. A second limitation is that the study did not address diagnostic utility. A prior investigation reported high levels of discriminant validity for the CARE, but the ADHD group was restricted to 55 participants (Glutting, Sheslow, & Adams, 2002). Further validation is required with larger and more varied clinical samples (e.g., comparing CARE results of those with ADHD vs. those with LD and of student vs. parent raters). Likewise, associations to important criteria such as college grade point average are needed to determine the extent to which ADHD impedes academic performance.

A benefit of the CARE is its use of multiple informants. Although current results show that the CARE has good factorial validity, the findings are incomplete because they did not separate trait variance from source variance. When only a single source is used to evaluate the properties of ADHD measures, it is impossible to separate the amount of trait variance (e.g., inattentiveness, hyperactivity, impulsivity) from that due to source variance (i.e., the rater). Two recent studies with children demonstrated that up to 59% of the common variance between parent and teacher ratings of ADHD was due to source rather than trait variance (Burns, Walsh, & Gomez, 2003; Gomez, Burns, Walsh, & Moura, 2003). Similar analyses need to be conducted between student and parent ratings from the CARE to determine whether strong source effects are also present in ADHD assessments at the college level.

It is surprising that students in the current study reported higher average symptom scores than did parents, which differs from previous reports with younger adolescents who underreported symptoms (Cantwell, Lewinsohn, Rohde, & Seeley, 1997). It is possible that college students might have more insight into their own symptoms than is typical for youths with externalizing problems, by virtue of either their age or their above-average cognitive ability. The parent and student inventories did not include exactly the same item content, but this seems unlikely to explain the differences fully, as parent report of hyperactive and impulsive symptoms was lower than the averages for both hyperactive and impulsive items considered separately for student reports. Given the discrepancies obtained here, it is likely that examiners need to administer both the SRI and the PRI to enhance the ecological validity of ADHD assessments by emphasizing the value of cross-informant inputs. In addition, like most personality measures, the SRI and PRI are dependent on the insight and accuracy of raters. Examiners need to be aware of this limitation and take into account that the validity of the SRI and PRI is compromised whenever raters lack insight or purposively over- or underreport symptoms.

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