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When Diagnosing ADHD in Young Adults Emphasize Informant Reports, *DSM* Items, and Impairment

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Abstract

Objective—This study examined several questions about the diagnosis of attention-deficit/hyperactivity disorder (ADHD) in young adults using data from a childhood-diagnosed sample of 200 individuals with ADHD (age *M* = 20.20 years) and 121 demographically similar non-ADHD controls (total *N* = 321).

Method—We examined the use of self-versus informant ratings of current and childhood functioning and evaluated the diagnostic utility of adult-specific items versus items from the Diagnostic and Statistical Manuel of Mental Disorders (*DSM*).

Results—Results indicated that although a majority of young adults with a childhood diagnosis of ADHD continued to experience elevated ADHD symptoms (75%) and clinically significant impairment (60%), only 9.6%–19.7% of the childhood ADHD group continued to meet *DSM–IV–*

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TR (*DSM*, 4th ed., text rev.) criteria for ADHD in young adulthood. Parent report was more diagnostically sensitive than self-report. Young adults with ADHD tended to underreport current symptoms, while young adults without ADHD tended to overreport symptoms. There was no significant incremental benefit beyond parent report alone to combining self-report with parent report. Non-*DSM*-based, adult-specific symptoms of ADHD were significantly correlated with functional impairment and endorsed at slightly higher rates than the *DSM-IV-TR* symptoms. However, *DSM-IV-TR* items tended to be more predictive of diagnostic group membership than the non-*DSM* adult-specific items due to elevated control group item endorsement.

Conclusions—Implications for the assessment and treatment of ADHD in young adults are discussed (i.e., collecting informant reports, lowering the diagnostic threshold, emphasizing impairment, and cautiously interpreting retrospective reports).

Keywords

adult ADHD; diagnosis; assessment

It is clear that when children with attention-deficit/hyperactivity disorder (ADHD) become adults, many continue to display manifestations of inattention, hyperactivity, and impulsivity (Barkley, Fischer, Smallish, & Fletcher, 2006; Mannuzza, Gittelman-Klein, Bessler, Malloy, & LaPadula, 1993; Weiss & Hechtman, 1993). As such, ADHD in adults is characterized by a range of impairments in daily life functioning (Barkley, Murphy, & Fischer, 2008). For example, compared with their peers, young adults who were diagnosed with ADHD in childhood are far less likely to pursue higher education, hold a steady job, responsibly manage their finances, and maintain adaptive social relationships (Barkley et al., 2006, 2008; Weiss & Hechtman (1993). These individuals also are more likely to experience dangerous problems with driving, risky sexual behavior, substance abuse, intimate partner violence, and criminal behavior (Barkley et al., 2008; Derefinko & Pelham, in press; Flory, Molina, Pelham, Gnagy, & Smith, 2006; Mannuzza, Klein, & Moulton, 2008; Thompson, Molina, Pelham, & Gnagy, 2007; Weiss & Hechtman, 1993; Wymbs et al., in press). Despite these poor outcomes, ADHD in adulthood is poorly defined and somewhat controversial (Barkley, 2006). A major reason for this confusion is that the field lacks clear evidence-based methods for identifying ADHD in adulthood.

Studies applying strictly interpretation of Diagnostic and Statistical Manuel of Mental Disorders (*DSM;* American Psychiatric Association, 1980–2000)) diagnostic criteria report low to moderate persistence rates (4%-42%; Barkley, Fischer, Smallish, & Fletcher, 2002; Kessler et al., 2005; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998; Mannuzza, Klein, & Moulton, 2003). Therefore, experts initially believed that ADHD tends to remit after adolescence (Barkley et al., 2002; Mannuzza et al., 1998). However, other studies report higher persistence rates (49%–66%) by defining diagnostic threshold according to the presence of significant impairment or elevated symptomatology (as compared with control-group norms; Barkley et al., 2002; Weiss & Hechtman, 1993). These data suggest that, as adults, individuals with childhood ADHD display the core symptoms of the disorder and serious dysfunction (Biederman, Mick, & Faraone, 2000) but meet criteria for fewer of the *DSM* ADHD symptoms than children.

Recent work on ADHD in adults aims to better characterize its symptom expression. However, the typical adult with ADHD may not be well represented in these samples. Namely, most diagnostic research involves self-identified clinical samples of adults with ADHD (Barkley et al., 2008; Biederman et al., 2006). Typically, up to 50% of adults in these samples are women (e.g., Biederman et al., 2006), and sample participants often are not required to possess a childhood history of significant ADHD-related impairment (e.g., Barkley et al., 2008), making their composition different from samples identified in

childhood, who possess a standard ADHD diagnosis. Namely, adults with a lifetime history of ADHD tend to underestimate their problems (Barkley et al., 2002), rarely present for ADHD treatment in adulthood, and therefore are unlikely to be included in adult-referred clinical samples. As a result, confusion over the expression of ADHD in adulthood may stem from research with somewhat unrepresentative samples.

Beyond "who" is included in the aforementioned samples, correct characterization of ADHD in adulthood hinges upon "how" information about these individuals is obtained. As mentioned previously, the typical adult with a childhood history of ADHD tends to dramatically underreport his or her own problems (Barkley et al., 2002; Sibley et al., 2010). Yet, most research with adult-diagnosed samples relies solely on self-report, which only appears valid for these self-referred individuals (Barkley, Knouse, & Murphy, 2011). Specifically, reports from informants such as parents (Barkley et al., 2002), siblings (Loney, Ledolter, Kramer, & Volpe, 2007), and other adults (Barkley et al., 2008) appear to offer more valid ratings of adults with an established childhood history of ADHD. Furthermore, most adult-diagnosed samples either do not require the *DSM* "B" criterion be met (ADHD symptoms in childhood; Barkley et al., 2008; Biederman et al., 2006) or rely solely on retrospective self-report to assess childhood functioning (Faraone et al., 2006; Kessler et al., 2010). Research is mixed with regard to the ability of adults with ADHD to provide accurate retrospective report of their childhood functioning (Mannuzza, Klein, Klein, Bessler, & Shrout, 2002; Miller, Newcorn, & Halpern, 2010). Therefore, further work is needed in this area.

The recent studies with adult-diagnosed samples universally suggest that the *DSM* needs new developmentally appropriate items for ADHD in adulthood (Barkley et al., 2008; Faraone, Biederman, & Spencer, 2010; Kessler et al., 2010). Undoubtedly, some of the *DSM–IV* (*DSM*–4th ed., American Psychiatric Association, 1994) symptoms are inappropriate descriptors of adults (e.g., difficulty playing quietly, inappropriate running and/or climbing). A string of studies asserts that combining adult-specific items with several developmentally ubiquitous ones (e.g., easily distracted, difficulty organizing tasks, difficulty sustaining attention) creates an adult-ADHD algorithm that improves upon the *DSM*'s diagnostic utility (Barkley et al., 2008; Faraone et al., 2010; Fedele, Hartung, Canu, & Wilkowski, 2010; Kessler et al., 2010). However, these findings are limited by factors discussed previously, namely, the use of adult-referred samples and self-report information. Consequently, there are now several recommended sets of adult-specific ADHD items that possess very little overlap with each other (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010; Wender, 1985). To date, adult-specific ADHD items have not been examined using a sample of adults with established ADHD in childhood that provides both self- and informant-report of functioning. Using these methods might elucidate the expression of ADHD in adulthood and the utility of adult-specific items.

In sum, further work is needed to understand and standardize the diagnosis of ADHD in adulthood. Thus, in the current study, we aimed to develop recommendations for an adult-ADHD diagnostic protocol by examining the symptoms and functioning of young adults in the Pittsburgh ADHD Longitudinal Study (PALS; Molina, Pelham, Gnagy, Thompson, & Marshal, 2007). The PALS includes a sample of young adults who were well diagnosed with ADHD in childhood using standard *DSM* criteria applied in a specialty clinic setting. We first compared estimates of ADHD persistence into young adulthood by examining rates of *DSM–IV–TR* (4th ed., text rev.; American Psychiatric Association, 2000) diagnosis (A criteria), elevated ADHD symptomatology, and clinically significant functional impairment. We hypothesized that a majority of the sample would continue to display elevated ADHD symptomatology and clinically significant functional impairment in young adulthood, but that fewer would meet *DSM* criteria for ADHD. With regard to the utility of informant

report, we hypothesized that young adults with ADHD would underreport their current and childhood symptomatology and that parent report alone would be the most useful method of assessing ADHD. Next, we evaluated the performance of adult-specific item sets posited by several research teams (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010) relative to item sets based on *DSM-IV* criteria. To do so, we compared symptom endorsement rates, parent- and self-report agreement, and convergent validity for each of these item sets within the PALS ADHD and non-ADHD control groups. We hypothesized that across these indices, the adult-specific items would possess greater diagnostic utility than the *DSM* items.

Method

Participants

PALS ADHD group—The ADHD group was recruited from a pool of 516 study-eligible participants diagnosed with *DSM–III–R* (*DSM*, 3rd ed., rev.; American Psychiatric Association, 1987) or *DSM–IV* ADHD in childhood and treated at the Attention Deficit Disorder Clinic at Western Psychiatric Institute and Clinic (WPIC) in Pittsburgh, Pennsylvania, from 1987 to 1996. Of the 516 participants, 493 were recontacted an average of 8.35 years later (*SD* = 2.79) to participate in annual interviews. Of those contacted, 364 (70.5 %) enrolled in the PALS. At the first follow-up interview, the ADHD group ranged in age from 11 to 28, with 99% falling between 11 and 25 years old. They were admitted to the follow-up study on a rolling basis between the years 1999 and 2003 and completed their first follow-up interview immediately upon enrollment.

All probands participated in the summer treatment program for children with ADHD, an 8-week intervention that included behavioral modification, parent training, and psychoactive medication trials where indicated (Pelham & Hoza, 1996; Pelham et al., 2010). Diagnostic information for the probands was collected at initial referral to the clinic in childhood (baseline) using parent- and teacher-rated *DSM–III–R* and *DSM–IV* symptom scales (Disruptive Behavior Disorders Rating Scale, or DBD; Pelham, Evans, Gnagy, & Greenslade, 1992) and a semistructured diagnostic interview administered to parents by a PhD-level clinician. The interview consisted of the *DSM–III–R* or *DSM–IV* descriptors for ADHD, oppositional defiant disorder (ODD), and conduct disorder (CD) with supplemental probe questions regarding situational and severity factors. It also included queries about other comorbidities to determine whether additional assessment was needed. Following *DSM* guidelines, clinicians made diagnoses of ADHD, ODD, and CD if a sufficient number of symptoms were endorsed (considering information from both parents and teachers) to result in diagnosis. Two PhD-level clinicians independently reviewed all ratings and interviews to confirm *DSM* diagnoses; when disagreement occurred, a third clinician reviewed the file and the majority decision was used. Exclusion criteria for probands were assessed in childhood (baseline) and included a full-scale IQ < 80, a history of seizures, neurological problems, pervasive developmental disorder, schizophrenia, or other psychotic or organic mental disorders.

Participants in the follow-up study were compared with the eligible individuals who did not enroll on demographic (i.e., age at first treatment, race, and parental education level and marital status) and diagnostic (i.e., parent and teacher ratings of ADHD and related symptomatology) variables collected at baseline. Only one of 14 comparisons was statistically significant at the $p < .05$ significance level. Participants had a slightly lower average CD symptom rating on a 4-point scale as indicated by a composite of parent and teacher ratings (participants $M = 0.43$, $SD = .31$; nonparticipants $M = 0.53$, $SD = .39$).

PALS control group—Control participants were 240 individuals without ADHD recruited for the PALS from the greater Pittsburgh community between 1999 and 2001. These individuals were recruited from several sources including pediatric practices in Allegheny County (40.8%), advertisements in local newspapers (27.5%), local universities and colleges (20.8%), and other methods (10.9%) such as Pittsburgh Public Schools and word of mouth. Control recruitment lagged 3 months behind the ADHD group enrollment in order to facilitate efforts to obtain demographic similarity (discussed in later section). A telephone screening interview was administered to parents of potential control participants to gather basic demographic characteristics, history of diagnosis or treatment for ADHD and other behavior problems, presence of exclusionary criteria as previously listed for the ADHD group, and a checklist of ADHD symptoms. Young adults also provided self-report of ADHD symptoms (see Measures). ADHD symptoms were counted as present if reported by either the parent or the young adult. Participants who met *DSM–III–R* criteria for ADHD, either currently or historically, were immediately excluded from study consideration.

If a potential control participant passed the initial phone screen, senior research staff members met to determine whether he or she was demographically appropriate for the study. Each potential control participant was examined on four demographic characteristics: (a) age, (b) gender, (c) race, and (D) parent education level. A control participant was deemed study-eligible if his OR her enrollment increased the control group's demographic similarity to the participants diagnosed with ADHD. At the end of the recruitment process, the two groups were equivalent on the four demographic variables noted previously.

Current Subsample

In the current study, we utilized data from 200 ADHD participants and 121 controls who were age 18 or older upon recruitment into the follow-up study (range: 18–28 years old). ADHD participants in this subsample ranged from 5 to 16 years old at baseline (M = 10.31, SD = 2.32). Additionally, baseline and the first follow-up visit were an average of 9.89 (SD = 2.42) years apart for these participants. At baseline, 42.6% of these probands met criteria for comorbid ODD and an additional 38.3% met criteria for CD according to combined parent and teacher report. At follow-up, 69.0% of probands and 49.0% of the control group lived in their parents' home. However, living at home was not significantly related to any demographic, symptom, or impairment variables after we accounted for the participant's age. Table 1 lists demographic characteristics of this subsample (total N = 321). The two groups did not differ on any demographic variables ($p > .25$).

Procedure

As noted, baseline diagnostic information was gathered for the ADHD group at initial referral to the clinic during childhood. Follow-up interviews in young adulthood were conducted by post-baccalaureate research staff. All questionnaires (paper and pencil or Web-based) in the current study were completed privately. During informed consent, participants were assured of the confidentiality of disclosed materials. In cases where distance prevented participant travel to WPIC, information was collected through mail, telephone correspondence, and home visits. PALS follow-up interviews were conducted yearly beginning in the year of enrollment. Data for the current study were from the first follow-up visit. Participants were permitted to take stimulant medication on the day of the follow-up visit; however, few of the ADHD group (<10%) were prescribed stimulant medication at the time of assessment.

Measures

Childhood ADHD symptomatology—Baseline and retrospective report of childhood ADHD symptomatology was measured using the DBD (Pelham, Gnagy, Greenslade, &

Milich, 1992). The DBD lists the *DSM–III–R* and *DSM–IV* symptoms of ADHD, ODD, and CD. At baseline, parents and teachers of study participants were asked to provide ratings of (0) *not at all*, (1) *just a little*, (2) *pretty much*, or (3) *very much* for each symptom of ADHD, ODD, and CD. The psychometric properties of the DBD rating scale are very good in childhood and adolescent samples, with empirical support for distinguishing inattention, hyperactivity/impulsivity, ODD, and CD factors, and internally consistent subscales with alphas above .95 (Pelham, Evans, et al., 1992; Pelham, Gnagy, et al., 1992; Pillow, Pelham, Hoza, Molina, & Stultz, 1998; Wright, Waschbusch, & Frankland, 2007). Severity scores (i.e., inattention, hyperactivity/impulsivity, ADHD total) were obtained by summing the ratings for each symptom on the dimension and dividing that sum by the total number of items on the subscale. For retrospective reports, parents and young adults were instructed to rate the child's behavior at baseline (entry into the summer treatment program).

Adult ADHD symptomatology—To measure young adult symptomatology at follow-up, clinicians administered an unpublished measure to participants and their parents (provided by R. Barkley; Barkley et al., 2008). This measure includes 91 items assessing the core symptoms of ADHD and associated features in a number of adult-related settings using age-appropriate behaviors and wording. Eighteen of these items were selected for the current analyses based upon previous work asserting the superiority of these items for distinguishing individuals with ADHD from non-ADHD controls (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010). The scale also includes the *DSM–IV–TR* symptoms of ADHD. Comparable to the DBD, responses on the adult ADHD measure were on a 0–3 scale. A symptom was counted as present if the respondent endorsed (2) *often* or (3) *very often*. ADHD symptom severity scores were calculated as they were on the DBD for four previously recommended sets of adult ADHD items (discussed later; American Psychiatric Association, 2000; Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010).

Functional impairment—To determine each young adult's level of functional impairment at follow-up, clinicians administered an age-appropriate version of the Impairment Rating Scale to parents and young adults (IRS; Fabiano et al., 2006). Respondents indicated the degree of impairment a young adult displayed in seven domains that included academics, relationships with others, job performance, and overall impairment. Respondents marked an "X" on a line representing the continuum from *no problem* to *extreme problem*. Responses to each of the seven items were coded 0–6, with 0 representing no impairment and 6 representing extreme impairment. In the current study, the overall impairment item, which was rated last in the scale, was used to measure clinically significant impairment. The IRS has been shown to demonstrate good concurrent, convergent, and discriminant validity in child, adolescent, and young adult samples (Evans et al., 2012; Fabiano et al., 2006). The IRS has been shown to be highly accurate in identifying impairment in ADHD samples across settings and informants, with a score of 3 indicating clinically significant functional impairment (Evans et al., 2012; Fabiano et al., 2006).

Results

Reporting on DSM "A" Criteria

At follow-up in young adulthood, the ADHD group met an average of 2.94 *DSM* inattention symptoms (*SD* = 3.04) and 2.05 *DSM* hyperactivity/impulsivity symptoms (*SD* = 2.73) according to parent reports and 1.31 *DSM* inattention symptoms (*SD* = 2.08) and 1.52 *DSM* hyperactivity/impulsivity symptoms (*SD* = 2.27) according to self-reports. In comparison, controls met an average of 0.17 symptoms of inattention (*SD* = 0.63) and 0.12 symptoms of hyperactivity/impulsivity (*SD* = 0.41) according to parent reports and 0.53 symptoms of

inattention (*SD* = 1.17) and 0.55 symptoms of hyperactivity/impulsivity (*SD* = 1.03) according to self-reports.

To judge persistence of ADHD into young adulthood, we examined the proportion of ADHD participants by each informant method (parent-only, self-only, combined parent and self) who (a) met *DSM–IV–TR* "A" criteria for ADHD, (b) possessed clinically significant impairment, and (c) displayed an elevated ADHD severity score. As is common practice for identifying developmentally normative behavior (Achenbach, 1991), elevated severity was defined by scores that were two standard deviations above the mean of the control group for either *DSM–IV–TR* inattention symptom severity (parent = 0.96, self = 1.27) or hyperactivity/impulsivity severity (parent = 0.66, self = 1.21). Analyses (see Table 2) revealed that a majority of probands possessed elevated ADHD symptom severity and clinically significant functional impairment but did not meet *DSM* diagnostic criteria for ADHD. Persistence also varied significantly as a function of informant. Post hoc follow-up analyses (see Table 2) with a Bonferroni adjustment of $p < .006$ were used to test specific hypotheses regarding the incremental value of informant reporting. Results indicated that parent reports endorsed significantly higher symptom severity and impairment than self-reports and that there was no significant incremental benefit to combining self and parent reports.

Reporting on DSM "B Criteria"

We also investigated the ability of parents and probands to retrospectively report childhood functioning. We examined partial intercorrelations between baseline parent and teacher reports and retrospective (at PALS follow-up) parent and self-reports, controlling for the number of years since baseline. A Bonferroni adjustment set the pre-established alpha level to $p < .01$ for these analyses. Self-retrospective reports were significantly correlated with parent ($r = .28$) and teacher ($r = .25$) baseline reports of symptomatology. Parent retrospective reports were significantly correlated with parent ($r = .46$), but not with teacher ($r = .02$), reports of baseline functioning. Parent and self-retrospective reports were not significantly correlated with each other ($r = .21$). In addition, according to self-retrospective report, 53.6% of the sample met *DSM*–A criteria for ADHD in childhood. Parent retrospective report correctly identified 81.6% of the sample as meeting diagnostic criteria for ADHD.

To detect within-subject trends, we also conducted two (parent and self) repeated-measures analyses with ADHD symptomatology as the dependent variable and report source (retrospective report, parent baseline, teacher baseline) as the within-subjects variable. Examination of sample moments revealed that assumptions of normality and independence for the generalized linear model were met. Mauchley's test of sphericity was significant for both models, indicating that this assumption had been violated. As a result, the Huynh–Feldt *F* test was employed to detect univariate effects using a model that accounts for this violation. Within-subjects analysis revealed that for parent retrospective report, the model was nonsignificant, $F(1.67, 197.44) = 0.14$, $p = .25$, $\eta_p^2 = .01$, indicating that parent retrospective report of childhood ADHD symptomatology did not differ significantly from parent or teacher baseline reports. For self-retrospective report, the main effect of rating was significant, $F(1.93, 341.80) = 82.87$, $p < .01$, $\eta_p^2 = .32$. Follow-up analyses indicated that self-retrospective report suggested significantly less symptomatology than parent report, $F(1, 181) = 136.92$, $p < .01$, $\eta_p^2 = .43$, and teacher report, $F(1, 178) = 39.58$, $p < .01$, $\eta_p^2 = .37$, at baseline.

Adult-Specific ADHD Items

On average, the ADHD group met 6.76 of the 18 adult-specific symptoms of ADHD according to parent report (*SD* = 5.76) and 3.31 according to self-report (*SD* = 4.33). In comparison, the controls met 0.82 adult-specific symptoms of ADHD according to parent report (*SD* = 2.15) and 2.23 according to self-report (*SD* = 3.06).

For all chi-square and correlational analyses of adult-specific items (see Table 3), a Bonferroni adjustment set the pre-established alpha level to $p < .001$. To compare the 18 previously identified adult-specific symptoms of ADHD to the 18 *DSM* items, we first examined the percentage of participants in each group who displayed each symptom according to self and parent report. Two sets (self and parent report) of thirty-six 2 (item endorsed: yes vs no) × 2 (group: ADHD vs control) chi-square analyses were conducted (see Table 3). According to self-report, the average *DSM* item was endorsed by 15.7% of young adults with ADHD and 6.1% of controls. The average adult-specific item was endorsed by 17.9% of young adults with ADHD and 11.9% of controls. For parent-report, the average *DSM* item was endorsed for 27.8% of probands and 1.6% of controls. The average adult-specific item was endorsed for 37.8% of probands and 4.6% of controls. Table 3 displays endorsement rates for each item individually. For parent-report, average odds ratio for the between group comparisons was higher for the DSM items ($OR_M = 26.62$)[1] than for the adult-specific items ($OR_M = 18.82$). For self-report, the *DSM* items ($OR_M = 5.20$) also tended to outperform the adult-specific items ($OR_M = 1.89$) in discriminating diagnostic group. According to parent report, the ADHD symptoms that best discriminated young adults with and without ADHD were the following: easily distracted (*OR* = 65.26), trouble organizing thoughts (*OR* = 45.50), loses things (*OR* = 44.61), fidgets (*OR* = 43.24), and cannot hold things in memory (*OR* = 41.90). For self-report, the most predictive symptoms were difficulty doing things quietly (*OR* = 19.17) and difficulty remaining seated (*OR* = 16.74). Next, we examined the correlations between parent report of each *DSM* and adult-specific item and parent report of overall impairment within the ADHD sample. The *DSM* items ($r_M = .45$) and the adult-specific items ($r_M = .47$)[2] were similarly correlated with overall impairment (see Table 3).

Comparing Previously Researched Adult Item Sets

To investigate whether a previously recommended set of adult-ADHD symptoms optimally classifies young adults according to their childhood diagnostic status, we compared three previously reported ADHD item sets for adults (see Table 3; Barkley et al., 2008–nine items; Faraone et al., 2010–nine items; Kessler et al., 2010–six items) to the *DSM* item set on several dimensions. First, we examined whether the three empirically identified sets were superior to the *DSM–IV–TR* criteria for classifying probands and controls into the correct diagnostic group. For each of the four sets referenced, we conducted a binary logistic regression analyses with childhood diagnostic status (ADHD vs control) as the dichotomous dependent variable and parent report of the severity of each item in the set as continuous predictors. Correct classification represents the percentage of participants who were classified into the correct diagnostic group using a logistic regression model that contained the severity of each item in the set as predictors. The overall test of each binary logistic regression analysis was significant—*DSM–IV–TR*: $\chi^2(18) = 151.65$, $p < .001$; Barkley's nine items: $\chi^2(9) = 120.18$, $p < .001$; Faraone's nine items: $\chi^2(9) = 119.74$, $p < .001$; Kessler's six items: $\chi^2(6) = 101.96$, $p < .001$—indicating that all four item sets were able to assign the correct diagnostic classification to a significant number of cases (*DSM–IV–TR* = 87.5%; Barkley's nine items = 80.3%; Faraone's nine items = 82.1%, Kessler's six items = 78.8%).

[1]Abbreviation OR_M indicates the mean odds ratio.
[2]Abbreviation r_M indicates the mean Pearson's correlation.

Second, we examined whether parent–proband agreement was enhanced by the alternative sets of items by examining Pearson's *r* between parent report and self-report of symptom severity for each of the four sets. The relationship between parent and self-report of ADHD symptom severity was nonsignificant for all four item sets: *DSM–IV–TR* $r = .16$; Barkley's nine items $r = .16$; Faraone's nine items $r = .13$, and Kessler's six items $r = .14$).

Finally, within the ADHD group, we examined Pearson's *r* between parent-reported functional impairment and parent-reported symptom severity for each set in order to determine each set of items' relationship with overall impairment in the lives of young adults with ADHD. For all correlational analyses, a Bonferroni adjustment set the pre-established alpha level to $p < .01$. The relationship between parent-reported ADHD symptom severity and overall impairment was significant for all four item sets: *DSM–IV–TR* $r = .60$; Barkley's nine items $r = .64$; Faraone's nine items $r = .61$, and Kessler's six items $r = .59$.

Discussion

This study used a prospectively followed sample of young adults with childhood-diagnosed ADHD to examine methodological and symptomatological issues related to the diagnosis of ADHD in young adults. Findings were that (a) 75% of young adults who were diagnosed with ADHD as children possessed elevated ADHD symptomatology and 60% possessed clinically significant impairment, yet only 20% qualified for a *DSM–IV–TR*–based ADHD diagnosis, (b) current parent reports as well as parent reports made in childhood detected far more symptoms and impairment than self-report, and (c) items written to assess adult-specific ADHD symptoms were endorsed more frequently for both the young adults with and without ADHD histories, and *DSM* items better discriminate these groups. Thus, in a sample of young adults with childhood-diagnosed ADHD, it does not appear that the previously identified adult-specific item sets (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010) outperform the *DSM* items. We will discuss each of these findings in turn.

The results of our study (see Table 2) suggest that according to self- and parent report, only 10%–20% of individuals with a childhood diagnosis of ADHD continue to meet the *DSM–IV–TR* symptom count threshold in young adulthood. Despite this low diagnostic persistence rate, 72%–76% of young adults diagnosed with ADHD in childhood continued to display elevated ADHD symptomatology and 55%–60% continued to experience clinically significant impairment in daily life functioning. This discrepancy between diagnosis and functioning is also consistent with other longitudinal follow-up studies of children with ADHD (Barkley et al., 2002; Mannuzza et al., 1998; Weiss & Hechtman, 1993). The mismatch between continued ADHD-related problems and adulthood diagnostic persistence is particularly concerning because under-identification of adult ADHD may hamper the referral and treatment of impaired adults with this disorder. Failing to meet diagnostic criteria may disqualify individuals from receiving services such as medication, post–high school educational accommodations, or insurance reimbursement for psychosocial treatment. The insufficient diagnostic criteria and methods applied to adults with ADHD no doubt contribute to the still-widespread notion that children with ADHD "grow out of it" over the course of development. Most professionals who work with adults are not familiar with ADHD as a problem in their patients (Kessler et al., 2006), leading to the dearth of effective treatments available to this population (Weiss et al., 2008).

Consistent with previous studies, our data suggest that young adults with a lifetime history of ADHD reported lower levels of symptomatology and impairment than informants (Barkley et al., 2002; Loney et al., 2007). In our sample, this trend was apparent for

impairment ratings, *DSM–IV–TR* symptom ratings, and adult-specific ADHD items (see Tables 2 and 3). The discrepancy between self- and parent report may reflect persistence into young adulthood of a characteristic self-perception bias (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002) or may be directly related to the ADHD cognitive profile (i.e., the tendency to respond carelessly or rush through rating scales; Sibley et al., 2010). However, it is important to note that in a handful of cases (3%–8% of the sample; see Table 2), self-reported information made a meaningful contribution to the diagnostic assessment. Furthermore, it is also possible that some parents overreported their son's or daughter's impairments. With respect to retrospective report of childhood functioning, our results also caution against relying upon self-report. Although self-retrospective reports were modestly correlated with baseline ratings (r = .25–.28), young adults with ADHD tended to underreport their childhood symptomatology. Parent retrospective report possessed a stronger, albeit imperfect, association with baseline parent report on the same measure (r = .46). Furthermore, there is a consistent finding in the literature suggesting a tendency for adults without ADHD to overendorse ADHD symptoms (Murphy, Gordon, & Barkley, 2002; Murphy & Schachar, 2000; Sollman, Ranseen, & Berry, 2010). Consistent with this finding, control self-report endorsed higher levels of ADHD symptoms than parent-report (see Table 3). These findings suggest that it is important to obtain informant report during the assessment of a young adult's current and childhood ADHD symptoms. In fact, given these results, we suggest that the utility of self-report be considered more for the perception of awareness, development of treatment plans, and consideration of alternative concurrent mental health problems, rather than as a sole source of ADHD diagnostic information. In our sample, there was no incremental benefit to combining self-reports with parent reports.

Regardless of diagnostic status, young adults and their parents tended to endorse the adult-specific symptoms of ADHD at higher rates than the *DSM* symptoms. This finding suggests that some adult-specific items may describe somewhat normative behaviors that are not specific to ADHD. For example, an equally high proportion of probands and controls (see Table 3) endorsed difficulty in persisting on uninteresting tasks (32.1% vs. 29.8%) and being prone to daydreaming (25.5% vs 23.1%). Consequently, *DSM–IV–TR* items tended to more accurately predict diagnostic group membership than the adult-specific items, despite sometimes possessing lower symptom prevalence rates. However, *DSM* items were still endorsed at far lower rates than they typically are in childhood or even in adolescence (Sibley et al., in press). In addition, adult-specific item sets (at least those evaluated here) were not incrementally useful in the identification of childhood-diagnosed young adults with ADHD. Therefore, it may be the case that a reduced diagnostic threshold combined with developmentally appropriate descriptions of the existing *DSM* items might possesses better diagnostic utility than an entirely new set of items. This is consistent with previous recommendations to reduce the adult diagnostic threshold to four symptoms (Barkley et al., 2008) and with the proposed changes to the *DSM–V* (see http://www.dsm5.org). For example, post hoc analyses of parent-reported symptoms suggested that reducing the *DSM–A* criteria diagnostic threshold to four symptoms increased ADHD prevalence from 12.0% to 39.9% in young adults. A threshold of three symptoms increased this prevalence to 48.9%, while prevalence of ADHD in control group remained below 3%.

Unlike previous researchers, we failed to find incremental benefit in the inclusion of adult-specific ADHD items (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010). One reason for these inconsistent results may be differential item utility in childhood (i.e., the PALS) versus adult-diagnosed samples (Barkley et al., 2008; Faraone et al., 2010; Kessler et al., 2010). Considering ADHD dimensionally, we believe that some studies of adult-diagnosed individuals may oversample populations with subthreshold symptomatology and higher functioning than individuals with a lifetime history of ADHD. Like the non-ADHD controls in our sample and others (Murphy et al., 2002; Murphy & Schachar, 2000; Sollman

et al., 2010), these individuals may even overendorse symptoms of inattention, hyperactivity, and impulsivity. Thus, it is hoped that future work on the expression of ADHD in adulthood will be conducted with childhood-diagnosed samples, which may help to represent the entirety of the ADHD population.

The results of this study should be considered within the context of its limitations. While our sample was demographically representative of the county in which the study occurred, many of our participants came from middle-class families. As a result, our findings may be most generalizable to middle-class, racial-majority males. Furthermore, given the small proportion of girls in our sample (<10%), we could not independently examine differential diagnostic trends by gender. As a clinic-referred sample, the outcomes found in the PALS may not generalize to epidemiological samples of individuals with ADHD. We did not obtain report from non-parent adult informants, who may play an important role in ADHD diagnosis for adults, especially for those participants who no longer lived at home. It is possible that a greater number of symptoms would be detected for participants if an additional informant was used. Our measure of impairment was limited to parent report; however, future research should validate symptoms with objective measures of impairment to protect against method variance. The IRS also does not specify that impairment must be solely due to ADHD, so it is possible that comorbid problems impacted severity ratings. Finally, our sample of adults with ADHD was relatively young (*M* age = 20.20 years) and our findings may not generalize to older adults with ADHD. Therefore, it will be important for us to reconsider these diagnostic issues as outcome data become available from the 25- and 30-year-old PALS assessments.

Despite these limitations, we believe that our study offers several important recommendations for the diagnosis of ADHD in young adults. First, our data suggest that informant reporting should be integral to the adult ADHD diagnostic process. Some work suggests siblings and other adults who are familiar with the client may also be useful informants (Barkley et al., 2008; Loney et al., 2007). Despite the potential inconvenience of contacting informants, they are far more likely than the target individual to provide valid information about current and childhood functioning. Second, rather than abandoning the *DSM–IV–TR* ADHD items for adults, our data suggest that a less stringent symptom threshold (e.g., four symptoms) and emphasis on the presence of clinically significant impairment may be the optimal algorithm for identifying ADHD in young adults without increasing the rate of false positives.

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Table 1

Demographic Characteristics of Young Adults at Follow-Up Recruitment

Demographic variables	ADHD	Control
Age (in years; *M*, *SD*)	20.20 (2.19)	19.77 (1.73)
Gender		
Male (%)	87.0	85.1
Racial minority (%)	18.6	12.7
African American (%)	12.0	9.3
Other (%)	6.6	3.4
Highest parent education		
High school graduate or GED (%)	9.7	9.6
Part college or specialized training (%)	37.7	35.6
College or university graduate (%)	26.0	27.9
Graduate professional training (%)	26.6	26.9
Single-parent household (%)	31.1	30.9

Note. All comparisons nonsignificant $p > .25$. ADHD = attention-deficit/hyperactivity disorder; GED = general equivalency degree.

Table 2

Proportion of ADHD Sample With Persistent Symptomatology at Follow-Up Crossed With Report Source

	Informant						
Variable	**Parent**	**Self**	**Combined**	χ^2	***df***	***p***	***OR***
DSM symptom threshold	12.0%	9.6%	19.7%	—	—	—	—
Parent vs self	—	—	—	0.28	1	.59	1.22
Parent vs combined	—	—	—	4.09	1	.04	1.90
Self vs combined	—	—	—	6.41	1	.01	2.32
Elevated symptom severity	71.8%	24.4%	75.6%	—	—	—	—
Parent vs self	—	—	—	70.31	1	<.001	7.87
Parent vs combined	—	—	—	0.60	1	.44	1.22
Self vs combined	—	—	—	82.05	1	<.001	9.64
Clinically significant impairment	55.6%	14.6%	60.4%	—	—	—	—
Parent vs self	—	—	—	58.96	1	<.001	7.41
Parent vs combined	—	—	—	.63	1	.43	1.20
Self vs combined	—	—	—	70.36	1	<.001	8.85

Note. McNemar's nonparametric chi-square tests were used to assess significant differences in prevalence from data of 159 young-adult participants with attention deficit/hyperactivity disorder for whom parent report was available. *Diagnostic and Statistical Manual* (*DSM*) symptom threshold represents DSM–A-criteria of at least six symptoms of either inattention or hyperactivity/impulsiveness. Elevated symptom severity was calculated based on 2 standard deviations above the mean of control group inattention or hyperactivity/impulsiveness severity. *OR* = odds ratio.

Table 3

Comparison of Diagnostic and Statistical Manual (4th ed., Text Rev.) and Adult-Specific Attention-Deficit/Hyperactivity Disorder Items

	Self-report				Parent report				
Symptom	**ADHD %**	**Control %**	**$\chi^2(1)$**	***OR***	**ADHD %**	**Control %**	**$\chi^2(1)$**	***OR***	**Correlation (*r*) with impairment[a]**
DSM–IV–TR symptoms									
Makes careless mistakes[b]	9.2	5.8	1.19	1.65	37.4	5.4	31.18*	10.52	.47*
Difficulty sustaining attention[b]	11.8	5.8	3.14	2.18	24.5	1.1	23.95*	29.84	.48*
Does not listen	9.3	1.7	7.29	6.09	18.4	0.0	19.25*	—	.44*
Difficulty following instructions	14.9	1.7	14.75*	10.40	37.4	2.2	39.12*	27.20	.57*
Difficulty organizing tasks[c]	10.2	6.6	1.20	1.61	38.4	2.2	40.09*	28.00	.46*
Dislikes tasks requiring attention	12.8	4.2	6.39	3.36	37.2	2.2	35.99*	17.80	.57*
Loses things	14.9	6.6	4.93	2.47	32.7	1.1	35.96*	44.61	.34*
Easily distracted	29.1	17.4	5.55	1.95	41.5	1.1	48.58*	65.26	.54*
Forgetful in daily activities	15.3	5.0	7.96	3.46	29.9	1.1	31.14*	39.30	.42*
Fidgets	29.6	17.4	5.99	2.00	32.0	1.1	33.99*	43.24	.35*
Difficulty remaining seated	12.2	0.8	13.43*	16.74	12.6	1.1	10.09*	13.25	.48*
Restless	23.0	6.6	14.36*	4.21	28.8	0.0	32.46*	—	.44*
Difficulty doing things quietly[c]	13.8	0.8	15.58*	19.17	13.7	1.1	11.30*	14.60	.43*
On the go, driven by motor	19.0	8.3	6.63	2.58	25.7	0.0	28.32*	—	.34*
Talks excessively	18.9	10.0	4.48	2.09	24.5	3.2	18.93*	9.73	.33*
Blurts out answers	12.8	6.6	3.03	2.07	17.0	1.1	14.97*	18.85	.41*
Difficulty waiting turn	15.4	2.5	13.15*	7.09	22.4	1.1	21.40*	26.63	.45*
Interrupts or intrudes	10.3	2.5	6.75	4.52	25.9	3.2	20.58*	10.46	.50*
Adult-specific symptoms									
Easily distracted during concentration[c]	27.6	19.0	2.70	1.62	42.2	7.6	32.93*	8.86	.50*

Symptom	Self-report				Parent report				Correlation (*r*) with impairment[a]
	ADHD %	Control %	$\chi^2(1)$	*OR*	ADHD %	Control %	$\chi^2(1)$	*OR*	
Makes decisions impulsively[c]	24.5	18.2	1.73	1.46	40.8	5.4	36.23*	12.14	.47*
Difficulty doing things in proper order[c]	12.8	9.1	1.00	1.46	23.3	1.1	22.43*	27.93	.42*
Starts projects without directions[c]	25.0	17.4	2.54	1.59	46.3	6.5	42.32*	12.48	.46*
Difficulty stopping activities[c]	10.8	9.1	.25	1.21	29.7	2.2	28.13*	19.25	.46*
Poor follow-through[c]	7.7	8.3	.03	.93	33.3	3.2	30.42*	15.00	.57*
Prone to daydreaming[d]	25.5	23.1	.23	1.14	27.9	3.2	23.15*	11.60	.34*
Lacks self-discipline[d]	11.2	9.0	.13	1.15	52.4	6.5	53.00*	15.97	.58*
Trouble doing what tells self[d]	15.3	5.8	6.58	2.94	25.9	1.1	25.69*	32.07	.50*
Cannot defer gratification[d]	17.3	9.1	4.19	2.10	38.8	7.5	28.44*	7.78	.48*
Trouble thinking clearly[d]	15.4	4.1	9.60	4.22	29.5	2.2	27.10*	19.00	.48*
Cannot hold things in memory[d]	16.8	8.3	4.69	2.25	31.3	1.1	33.03*	41.90	.44*
Difficulty persisting on uninteresting tasks[d]	32.1	29.8	.20	1.12	57.8	11.8	50.21*	10.22	.41*
Trouble organizing thoughts[d]	17.4	9.1	4.26	2.11	33.3	1.1	35.57*	45.50	.52*
Difficulty prioritizing work[b]	14.3	7.4	3.40	2.07	46.3	3.2	50.64*	25.82	.54*
Trouble planning ahead[b]	15.8	6.6	5.88	2.65	40.8	5.4	36.23*	12.14	.46*
Cannot complete tasks on time[b]	16.3	6.6	6.40	2.76	34.0	4.3	28.84*	11.47	.52*
Cannot work unless under deadline[b]	16.4	14.0	.32	1.20	47.6	8.6	39.53*	9.66	.39*

Note. OR = odds ratio.

[a] Impairment *r* represents the relationship between parent endorsed symptom severity and parent rated overall impairment (Impairment Rating Scale; Fabiano et al., 2006).

[b] Items suggested by Kessler et al., 2010.

[c] Items suggested by Barkley et al., 2008.

[d] Items suggested by Faraone et al., 2010.

* $p < .001$.