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How Persistent is ADHD into Adulthood? Informant Report and Diagnostic Thresholds
in a Female Sample

By

Brian Tate Guelzow

A dissertation submitted in partial satisfaction of the
requirements for the degree of

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in

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of the

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Committee in charge:

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How Persistent is ADHD into Adulthood? Informant Report and Diagnostic Thresholds in a Female Sample

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Abstract

How Persistent is ADHD into Adulthood? Informant Report and Diagnostic Thresholds in a Female Sample

By

Brian Tate Guelzow

Doctor of Philosophy in Psychology

University of California, Berkeley

Professor Stephen P. Hinshaw, Chair

Although the notion that Attention-Deficit/Hyperactivity Disorder (ADHD) often persists into adulthood is increasingly accepted, important diagnostic questions remain. Using a large (baseline proband $n = 140$, comparison $n = 88$) prospectively followed, ethnically diverse female sample, I examined the impacts of (a) informant (i.e., parent- vs. self-report) and (b) diagnostic symptom threshold (i.e., the DSM-IV 6/9 symptoms of inattention [IA] or hyperactivity/impulsivity [H/I] vs. a developmentally referenced criterion [DRC]) on estimates of ADHD persistence from childhood (age range 6-12) into young adulthood (mean age = 19.6 years). Further, I assessed and compared the predictive validity of ADHD status per each informant, as well as via the two different symptom cutoffs, on measures assessing functioning in a number of important domains (e.g., depression, academic achievement, global impairment).

Separate 2 x 2 (Wave 1 diagnostic status x Wave 3 diagnostic status) chi-square analyses revealed that per parent report, significantly more probands (44%) than baseline comparison participants (1%) met full ADHD criteria ($\chi^2 [187] = 42.51, p < 0.001, \phi = 0.47$). Significantly more probands (22%) than comparisons (2%; $\chi^2 [209] = 15.97, p < 0.001, \phi = 0.28$) met full criteria via young adult self-report as well. Informant diagnostic concordance was significant, but of a small effect size ($\kappa = .22$). Using a series of hierarchical multiple regression analyses and controlling for key covariates, parent-reported ADHD was found to be independently associated with poorer outcomes on eight of nine considered measures ($|\beta|$'s ranging from 0.18 to 0.61). Self-reported ADHD was independently associated only with lower math scores ($|\beta| = .18$).

As in past research, the DRC was set at two SD above the comparison participants' mean symptom number, yielding a diagnostic threshold of 4/9 H/I and 5/9 IA symptoms. Via the DSM-IV cutoff, ADHD was estimated to persist in 55.9% of baseline probands; via the DRC, this estimate rose to 61.4%. One-way ANCOVA models were used to test mean differences on outcome measures for participants who met the DSM-IV threshold, those who only met the DRC ("DRC-only"), and those who met neither threshold. All models were significant (all F s > 6.50 , all p s $< .01$). DRC-only participants endorsed poorer outcomes of large to very large effect sizes

across seven of the study's nine outcome measures, compared to participants who met neither cutoff. Further, DRC-only participants did not differ on any outcome measure from those who met the higher DSM-IV threshold.

The present findings add to extant research in suggesting that (a) parent-report yields higher ADHD persistence estimates than young adult self-report and (b) parent-reported persistence remains a more potent predictor of young adult functioning than self-report. Findings also suggest that self-reported ADHD persistence rates may be higher in young adult females than in males, although this suggestion merits further investigation. Further, findings suggest that a lower symptom threshold than that traditionally used in clinical nomenclatures (i.e., than a threshold identical to that of child-based diagnosis) may be more developmentally appropriate in young adults.

Introduction

As recently as the 1990's, attention-deficit/hyperactivity disorder (ADHD) was believed by many (e.g., Hill & Schoener, 1996; Shaffer, 1994) to be a condition of childhood and adolescence that remitted by adulthood in the vast majority of cases (Barkley, Murphy, & Fischer, 2008; Spencer, Biederman, Wilens, & Faraone, 1998). As participants in a number of long-term follow-up studies have matured into young adulthood, however, it has become increasingly clear that ADHD symptoms, and particularly impairment, persist past adolescence for many (Barkley et al., 2008; Wilens, Faraone & Biederman, 2004). This realization has fueled a surge of interest in the scientific and popular press, leading to a dramatic rise in treatment seeking, including a 90% increase in U.S. stimulant medication prescriptions for individuals over the age of 19 between March 2002 and June 2005 (Okie, 2006).

Yet important diagnostic issues and research questions remain. Estimates of the persistence of ADHD from childhood into adulthood in males range hugely from 5%-66% (Mannuzza, Klein, & Moulton, 2003), due in part to crucial methodological differences between extant longitudinal studies. Furthermore, study of the persistence of ADHD into young adulthood is complicated by a number of nosological difficulties, related to the fact that ADHD was first conceptualized as a disorder of childhood and adolescence (Adler, Barkley, & Newcorn, 2008; Kessler et al., 2010; McGough & Barkley, 2004; McGough & McCracken, 2006). Of particular interest herein are the questions of whether the diagnostic thresholds established for children (i.e., 6 of 9 symptoms of inattention [IA] or hyperactivity/impulsivity [H/I]) in the *Diagnostic and Statistical Manual of Mental Disorders – 4th edition* (DSM-IV; American Psychiatric Association, 1994) are excessively stringent when applied across the lifespan, and whether young adults versus their parents (or other informants) are more accurate reporters regarding adult ADHD symptomatology and impairment. In addition, the vast majority of research into ADHD at all ages has been conducted with samples that are exclusively or predominately male, leaving many unanswered questions regarding the persistence and presentation of the disorder across the lifespan in females (Biederman et al., 2010; Biederman, Petty, O'Connor, Hyder, & Faraone, 2012; Gaub & Carlson, 1997; Gershon, 2002; Hinshaw, 2002; Monuteaux, Mick, Faraone, & Biederman, 2010; Nussbaum, 2012; Rucklidge, 2010).

The present study seeks to help clarify the thorny issue of ADHD persistence into adulthood. I first examine such persistence in a prospectively followed sample of females, focusing on differences in estimates obtained from parent-report and young adult self-report. I then assess whether a 'developmentally referenced criterion' (DRC) symptom threshold detects impairment beyond the DSM-IV cutoff.

Prevalence Estimates of Adult ADHD

There is notable variability in adult ADHD prevalence estimates yielded by cross-sectional studies of large community samples. Murphy and Barkley (1996) examined symptom prevalence in adults recruited from Department of Motor Vehicles offices and reported a 4.7% prevalence rate for current ADHD. A Dutch study (Kooij et al., 2005) assessed self-reported current ADHD symptoms in a large community-based probability sample aged 18-75 years. Using the DSM-IV symptom cutoff, the authors arrived at a prevalence estimate of 1.0%. The National Comorbidity Survey-Replication (Kessler et al., 2005), the first large-scale U.S. psychiatric epidemiological study to include adult ADHD, yielded a prevalence estimate of 4.4%. The World Health Organization's World Mental Health study (Fayyad et al., 2007)

estimated the prevalence of adult ADHD in ten countries in Europe, the Americas, and the Middle East. The overall prevalence estimate for adult ADHD was 3.4%. A meta-analytic review (Simon, Czobor, Balint, Meszaros, & Bitter, 2009) arrived at a pooled adult prevalence estimate of 2.5% (about half the international rate for children and adolescents; see Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007), with individual study estimates ranging from 1.0% to 7.3%. The authors noted that the studies all used DSM-IV diagnostic criteria, even though most questioned the applicability of this criterion set to adults. Extant research with youth samples suggests that the range in these estimates is likely largely due to methodological differences (Polanczyk et al., 2007).

Available epidemiologic investigations do not examine ADHD's persistence across the lifespan. Moreover, there are strong reasons to believe that cross-sectional samples of adults who meet diagnostic criteria for ADHD are quite different from samples of children with carefully ascertained hyperactivity or ADHD, followed longitudinally into adulthood (see Barkley et al., 2008). Thus, I now review major longitudinal studies, featuring predominately male samples.

Prospective Investigations in Males

In the early 1960's, Weiss and colleagues began the Montreal Study, one of the first to examine ADHD across the lifespan (baseline proband $n = 104$; control $n = 45$). At 15-year follow-up, with mean age of 25 years, the Montreal Study found rates of persistence of 44% (via observed restlessness in the follow-up interview) and 66% (via self-reported persistence of one or more impairing core symptoms; see Weiss, Hechtman, Milroy, & Perlman, 1985). Hyperactive participants had much lower overall functioning levels, significantly fewer years of education, and a higher number of suicide attempts than controls. They also had a higher rate of Antisocial Personality Disorder and more comorbidity overall.

Another early prospective study was initiated in New York City by Mannuzza, Klein, and colleagues. The New York Study assembled two clinic-referred cohorts of Caucasian male probands (baseline total $n = 207$) and added controls (total $n = 178$) at adolescent follow-up. By young adulthood, rates of DSM-III-R (American Psychiatric Association, 1987) ADHD had declined precipitously (Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993, 1998). Persistence rates of 6% and 1% were reported in probands and controls, respectively, a far lower estimate than those observed in other longitudinal studies (Mannuzza, Klein, & Moulton, 2003). The authors noted that the exclusion of children with primary aggression or other antisocial behavior might have resulted in a baseline sample with low overall impairment, with consequently improved adult outcomes. In the 33-year follow up (mean age = 41), the authors reported a 22.2% prevalence of ADHD in probands, who also showed poorer educational and occupational outcomes than comparisons, as well as higher rates of divorce, incarceration, and death (Klein et al., 2012). Probands did not differ from comparisons, though, in rates of mood or anxiety disorders or adult-onset psychopathology.

Rasmussen and Gillberg (2000) reported on the young adult outcomes of a controlled longitudinal community sample recruited from all 6-year-olds living in Gothenburg, Sweden. At 15-year follow-up (mean age = 22), 49% of ADHD probands (vs. 9% of controls) reported 'marked symptoms' of ADHD. Broadly, 58% of probands (vs. 13% of controls) had at least one of six assessed negative life outcomes (e.g., completion of <12 years of education).

A research team in Boston assembled a sample of clinic-referred DSM-III-R ADHD-diagnosed Caucasian males (baseline $n = 140$) and matched controls (baseline $n = 120$). At young adult follow-up (mean age = 22), full or “subthreshold” (i.e., 4 or 5 symptoms; all other criteria present) DSM-IV ADHD was observed in 58% of probands and 6% of controls (Biederman et al., 2006). Probands also had significantly higher rates of lifetime antisocial, addictive, mood, and anxiety disorders.

Another influential study, conducted in Milwaukee, tracked the outcomes of 158 clinic-referred hyperactive children and 81 matched controls (Barkley, Fischer, Edelbrock, & Smallish, 1990). Young adult outcomes were reported in 2002 (Barkley, Fischer, Smallish, & Fletcher), with a focus on the impact of informant (i.e., parent vs. young adult) on ADHD persistence estimates. The study also investigated whether a DRC would detect meaningful impairment more comprehensively than the standard DSM diagnostic threshold. Via parent-reported DSM-IV criteria, ADHD was found to persist in 58% of probands in young adulthood.

Mannuzza et al. (2003) discussed methodological differences that may have contributed to the disparate persistence estimates across extant longitudinal studies (i.e., the Montreal, New York, Swedish, and Milwaukee studies). Only the Milwaukee Study had interviewed both young adults and caregivers, with parent assessments yielding dramatically higher persistence estimates. Differential proband retention was also cited as a possible problem, as the Montreal study had only 59% retention at young adult follow-up. Barkley and colleagues (2002) noted that varied diagnostic procedures across studies might have influenced persistence estimates. Moreover, attempts to estimate ADHD persistence across the lifespan are complicated by numerous questions regarding the applicability of DSM-IV diagnostic criteria to adults. Among these, questions of symptom thresholds and informant validity are central to the present study.

DSM-IV ADHD Diagnostic Limitations and Controversies

In a provocative editorial, McGough and McCracken (2006) noted that for most psychiatric disorders (e.g., depression), diagnostic criteria were formulated based upon the most typical presentation in adults, then applied to children. Regarding ADHD, however, the opposite is true, as criteria derived from its childhood presentation are applied to adults (McGough & McCracken, 2006). Given normative ADHD symptom declines across the lifespan (Hart, Lahey, Loeber, Applegate, & Frick, 1995) and the vast qualitative and quantitative differences in domains of adult and child functioning, the appropriateness of DSM-IV ADHD criteria for adults has been broadly questioned. As stated by McGough and Barkley (2004), these criteria “make no allowance for developmental variations in symptom expression (p. 1953).” As the release of DSM-5 approached, a variety of recommendations were made to increase the applicability of ADHD criteria across the lifespan (e.g., Barkley, 2010; Barkley et al., 2008; Bell, 2011; Coghill & Seth, 2011; Hechtman, French, Mongia, & Cherkasova, 2011; Kessler et al., 2010; McGough & Barkley, 2004; McGough & McCracken, 2006; Polanczyk et al., 2010; Ramtekkar, Reiersen, Todorov, & Todd, 2010; Rutter, 2011). Initial proposed changes to the DSM-5 included shifting the diagnostic symptom threshold to 4/9 symptoms of IA or H/I in individuals aged 17 or older (for rationale, see Heiligenstein, Conyers, Berns, & Miller, 1998; Kooij et al., 2005). Ultimately, though, in addition to relaxing the age of onset criterion from under 7 to under 12 years of age for the presence of at least some impairing symptoms and modifying symptom descriptions to include adult-relevant manifestations, the published DSM-5 set the diagnostic cutoff at 5/9 symptoms of IA or H/I (American Psychiatric Association, 2013).

Sensitivity of diagnostic thresholds. As clearly demonstrated by Murphy and Barkley (1996), the DSM-IV 6/9 symptom diagnostic cutoff (or, indeed any fixed ADHD symptom threshold set in childhood) becomes far more statistically deviant by adulthood than in childhood.

In their meta-analysis of prevalence studies, Simon et al. (2009) found that although ADHD symptoms normatively decline with age, functional impairment persists. This finding led the authors to echo the contention of Barkley et al. (2002) that rather than outgrowing ADHD, many adults may merely “outgrow the diagnostic criteria” (p. 209).

In a meta-analysis of 32 longitudinal studies, a distinction was made between “syndromatic” (i.e., continuing to meet full diagnostic criteria) and “symptomatic” (i.e., the maintenance of <6 symptoms yet with continued impairment) types of ADHD persistence (Faraone, Biederman, & Mick, 2006). The authors asserted that reliance upon the former definition would lead to low persistence estimates, as many adults still struggling with impairing ADHD symptoms would be categorized as “in remission.” Indeed, via syndromatic persistence, only 15% of participants across studies were classified as having ADHD at age 25, compared to 40-60% via symptomatic persistence. Thus, I test both syndromatic and symptomatic persistence in this investigation.

Informant discrepancies. Because of (a) the generally low correspondence across informants regarding youth emotional/behavioral problems (Achenbach, McConaughy, & Howell, 1987), and (b) the well-documented tendency for children with ADHD to overestimate their competence (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007), a multi-informant approach to assessment is crucial. Yet less is known about informant correspondence for adult assessment (Sibley et al., 2010, 2012). McGough and Barkley (2004) noted that adults with ADHD often struggle to remember details of their childhood functioning (e.g., Barkley et al., 2002; Mannuzza, Klein, Klein, Bessler, & ShROUT, 2002), and may overestimate their current competence (e.g., Knouse, Bagwell, Barkley, & Murphy, 2005) or under-report maladaptive behavior (e.g., Sibley et al, 2010). Corroboration from additional informants and/or official records may thus be crucial when assessing ADHD-related symptoms and impairment in adults.

Indeed, it has been reported that among young adults who were initially diagnosed with ADHD as children, self-report estimates of DSM-III-R ADHD did not differentiate probands from controls, with rates of 5% and 0%, respectively (Barkley et al., 2002). Further, self-reports did not differentiate the number of probands and controls who met a DRC cutoff (defined as two standard deviations [SD] above the mean number of symptoms seen in control participants), with rates of 12% and 10%, respectively (Barkley et al., 2002). In contrast, large differences emerged via parent-report, with 46% of probands meeting criteria for ADHD persistence via the DSM threshold and 66% via the DRC, vs. 1% and 8% of controls, respectively. Further, parent-reported symptoms contributed to all eight impairment domains, while self-report only contributed to two. Moreover, the 27 probands who met the DRC threshold but *not* the DSM cutoff showed greater impairment than controls on six of eight outcomes (e.g., higher number of arrests, fewer years of education, poorer employer-rated job performance) (Barkley et al., 2002). These findings underscore the importance of parental report and symptomatic (i.e., DRC) versus strict syndromatic definitions of adult persistence. At present, though, few investigations have examined the issue of informant concordance or differing diagnostic thresholds in young adult women diagnosed with ADHD in childhood.

ADHD in Females

ADHD has been far more extensively studied in males than in females. Because a number of large prevalence studies have suggested that the male: female ratio of the disorder may be markedly lower than once believed, especially in adulthood (e.g., DuPaul et al., 2001; Kessler et al., 2005; Ramtekkar et al., 2010; Simon et al., 2009), research on ADHD in young women presents an urgent area of need (see also Gaub & Carlson, 1997; Gershon, 2002). Overall, girls with ADHD may be at particularly high risk for negative outcomes over time (see Babinski et al., 2011; Biederman et al., 2010, 2012; Chronis-Tuscano et al., 2010; Dalsgaard, Mortensen, Frydenberg, & Thomsen, 2002; Hinshaw et al., 2012).

In terms of diagnostic persistence, Babinski et al. (2011) examined rates of ADHD in the female subsample of the Pittsburgh ADHD Longitudinal Study (PALS). Of the 58 female participants (34 probands, 24 controls), assessed at a mean age of 19.9 years, ADHD was found to persist in 41% (via parent-report utilizing DSM-IV criteria), compared to only 13% via self-report. With a DRC of 1.5 SD above the comparison mean, both the parent-report and self-report estimates rose, to 57% and 23%, respectively. Parents also reported impairment in more domains (e.g., self-esteem, parent and sibling conflict) than young adults. Further, Hinshaw et al. (2012) reported that over 40% of childhood-diagnosed girls with ADHD no longer met the DSM-IV cutoff in young adulthood, in spite of persistent impairment. This study pursues crucial additional analyses with this sample.

Hypotheses

In the current study, I investigated young adult outcomes in the largest prospectively followed sample of preadolescent girls with ADHD, the Berkeley Girls with ADHD Longitudinal Study (BGALS), described below. I examined the concordance of parent-reports versus young adult self-reports of current ADHD symptomatology, with a further focus on the extent to which each predicted functioning in a number of important domains. I also investigated whether a DRC threshold detected impairment above and beyond a strict DSM-IV cutoff. On the basis of the literature reviewed above, I tested several key hypotheses.

First, I predicted that at young-adult follow-up, estimates of ADHD persistence – defined as meeting full DSM-IV diagnostic criteria (via the Young Adult Diagnostic Interview Schedule for Children – 4th edition [YADISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000]) – would vary significantly, depending upon the informant interviewed. Specifically, I predicted that childhood-ascertained probands would continue to show higher rates than comparison participants, based upon parent-report but not self-report. I further predicted that concordance between parent- and self-reports regarding ADHD symptomatology would be statistically significant, but with a small effect size.

Second, I hypothesized that estimates of young-adult ADHD persistence – as measured dimensionally by ratings on the Swanson, Nolan, and Pelham Rating Scale – 4th edition (SNAP-IV; Swanson, 1992) – would vary depending upon the diagnostic cutoff used. Specifically, I anticipated that a DRC threshold (defined as two SD above the mean scores for comparison participants) would yield higher estimates of ADHD persistence than DSM-IV symptom cutoffs.

Third, I hypothesized that degree of current impairment – operationalized by level of depression, self-esteem, externalizing symptoms, academic achievement, global impairment, and number of out-of-home placements – would be differentially predicted by (a) informant and (b) diagnostic approach. Specifically, I predicted that (a) parent-reported ADHD status would be a

better and more robust predictor of impairment than self-reported ADHD status; and (b) participants who met the DRC threshold but fell short of the DSM-IV symptom cutoff for ADHD (hereafter referred to as “DRC-only” participants) would show impairment in more domains, and with higher predictive validities, than participants who met neither threshold, *and* would not differ significantly from participants who met the DSM-IV symptom cutoff.

Method

Overview of Procedures

This investigation used data from the 10-year follow-up (Wave 3) of BGALS participants. At baseline (Wave 1), a large, carefully diagnosed sample of girls (proband $n = 140$, comparison $n = 88$, age range 6-12) participated in research day camps, conducted during the summers of 1997, 1998, and 1999 (see Hinshaw, 2002 for full description). Probands exhibited poorer functioning than comparisons in all domains assessed, including higher levels of internalizing and externalizing problems, greater peer rejection and conflict, poorer academic performance and cognitive abilities, and higher incidences of negative parent-child communication patterns and authoritarian parenting (Hinshaw, 2002; Mikami & Hinshaw, 2003; Peris & Hinshaw, 2003; Zalecki & Hinshaw, 2004).

At the 5-year follow-up (Wave 2), participants were re-assessed in adolescence (proband $n = 128$, comparison $n = 81$, mean age = 14.2; see Hinshaw, Owens, Sami, & Fargeon, 2006). ADHD was found to persist in 80.2% of probands. Differential declines were seen in the broad ADHD symptom clusters, with greater diminution of H/I symptoms than IA symptoms. Even so, baseline-ascertained probands fared significantly worse than comparisons in all of the assessed outcome domains (Hinshaw et al., 2006). Moreover, far fewer probands than comparison participants (16.4% vs. 86.4%, respectively) exhibited “positive adjustment,” defined as functioning well in at least five of six life domains (Owens, Hinshaw, Lee, & Lahey, 2009).

Five years later, at Wave 3 (Hinshaw et al., 2012), baseline-ascertained probands continued to show higher rates of ADHD symptoms and impairments than comparisons in nearly all assessed domains (e.g., psychiatric symptomatology, academic achievement, global impairment). Further, baseline probands who no longer met the definition for syndromic ADHD persistence (i.e., reported fewer symptoms than the DSM-IV threshold) still exhibited more impairment than comparisons. Miller, Ho, and Hinshaw (2012) compared baseline-ascertained comparisons with two subgroups of baseline probands: (a) those who still met full ADHD diagnostic criteria and (b) those whose ADHD had “remitted” at Wave 3. Both persistent and remitted probands showed greater executive function impairment than comparisons, further underscoring the need to examine the appropriateness of DSM-IV diagnostic thresholds.

Participants

At Wave 1, a multi-gated screening and diagnostic procedure was used to recruit girls with ADHD, plus age- and ethnicity-matched comparison participants. Recruitment materials were sent to a variety of settings, including mental health clinics, schools, and pediatricians. Interested families contacted study staff and were mailed packets of measures to be completed by parents and teachers. Participants were initially considered for the ADHD group if (a) at least 5 (of 9) symptoms were endorsed on their parent and teacher SNAP-IV IA Scale, and (b) they had

a score of at least $T = 60$ on their parent-reported Child Behavior Checklist (CBCL) (Achenbach, 1991a) and Teacher Report Form (TRF) Attention Problem scale (Achenbach, 1991b). These cutoffs were set low to avoid excluding participants before a thorough assessment could be conducted. To be considered for the comparison group, participants' scores had to fall below these thresholds. Families of girls meeting screening criteria for either the ADHD or comparison groups were then invited to complete a diagnostic interview. ADHD status was defined as meeting full DSM-IV diagnostic criteria on parent-rated SNAP-IV scales and the Diagnostic Interview Schedule for Children-4th edition (DISC-IV) (Shaffer et al., 2000). Participants were classified as comparisons if their DISC-IV ADHD module profile was negative.

The baseline sample reflected the ethnic diversity of the San Francisco Bay Area (i.e., 53% Caucasian, 27% African American, 11% Latina, 9% Asian American); participating families' socioeconomic status ranged from receiving public assistance to the highest income strata.

Wave 2 assessments yielded a retention rate of 92%. Five years later, participants were re-contacted and asked to participate in the third wave of data collection. Social media outlets (e.g., Facebook) were used, allowing study staff to reestablish contact with participants who could not be located at Wave 2 follow-up. Thus, retention was excellent, with at least some data collected from 95% of the study's baseline sample (216/228) in young adulthood (Wave 3 age range = 17-25, mean age = 19.6). The 12 participants lost to follow-up differed from the retained sample on five out of 23 baseline measures, showing lower family income, lower IQ, and greater symptomatology (Hinshaw et al., 2012).

Young adult assessments were conducted over two half-day, clinic-based sessions by highly trained bachelor's-level research assistants or clinical psychology doctoral students. Assessors were unaware of participants' baseline diagnostic status. When clinic visits were not possible, assessments were conducted at participants' homes or over the telephone. Parents of participants (usually mothers) completed a battery of measures during a single clinic-based session, or via telephone or home visits. For questions related to ADHD, parents and young adults were asked to give responses that described non-medicated functioning. Because of occasional assessment difficulties that arose (e.g., participant fatigue, or refusal to complete full battery, computer failure), sample size varied among the measures analyzed, as noted in Results.

Measures

Predictor Variables: ADHD Status and Symptom Counts. At Wave 1 and subsequent follow-ups, a multi-method, multi-informant procedure was used to ascertain ADHD status (see Hinshaw, 2002; Hinshaw et al., 2006, 2012 for full descriptions).

Diagnostic Interview Schedule for Children – 4th edition, Young Adult Diagnostic Interview Schedule for Children – 4th edition (DISC-IV and YADISC-IV; Shaffer et al., 2000). The DISC-IV is a highly structured diagnostic interview that is well-validated and widely used in child and adolescent psychology research. The DISC-IV provides categorical DSM-IV diagnoses, based upon symptom counts and severity, as well as duration of impairment. DISC-IV diagnoses demonstrate good-to-adequate test-retest reliability in both clinical and community samples (Shaffer et al., 2000). The Wave 1 ADHD group included girls diagnosed with the ADHD-I and ADHD-C subtypes. However, for the present study's analyses, these subtypes were combined to yield a dichotomous ADHD present vs. absent variable, as subtype status is known to be highly

unstable across development and does not differentially predict most key outcome variables (e.g., Hinshaw et al., 2006; see also Lahey, Pelham, Loney, Lee, & Wilcutt, 2005).

At Wave 3, the YADISC-IV was administered separately to participants and their parents. The YADISC-IV was designed as a developmental extension of the DISC-IV for use with individuals ages 18-24; it has been used to assess young adult psychiatric symptomatology in the Fast Track Project (2010-2011). For the present study, baseline diagnostic status (see Hinshaw, 2002) and Wave 3 YADISC-IV ADHD diagnostic status were used to evaluate the effects of informant upon persistence estimates, and Wave 3 YADISC-IV ADHD diagnostic status was used to evaluate the relative predictive utility of parent- vs. young adult self-report.

Swanson, Nolan, and Pelham Rating Scale – 4th edition (SNAP-IV; Swanson, 1992). The SNAP-IV is a 39-item pencil-and-paper checklist that has been widely used in research on ADHD (e.g., MTA Cooperative Group, 1999). Acceptable internal consistency and inter-rater reliability were reported by Bussing et al. (2008). SNAP-IV items are rated on a metric ranging from 0 ('not at all' present) to 3 ('very much' present). At baseline, the SNAP-IV was separately completed by participants' parents and teachers, and at Wave 3, by parents and the participants themselves. For the present study, I considered only the first 18 SNAP-IV items, which correspond directly to the DSM-IV symptoms of ADHD. Items rated as 2 or 3 were coded as "symptom present." Because it offers a direct ADHD symptom count, Wave 3 SNAP-IV scores were used to set this study's DRC threshold, to test hypotheses concerning dimensional persistence estimates, and to compare the DRC's predictive utility with that of the DSM-IV threshold. Although such dimensional measures cannot include impairment, symptom duration, and the like, this approach has been used in other investigations of ADHD symptom thresholds (e.g., Barkley et al., 2002; DuPaul et al., 2001; Heiligenstein et al., 1998; Sibley et al., 2012).

Covariates

Wechsler Intelligence Scale for Children – 3rd edition (WISC-III; Wechsler, 1991). At Wave 1, the full WISC-III battery (except for the Mazes supplemental subtest) was administered to participants by trained graduate students. Scores were computed for its factors of Verbal Comprehension, Freedom from Distractibility, Perceptual Organization, and Processing Speed. The WISC-III (and its subsequent revision) has excellent psychometric properties and is the most widely used instrument for assessing child and adolescent cognitive abilities. The Full Scale IQ composite score was included as a covariate.

Demographics. A number of demographic variables were collected at the first of the two Wave 3 young adult assessment sessions. For this study's analyses, young adult-reported age and ethnicity and parent-reported family income were considered as covariates.

Criterion Variables: Functional Outcomes. A number of multi-informant Wave 3 measures were used to assess participants' current functioning in a variety of domains.

Columbia Impairment Scale (CIS; Bird, 1999). The CIS is a widely used (e.g., Hinshaw et al., 1997) survey measure that assesses functional impairment in home, peer, and school domains. Across its 13 items (e.g., "Getting along with other kids his/her age?", "Schoolwork/job?", etc.), parents provide ratings of how their child is doing on a 4-point scale

(i.e., 0 = ‘No Problem’ to 4 = ‘Very Bad Problem’). For the present study, I used the CIS total score, which has demonstrated internal consistency ($\alpha = .89$) and convergent validity with other measures of psychological impairment (Bird, 1999). Bird (1999) reported adequate test-retest reliability ($r = .68$) and noted that the CIS discriminated between community and clinical participants.

Out-of-home placements. At Wave 3, parents completed the Family Information Profile (FIP) regarding their daughters’ development since the Wave 2 follow-up visit. The FIP is a detailed questionnaire that assesses year-by-year frequency of major life events in a number of important domains (e.g., occupational, education, housing). For the present study, three items (i.e., “special education *residential* school”, “incarceration [e.g., jail; juvenile hall; electronic monitoring]”, and “hospitalization due to mental health reasons”) were combined to examine number of out-of-home placements during the years since Wave 2 follow-up.

Global Assessment of Functioning (GAF; American Psychiatric Association, 1994). The GAF is a 100-point numeric scale used to assess severity of mental illness vis-à-vis level of functioning in the psychological, social, and occupational domains. A single GAF score is assigned, with lower values representing greater impairment (e.g., 1-10 = “Persistent danger of severely hurting self or others...”) and higher scores characterizing higher levels of functioning (e.g., 91-100 = “Superior functioning in a wide range of activities...”). In a study involving a sample of patients with schizophrenia, Startup and colleagues (2002) reported good concurrent validity between the GAF and other measures of symptoms and social functioning, and noted that excellent inter-rater reliability was achieved after only a brief training on the instrument. At Wave 3, consensus GAF scores were generated for each young adult, based upon separate scores assigned by the staff members who interviewed the parent and young adult.

Wechsler Individual Achievement Test – 2nd version (WIAT-II; Wechsler, 2001). At Wave 3, participants’ academic achievement was objectively assessed via the WIAT-II Math Reasoning and Basic Reading subtests. The WIAT-II is a widely used battery with well-established psychometric properties; the Math Reasoning and Basic Reading subtests have shown strong test-retest reliabilities (i.e., .85-.92; Wechsler, 1992).

Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965). Global self-esteem was assessed via the RSE, a venerable self-report scale. The RSE is composed of five negatively valenced (e.g., “At times I think I am no good at all”) and five positively valenced (e.g., “I am able to do things as well as most other people”) statements about the self, and participants rated their agreement with each on a 4-point scale (i.e., 1 = ‘strongly disagree’ to 4 = ‘strongly agree’). The RSE is the most thoroughly empirically validated and psychometrically analyzed measure of self-esteem (Robins, Hendin, & Trzesniewski, 2001). Fleming and Courtney (1984) reported excellent internal consistency ($\alpha = .88$) and test-retest reliability ($r = .82$), and the RSE has shown convergent validity with other measures of self-esteem (Robins et al., 2001).

Beck Depression Inventory – II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a self-report measure to detect the presence and severity of DSM-IV-defined depression in the past two weeks. Respondents rate 21 items addressing common symptoms of depression on a 4-point scale, with scores of 0 indicating the lowest symptom intensity and 3 indicating the highest. Item

scores are then summed and a total score is derived. Total scores ranging from 0-19 are considered ‘minimal’ to ‘mild’, while those ranging from 20-28 are considered ‘moderate’, and 29-63, ‘severe’. The BDI-II has been extensively psychometrically validated, with consistent reports of moderate-to-strong convergent validities with other ratings of depression (r 's $> .50$) and high internal consistency scores (α 's $> .90$) across multiple studies (Steer & Beck, 2000). Beck and colleagues (1996) also reported a one-week test-retest reliability of $r = .93$.

Adult Self-Report, Adult Behavior Checklist (ASR and ABCL; Achenbach, 2009). Wave 3 externalizing behavior was assessed via young adult self-report (ASR) and parent-report (ABCL). These measures are developmental extensions of the Child Behavior Checklist (CBCL; Achenbach, 1991a), used at Waves 1 and 2. The ABCL and ASR are components of the broader Achenbach System of Empirically Based Assessment, which has been used in more than 7,000 studies concerning over 500 topics (Achenbach, 2012). Both measures ask respondents to endorse the extent to which 126 items are true of themselves (ASR) or their offspring (ABCL) during the last six months (scoring metric for each item = 0-2). For the present analyses, ASR and ABCL Externalizing Scale T scores were used.

Data Analytic Plan

All statistical analyses were performed with SPSS for Macintosh, Version 21. Young adult ADHD status was determined in two distinct manners. First, the YADISC-IV, administered separately to participants and parents, was used to generate a categorical diagnosis (present vs. absent) regarding whether the participant met strict DSM-IV criteria for ADHD at Wave 3. YADISC-IV diagnoses were used to assess the persistence of ADHD into adulthood, concordance between parent- and self-report regarding diagnostic status in young adulthood, and the relative utility of parent- and self-report with respect to prediction of current functional outcomes. Because the YADISC-IV algorithm for determining diagnostic status does not map directly onto the 18 DSM-IV symptoms of ADHD, I used the first 18 items of the SNAP-IV to estimate differences in ADHD persistence based upon DSM and DRC cutoffs. SNAP-IV-derived “diagnoses” (signifying scores at or above the DSM-IV symptom cutoff) were used to test study hypotheses regarding whether DRC-only participants were more impaired than participants who met neither ADHD threshold or differed in their impairment from participants who met the DSM-IV 6/9 symptom cutoff.

Overall, 177 parent and 195 young adult SNAP-IVs were collected at Wave 3 follow-up. Given this discrepancy, current symptom presence was determined using an ‘either-or’ decision rule: symptoms rated 2 (‘quite a bit present’) or 3 (‘very much present’) by either parent or young adult were coded as ‘present’. This decision rule was used to ensure adequate statistical power. Participants with ≥ 6 current SNAP-IV symptoms of IA or H/I were categorized as “DSM-IV ADHD.” Following the procedures used in Barkley et al. (2002), the DRC threshold was defined as two SD above the current SNAP-IV symptom mean of participants designated as comparisons at baseline. Originally, I planned to derive this mean from parent reports of comparison participants, as past research has shown that children may under-report symptoms of ADHD. However, initial analyses revealed that parents of comparisons reported virtually no symptoms of H/I ($M = 0.09$, $SD = .38$) in their daughters. Because this calculation would have set an untenably low diagnostic threshold of a single H/I symptom, I instead used comparison self-reported mean symptoms (H/I: $M = 0.58$, $SD = 1.34$; IA $M = 0.9$, $SD = 1.79$) to set the DRC. This procedure resulted in DRC symptom thresholds of 4 H/I and 5 IA symptoms.

A 2 x 2 (Wave 1 diagnostic status x Wave 3 diagnostic status) chi-square analysis was conducted to compare the proportion of baseline-ascertained probands and comparison participants who met YADISC-IV ADHD criteria at Wave 3 follow-up. Separate analyses were conducted for parent- and self-report diagnoses. Effect size was calculated as the phi coefficient (i.e., 0.1 = small, 0.3 = medium, 0.5 = large; see Cohen, 1988). Overall concordance between proband parent- and self-report of current diagnostic status was examined using Cohen's kappa. Landis and Koch (1977) proposed that kappa values greater than .60 represent good-to-excellent agreement. To better understand the nature of any observed concordance, I calculated Positive and Negative Agreement between parent- and self-report (Cicchetti & Feinstein, 1990; Feinstein & Cicchetti, 1990).

I then tested the effects of reporting source (i.e., parent- vs. self-report) on functional outcomes via a series of hierarchical multiple regression analyses. Covariates were entered at the first step, parent and young adult DISC-IV diagnoses were entered at the second, and the interaction between parent and young adult diagnoses were entered at the final step. I examined the ΔR^2 associated with each step.

Finally, I performed a one-way ANCOVA to assess mean differences between the three diagnostic groups (i.e., no diagnosis, DRC-only, and DSM-IV) with respect to young adult impairment measures. Following a significant omnibus test, I performed all three pairwise comparisons, utilizing a Bonferroni correction for multiple comparisons. Effect sizes were computed as Cohen's *d* (Cohen, 1988).

Results

Table 1 displays the numbers and percentages of probands and comparisons who met DSM-IV ADHD criteria at Wave 3, via parent-report and young adult self-report YADISC-IVs. Utilizing parent-reports, significantly more probands (44%) than baseline comparison participants (1%) met full ADHD criteria ($\chi^2 [187] = 42.51, p < 0.001, \phi = 0.47$). Wave 3 self-report also yielded a significantly higher number of DSM-IV ADHD diagnoses for probands (22%) than comparisons (2%; $\chi^2 [209] = 15.97, p < 0.001, \phi = 0.28$). Thus, both probands and their parents reported higher rates of Wave 3 ADHD than comparisons.

Overall, there was significant diagnostic agreement between baseline probands' Wave 3 parent- versus self-report, but with a small effect size ($\kappa = .22$). Among baseline probands and their parents, there was higher Negative Agreement than Positive Agreement, as they were more likely to agree regarding the absence of ADHD (73%) than about its presence (44%). Among baseline comparisons and their parents, there was near universal Negative Agreement (99%). There were only two cases in which ADHD was endorsed among baseline comparisons. In one of these cases, the young adult and her parent agreed that ADHD was present. In the other, the young adult indicated that ADHD was present, while her parent reported it was not (Positive Agreement = 67%; see Table 2).

Utilizing the standard DSM-IV diagnostic threshold of 6/9 symptoms of H/I or IA, ADHD was found to persist in 55.9% (71 of 127) of baseline probands. A higher persistence estimate (i.e., 61.4%) was observed when the DRC was used. As noted in Table 3, seven new cases were identified by the DRC, representing a 9.9% increase over the number identified with the DSM-IV threshold.

As summarized in Table 4, after controlling for key covariates, parent-reported ADHD was independently associated with worse outcomes on eight of nine considered measures, with

WIAT Reading scores the sole exception. Effects were of medium to large size – i.e., $|\beta|$'s ranged from 0.18 to 0.61. Young adult self-reported ADHD, on the other hand, was independently associated only with lower WIAT Math scores ($|\beta| = .18$).

Young adults who met the DRC threshold but fell short of the traditional DSM-IV symptom cutoff for ADHD (“DRC-only” participants) showed impairment in more domains than participants who met neither threshold. Results of ANCOVA models testing mean differences by diagnostic status are summarized in Table 5. All models were significant (all F s > 6.50 , all p s $< .01$). DRC-only participants revealed worse functional outcomes of large to very large effect sizes across seven of the study’s nine outcome measures. Specifically, staff-rated GAF scores revealed $d = 1.34$; young adult- and parent-rated externalizing symptoms yielded d s = -1.37 and -1.65, respectively; parent-rated global impairment yielded $d = -1.53$; young adult-rated depression yielded $d = -1.11$; and WIAT Math and Reading scores yielded d s = 0.78 and 0.92, respectively. Findings for the other two outcome measures approached significance (p s $< .10$), with medium effect sizes (i.e., parent-rated Out-of-Home Placements $d = -0.53$, young adult-rated self-esteem $d = 0.75$). Finally, DRC-only young adults *did not* differ significantly on any outcome measure from participants who met the DSM-IV’s higher symptom cutoff.

Exploratory Analyses

Extant studies of adult ADHD (e.g., Heiligenstein et al., 1998; Kooij et al., 2005) have found that a diagnostic threshold of 4/9 symptoms of IA or H/I best delineates impaired individuals. Thus, I conducted exploratory analyses to examine the appropriateness of this threshold. As depicted in Table 3, a similar pattern of findings emerged as was observed in the DRC-only participants. Eight additional cases were identified amongst probands using this exploratory threshold, and these participants continued to show worse outcomes in all the domains identified above, with the previous marginally significant finding regarding self-esteem now attaining full significance. Participants identified by this lower threshold also did not differ across outcomes from those identified by DSM-IV cutoff.

Although my primary hypotheses concerned the main effects of informant on outcome, I also examined the interaction of parent- and self-reported diagnostic status relative to impairment. Following any significant interaction, I conducted post-hoc simple effect analyses to pinpoint the nature of the observed moderated effects. Significant informant interactions were observed on two outcome measures (self-reported depression symptoms, parent-rated externalizing symptoms; see Table 4). A similar pattern was observed across both of these outcomes. That is, simple effect analyses revealed that outcome did not differ by parent-reported ADHD status when young adult-reported ADHD was positive. However, when self-reported ADHD status was negative, outcomes were worse in young adults whose parents reported a positive ADHD diagnoses, relative to those whose parents did not (see Figures A & B).

Discussion

I aimed to examine the effects of informant (i.e., young adult self-report vs. parent report) and diagnostic symptom thresholds (i.e., DSM-IV vs. DRC) on ADHD persistence estimates in a well-characterized, ethnically and socioeconomically diverse, highly retained sample of young adult women (mean age = 19.6 years), followed prospectively since childhood. Further, utilizing a variety of multi-informant outcome measures, I sought to compare the predictive validities of

(a) self- vs. parent-reported ADHD diagnostic status and (b) standard DSM-IV symptom cutoffs vs. the DRC threshold. Key findings regarding each of these questions are discussed below. Comparisons to past research findings are made cautiously, as females have rarely been investigated in this regard and variation in sampling and procedures across studies renders direct comparison difficult.

Effects of Informant on DSM-IV ADHD Persistence Estimates. As predicted, via YADISC-IV parent report, a higher percentage (44%) of probands met full criteria for persistent ADHD than did comparisons (1%). This estimate is close to that observed in the 2011 study of the PALS female subsample (Babinski et al., 2011), which yielded a 41% persistence rate via DSM-IV parent report. Findings from past work regarding parent-reported persistence in predominately male samples are mixed. The Milwaukee Study reported 58% persistence (Barkley et al., 2002), but a recently-published analysis of the broader PALS sample, (mean age = 20.2; 87% male; Sibley et al., 2012) yielded a considerably lower estimate, with only 12% of proband parents reporting symptom levels that met the DSM-IV cutoff. Contrary to predictions, a significantly higher percentage (22%) of probands self-reported persistent ADHD than did comparison participants (2%). This persistence estimate is higher than those gleaned from self-report in past longitudinal studies of both female and predominately male samples of young adults (e.g., Barkley et al., 2002; Babinski et al., 2011; Sibley et al., 2012).

The present findings regarding informant effects on persistence estimates are broadly consistent with the extant research, insofar as a higher rate was observed via parent-report. As such, this study supports the contention that, across male and female samples, parents report higher rates of ADHD persistence into young adulthood in their offspring than do the young adults themselves. Still, the BGALS probands also reported significantly higher persistence than comparison participants, albeit at a markedly lower level than their parents. Thus, young women may demonstrate a greater awareness of persistent ADHD symptomatology than their male counterparts. In a recent cross-sectional study of college students with ADHD, (Fedele, Lefler, Hartung, & Canu, 2012), female participants reported higher levels of IA and H/I symptoms, as well as greater impairment in multiple domains, than males. The authors speculated that young adult females might be less influenced than men by the Positive Illusory Bias (PIB), the tendency, common in childhood ADHD, to view one's abilities in an unrealistically positive light (see Owens et al., 2007). In observing that a greater percentage of probands in the Milwaukee Study self-reported persistent ADHD at a mean age of 27 than did at age 21, Barkley and colleagues (2008) noted that increased self-awareness, possibly mediated by frontal-striatal circuitry maturation, might play a role. Such putative contributing factors should be considered cautiously, however, given that the present self-reported prevalence estimate was notably higher than that observed in Babinski et al.'s (2011) small female sample. Further, although the young adult self-report persistence estimate was higher than expected, effect sizes for parent report were nearly twice as large.

Diagnostic Concordance. As predicted, there was significant concordance between parents and young adults regarding diagnostic status, but the effect size was small. As was also the case in the Milwaukee Study (Barkley et al., 2002), probands and their parents were much more likely to agree that ADHD was absent than they were that the disorder was present. Still, although probands and their parents agreed that ADHD was present only 44% of the time herein, this level

of Positive Agreement was more than four times higher than that observed in the Milwaukee Study's sample in young adulthood (Barkley et al., 2002).

Effects of Symptom Thresholds on ADHD Persistence Estimates. Broadly, when SNAP-IV symptom counts were used to “diagnose” current ADHD in BGALS probands, a persistence estimate of 55.9% was observed via the DSM-IV threshold. As predicted, utilizing a DRC of 4/9 H/I or 5/9 IA symptoms led to the identification of more “cases” ($n = 7$) of ADHD persistence.

Effects of Informant on Young Adult Outcomes. As hypothesized, parent-reported ADHD status was more predictive of impairment than young adult self-reported ADHD (when controlling for the other informant's effects) on a variety of outcome measures (see Table 4). Specifically, parent-reported ADHD predicted poorer outcomes on measures of (a) staff-reported global functioning, (b) parent-reported broad impairment, externalizing behaviors, and out-of-home placements, (c) self-reported depression, externalizing behaviors, and self-esteem, and (d) an objective measure of math achievement. Of the nine outcomes assessed, the only measure for which parent-reported ADHD did not predict worse scores was WIAT Reading. Notably, these effects were maintained even after controlling for a number of covariates, including baseline IQ, a particularly strict control. This finding underscores that parent-reported ADHD status in young adulthood confers real risk for significant impairment. Indeed, young adult self-reported ADHD status uniquely predicted only lower WIAT Math scores.

These findings suggest strongly that even into early adulthood, parent-reported ADHD status remains a more potent predictor of functioning than self-report in childhood-diagnosed individuals. Babinski and colleagues (2011) found that parents reported greater impairment than their daughters, particularly in the domain of intrafamily conflict; Barkley et al. (2002) found that parent-reported ADHD status was associated with poorer outcomes on all eight of their study's outcomes, including such objective measures as employer performance ratings and school transcripts. Further, although Sibley et al. (2012) found that parent- and self-report DSM-IV ADHD rates did not differ significantly (i.e., 12.0% and 9.6%, respectively), far higher percentages of parents than young adults reported clinically significant impairment (55.6% vs. 14.6%) and elevated symptom severity (71.8% vs. 24.4%).

Regarding informant interaction effects, I found poorer outcomes on parent-rated externalizing symptoms and self-reported depression in cases in which parent-report yielded an ADHD diagnosis but self-report did not. Broadly, a lack of parental and young adult attunement regarding ADHD status may be associated with particularly poor outcomes. These findings underscore the importance of obtaining *both* self- and other-report in young adulthood (e.g., Gibbins and Weiss, 2007; Hechtman et al., 2011; Mannuzza et al., 2003). As longitudinal research samples move further into adulthood and parent-young adult interactions become less salient, it will be important to assess the relative predictive usefulness of other collaterals (e.g., spouse, roommates).

Effects of Symptom Thresholds on Outcome Ratings. Among DRC-only participants, poorer scores were observed on seven out of nine assessment measures, with the remaining two outcomes (i.e., parent-reported out-of-home placements, young adult-rated self-esteem) approaching significance. Also, no differences emerged for DSM-IV versus DRC-only participants. As noted above, a parallel pattern was observed in the BGALS sample in a study of executive function (Miller et al., 2012).

These findings are consistent with a growing body of literature suggesting that symptom thresholds below the DSM-IV symptom cutoff are still associated with poorer outcomes, relative to non-diagnosed persons. Heiligenstein et al. (1998) and Kooij et al. (2005) found that meeting or exceeding a cutoff of 4/9 symptoms of IA or H/I was associated with greater impairment in their large cross sectional samples of college students and Dutch community respondents, respectively. Similar findings have been observed in prospective studies (e.g., Barkley et al., 2002; Biederman et al., 2006). In 2010, Biederman and colleagues reported findings from the young adult (mean age = 22) follow-up of a large prospective study of childhood-ascertained ADHD women. Persistence of full DSM-IV ADHD was observed in 33.3% of probands, but another 29.2% met criteria for “symptomatic” persistence, defined as endorsing 4 or 5 symptoms of IA or H/I, with all other criteria present, including impairment (i.e., GAF scores <60). Faraone et al.’s (2006) meta-analyses noted that the tendency for adults to show reduced symptoms but persistent impairment might reflect not only the natural course of the disorder but also the decreased relevance of certain DSM-IV symptoms to adult functioning (e.g., “often leaves seat in classroom or in other situations in which remaining seated is expected”). Even so, the current findings regarding diagnostic thresholds appear to support the contention, voiced by Kooij et al. (2005) that “...lower symptom levels in adults do not imply better functioning (p. 824).”

With the publication of the DSM-5, concerns and criticism have been widely publicized in the popular press regarding diagnostic and treatment practices of ADHD, especially regarding adults. A March 2013 front-page article in the *New York Times* (Schwarz & Cohen) reported a 41% rise in child and adolescent ADHD diagnoses in the past decade. The authors also noted that DSM-5 changes would only increase the rates of diagnosis and serve to enhance already-high medication prescriptions. Commenting for the article, C.D.C. Director Thomas Frieden stated that, “The right medications for A.D.H.D., given to the right people, can make a huge difference. Unfortunately, misuse appears to be growing at an alarming rate” (Schwarz & Cohen, 2013, para. 10). Relatedly, the illicit use of stimulants as “study drugs” for “neuroenhancement” (and as drugs of abuse) has also drawn considerable attention (e.g., Cohen, 2013; Einhorn, Huang, & Lavalee, 2012; Miller, 2013; Schwarz, 2013a; Talbot, 2009). Other recent articles have underscored the potential for secondary gain (e.g., academic and testing accommodations) from obtaining an ADHD diagnosis. Indeed, an article posted in the popular online blog *The Daily Beast* was provocatively titled, “Faking ADHD Gets You Into Harvard” (Mitchell, 2012).

Recent findings give some credence to these concerns. Extant studies reveal that ADHD can be feigned relatively easily (see Musso & Gouvier, 2012; Sansone & Sansone, 2011 for review). Sollman, Ranseen, and Berry (2010) reported that non-ADHD college students, given five minutes to study online information and secondary motivation (i.e., a cash payment) for successfully faking the disorder were indistinguishable from participants with an actual past ADHD diagnosis on a variety of diagnostic measures. As has been observed elsewhere (see Musso & Gouvier, 2012; Sansone & Sansone, 2011), the authors found that symptom checklists were particularly susceptible to faking in their sample. Illicit use of ADHD medications on college campuses has also been the subject of considerable inquiry. A survey of more than 1800 undergraduates at a single university (DeSantis, Webb, & Noar, 2008) found that 34% of respondents endorsed having used ADHD medications illegally, though the authors cautioned that this rate was higher than those found in previous studies. A number of university counseling centers (e.g., see California State University, Fresno Student Health Center, 2013) have begun to refuse to provide ADHD evaluations for students (Schwarz, 2013b). Although the notion that

childhood ADHD may persist into adulthood is far more widely accepted than in the past (Barkley et al., 2008), skepticism remains (Moncrieff & Timimi, 2010; see commentary in Sclar et al., 2012). Accurate nosological guidelines and careful, comprehensive diagnostic practices are paramount, providing a context for further discussion of the current findings.

Broadly, the present results regarding diagnostic thresholds suggest that the revised 5/9 symptom cutoffs of the DSM-5 are a step in the right direction, but may not go far enough. Specifically, although the current data suggest that a cutoff of 5/9 symptoms of IA is appropriate, they also suggest that a threshold of 4/9 persistent symptoms of H/I better captures impairment in young women diagnosed with ADHD in childhood (see also exploratory analyses). Given the intensive debate over sensitivity vs. specificity regarding adult diagnosis of ADHD (Coghill & Seth, 2011; Frances, 2010, 2012), extant research and the current data suggest that an overly stringent, developmentally insensitive cutoff might lead to a struggling adult's not obtaining warranted services or academic accommodations, because of their being judged as having "outgrown" ADHD. Again, I cite the need for careful assessment procedures for establishing ADHD persistence in young adults, as well as the perils of relying solely or too heavily on face-valid symptom checklists in establishing a diagnosis. To this end, I echo Heiligenstein and colleagues (1998), who, while arguing for a reduced symptom cutoff, stated that "sole reliance on DSM-IV symptom threshold criteria to establish the diagnosis of ADHD in college students is conceptually weak" (p. 187). Indeed, a number of past authors (e.g., Bell, 2011; Gibbins & Weiss, 2007; Sibley et al., 2012) have highlighted the importance of considering impairment when assessing ADHD. Still, the area remains controversial. ADHD symptom thresholds in adulthood remain an important area for further inquiry, with a particular focus on whether different cutoffs may be more appropriate for males and females across the lifespan.

Other findings herein broadly support that the report of parents regarding current symptomatology and impairment remains a vital component of a thorough ADHD evaluation of childhood-diagnosed females, even into young adulthood when many probands may not be living at home. Not only did parents report higher levels of persistent ADHD, but parent-reported diagnostic status predicted current current impairment across a wider array of measures than did young adult self-reported status. Indeed, the importance of including collateral report into young adulthood has been established in a number of longitudinal investigations (e.g., Babinski et al., 2011; Barkley et al., 2002; Mannuzza et al., 2003; Sibley et al., 2012). Sole reliance on self-report may result in under-reporting of current symptomatology and consequent underestimates of ADHD persistence into adulthood (e.g., Barkley et al., 2002). Furthermore, it seems reasonable to speculate that assessing collaterals could also make it more difficult for malingers to obtain an ADHD diagnosis for secondary gain. Still, parent report is not a panacea and may be inaccurate and/or unavailable (see Mannuzza et al., 2002). In short, researchers and clinicians should also attempt to obtain objective evidence (e.g., school records, past testing) of impaired function whenever possible (see Heiligenstein & Langheim, 2012).

Given the expense and challenges of including other informants in prospective research and the considerable practical difficulties inherent in obtaining collateral reports in clinical settings, it will be crucial to understand the age(s) at which reliance upon self-report alone becomes more advisable. Drawing from data regarding the most recent follow-up of the Milwaukee Study, Barkley et al. (2008) have asserted that under-reporting may become less problematic as adult males approach age 30. Even so, the present findings that both self-reported ADHD persistence and Positive Agreement between probands and parents regarding diagnostic status were higher-than-expected raise the intriguing possibility that in young women, self-report may be more

diagnostically useful at an earlier age than it is in young men. It will also be important to observe whether, as the BGALS probands age, their self-reported ADHD persistence rises. Such a rise between the 25- and 41-year follow-ups of the New York Study was recently reported (Klein et al., 2012), which the authors speculated might reflect increased media coverage of adult ADHD, the effects of age-related decline in “mental alacrity and resources” (p. 1301), and/or the accrual of responsibilities and demands that, over time, outstripped participants’ coping abilities.

Strengths and Limitations

The findings of this study should be considered in light of its strengths and limitations. Strengths include a well-characterized, highly retained sample. Other strengths include its notable ethnic and socioeconomic diversity. Furthermore, the study’s conclusions are strengthened by the diverse range and multi-informant nature of the present outcome measures.

Regarding limitations, variable availability of data from both informants posed a problem. A substantial subsample of participants lacked parent-reported SNAP-IV’s, necessitating a reliance solely upon self-report to establish symptom presence. Consequently, the data may be negatively biased, given the well-established tendency of longitudinally followed young adults with ADHD to under-report their current symptomatology. This factor may have contributed in part to the relatively low number of additional cases identified by the study’s DRC. It also bears repeating that although sample retention was high, participants lost to follow-up were relatively more impaired than those who were retained. The present investigation would also have benefitted from the inclusion of more objective measures of impairment, such as employer reports or recent school records. Also, I did not model the effects of past treatment interventions on symptom manifestation. Future research will need to assess the moderating effects of stimulant medications and other types of treatment, although this presents a clear methodological challenge in a naturalistic longitudinal study. Finally, as noted by Hinshaw (2002), the present sample was not intended to be representative or epidemiologically derived.

Conclusion

Utilizing a large, diverse, well-retained sample of longitudinally followed young women, I examined the effects of informants and symptom thresholds on ADHD persistence estimates. Higher persistence estimates were observed when utilizing parent report. Parent report independently predicted impairment on eight of nine multi-informant outcome measures, whereas self-report only predicted impairment on a single outcome measure. Participants who met the reduced DRC cutoff but not the DSM-IV threshold were broadly more impaired than participants who met neither threshold, and did not differ significantly from those who met the full DSM-IV cutoff. These findings pose interesting implications for diagnostic practices in clinical and research settings.

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Tables

Table 1. Estimates and contrasts of ADHD persistence into young adulthood amongst baseline comparison and proband participants for self- and parent-reported *DSM-IV* symptoms.

Reporting Source	Comparisons			Probands			χ^2	ϕ	p
	n	N	%	n	N	%			
Parent DISC	1	76	1	50	113	44	42.51	0.47	<0.001
YA DISC	2	86	2	27	125	22	15.97	0.28	<0.001

Note. Sample size differs by informant source due to missing data. DISC = Diagnostic Inventory Schedule for Children (*4th edition-Young Adult version*). YA = young adult. Effect size, ϕ : 0.1 = small, 0.3 = medium, 0.5 = large

Table 2. Correspondence between self- and parent-reported DISC-derived ADHD diagnoses in young adulthood.

<i>Total sample N = 186</i>					
		Parent		Test statistic	Confidence Interval
		Present	Absent	$\kappa = 0.33$	0.18, 0.49
YA	Present	17	9	$PA = 0.45$	0.31, 0.59
	Absent	32	128	$NA = 0.86$	0.82, 0.90

<i>Proband sample N = 110</i>					
		Parent		Test statistic	Confidence Interval
		Present	Absent	$\kappa = 0.22$	0.05, 0.38
YA	Present	16	8	$PA = 0.44$	0.30, 0.59
	Absent	32	54	$NA = 0.73$	0.65, 0.81

<i>Comparison sample N = 76</i>					
		Parent		Test statistic ^a	Confidence Interval
		Present	Absent	$\kappa = 0.66$	0.04, 1.28
YA	Present	1	1	$PA = 0.67$	0.05, 1.28
	Absent	0	74	$NA = 0.99$	0.98, 1.00

Note. DISC = Diagnostic Inventory Schedule for Children (4th edition-Young Adult version.); ADHD = Attention Deficit/Hyperactivity Disorder; YA = young adult, PA = Positive Agreement, NA = Negative Agreement.

^a Concordance estimates for the comparison sample are unstable due to low cell counts. However, examination of the raw data suggests near universal parent-young adult agreement on the disorder's absence.

Table 3. Comparison of ADHD persistence estimates for *DSM* and *DRC* symptom cutoffs.

ADHD Status	DSM	Symptom Criteria <i>5 of 9 IA; 4 of 9 H/I</i>		Symptom Criteria <i>4 of 9 both IA and H/I</i>	
		DRC	% Δ	DRC	% Δ
Present	71	78	9.9	86	21.1
Absent	56	49	-12.5	41	-26.8

Note. N = 127. *DSM-IV* = Diagnostic and Statistical Manual (4th edition). DRC = Developmentally-Referenced Criterion. % Δ reflects the proportion of new cases identified by DRC criteria. IA = Inattentive Subtype; H/I = Hyperactive/Impulsive Subtype.

Table 4. Effects of caregiver and young-adult diagnoses of ADHD on functional, psychosocial, and academic outcomes.

Predictor	Total R^2	ΔR^2	b	$SE\ b$	t	β
<i>Dependent Variable: Global Assessment of Functioning</i>						
1. Parent ADHD	0.28	0.12***	-10.17	2.31	-4.41***	-0.35
YA ADHD			-2.71	2.98	-0.91	-0.07
2. Parent x YA	0.30	0.02 [†]	10.58	5.80	1.82 [†]	0.22
<i>Dependent Variable: Total Impairment</i>						
1. Parent ADHD	0.40	0.32***	1.14	0.13	8.81***	0.61
YA ADHD			-0.20	0.16	-1.26	-0.09
2. Parent x YA	0.41	0.01	-0.38	0.31	-1.20	-0.14
<i>Dependent Variable: Depression Symptoms</i>						
1. Parent ADHD	0.08	0.04*	4.47	1.84	2.43*	0.20
YA ADHD			0.60	2.40	0.25	0.02
2. Parent x YA	0.11	0.03*	-10.46	4.76	-2.19*	-0.31
<i>Dependent Variable: Self-Esteem</i>						
1. Parent ADHD	0.07	0.05*	-2.91	1.21	-2.40*	-0.20
YA ADHD			-1.06	1.54	-0.70	-0.06
2. Parent x YA	0.09	0.01	4.56	3.01	1.52	0.20
<i>Dependent Variable: Parent-rated Externalizing</i>						
1. Parent ADHD	0.32	0.24***	12.65	1.85	6.85***	0.50
YA ADHD			1.05	2.30	0.46	0.03
2. Parent x YA	0.34	0.02*	-8.89	4.50	-1.98*	-0.23
<i>Dependent Variable: Young Adult-rated Externalizing</i>						
1. Parent ADHD	0.20	0.15***	8.98	2.07	4.34***	0.34
YA ADHD			4.31	2.68	1.61	0.13
2. Parent x YA	0.20	0.00	-2.65	5.46	-0.49	-0.07
<i>Dependent Variable: WIAT Reading</i>						
1. Parent ADHD	0.37	0.01	-2.19	2.10	-1.04	-0.07
YA ADHD			-0.68	2.63	-0.26	-0.02
2. Parent x YA	0.39	0.01 [†]	9.44	5.18	1.82 [†]	0.20
<i>Dependent Variable: WIAT Math</i>						
1. Parent ADHD	0.12	0.08***	-6.54	2.94	-2.22*	-0.18
YA ADHD			-8.14	3.69	-2.21*	-0.18
2. Parent x YA	0.13	0.01	7.16	7.38	0.97	0.13
<i>Dependent Variable: Total Out-of-Home Placements</i>						
1. Parent ADHD	0.08	0.07**	0.95	0.28	3.42**	0.29
YA ADHD			-0.03	0.35	-0.09	-0.01
2. Parent x YA	0.08	0.00	0.21	0.69	0.30	0.04

Note. All analyses controlled for parental income and young adult's baseline full-scale IQ, age, and ethnicity. Sample size differs by analysis due to missing data. ADHD status was coded 0 = absent, 1 = present for both parent and young adult report. ADHD = Attention Deficit/Hyperactivity Disorder; YA = Young adult; WIAT = Wechsler Individual Achievement Test (2nd version)

[†] $p < 0.07$; * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Table 5. Comparison of functioning at young-adult follow-up for girls with and without ADHD utilizing DSM-IV and Developmentally-Referenced Criteria (DRC) symptom cutoffs.

Variable	F _{df}		No Dx		DSM Dx		DRC Dx		ES ^b and post-hoc ^c			
	<i>n</i>	<i>M^a</i>	<i>n</i>	<i>M^a</i>	<i>N</i>	<i>M^a</i>	<i>n</i>	<i>M^a</i>	0 - 1	0 - 2	1 - 2	
<i>DRC-Criteria (HI = 4 of 9 symptoms; IA = 5 of 9 symptoms)</i>												
Staff GAF	19.72 _{2,140} ***	79	76.45	65.08	59	60.83	9	60.83	0.95***	1.34***	0.35, ns	
Total Impairment	42.43 _{2,154} ***	83	0.58	1.62	68	1.52	10	1.52	-1.46***	-1.53***	0.13, ns	
Depression	15.81 _{2,182} ***	107	6.52	14.68	70	16.77	12	16.77	-0.79***	-1.11**	-0.19, ns	
Self-esteem	6.68 _{2,181} **	106	32.85	29.52	70	28.56	12	28.56	0.52***	0.75 [†]	0.15, ns	
PA-rated Externalizing	42.28 _{2,154} ***	83	48.36	62.70	68	60.80	10	60.80	-1.48**	-1.65***	0.23, ns	
YA-rated Externalizing	28.32 _{2,183} ***	109	49.13	61.00	69	62.34	12	62.34	-1.10***	-1.37***	-0.13, ns	
WIAT Reading	7.38 _{2,186} **	109	104.01	100.06	72	92.07	12	92.07	0.28 [†]	0.92**	0.59 [†]	
WIAT Math	8.04 _{2,186} **	109	99.60	94.28	72	87.67	12	87.67	0.32*	0.78**	0.41, ns	
Out-of-Home Placements	9.25 _{2,180} ***	103	0.10	0.99	72	1.10	12	1.10	-0.65***	-0.53 [†]	-0.05, ns	
<i>Exploratory DRC-Criteria (HI = 4 of 9 symptoms; IA = 4 of 9 symptoms)</i>												
Staff GAF	21.79 _{2,140} ***	71	77.55	64.82	59	64.51	17	64.51	1.10***	1.14***	0.03, ns	
Total Impairment	40.66 _{2,154} ***	76	0.55	1.63	68	1.23	17	1.23	-1.53***	-1.22**	0.53, ns	
Depression	20.32 _{2,182} ***	99	5.75	14.78	70	16.18	20	16.18	-0.90***	-1.12***	-0.12, ns	
Self-esteem	9.05 _{2,181} **	97	33.26	29.46	70	28.69	21	28.69	0.60***	0.78**	0.12, ns	
PA-rated Externalizing	43.02 _{2,154} ***	75	47.68	62.86	68	57.54	18	57.54	-1.59***	-1.23***	0.60, ns	
YA-rated Externalizing	33.18 _{2,183} ***	100	48.23	61.15	69	60.46	21	60.46	-1.21***	-1.32***	0.07, ns	
WIAT Reading	7.40 _{2,186} **	100	104.49	99.95	72	95.27	21	95.27	0.32*	0.70**	0.34, ns	
WIAT Math	10.19 _{2,186} ***	100	100.36	94.16	72	89.63	21	89.63	0.38**	0.66***	0.26, ns	
Out-of-Home Placements	8.61 _{2,180} ***	94	0.08	1.00	72	0.75	21	0.75	-0.68***	-0.47, ns	0.17, ns	

Note. 0 = No ADHD Dx, 1 = DSM dx, 2 = DRC-only dx. GAF=Global Assessment of Functioning, PA = Parent, YA = Young Adult, WIAT = Wechsler Individual Achievement Test

All analyses controlled for parental income and young adult's baseline full-scale IQ, age, and ethnicity.

^a Means are adjusted for model covariates

^b Effect sizes = Cohen's *d*, 0.3 = small, 0.5 = medium, 0.8 = large.

^c Bonferroni adjusted for multiple comparisons.

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figures

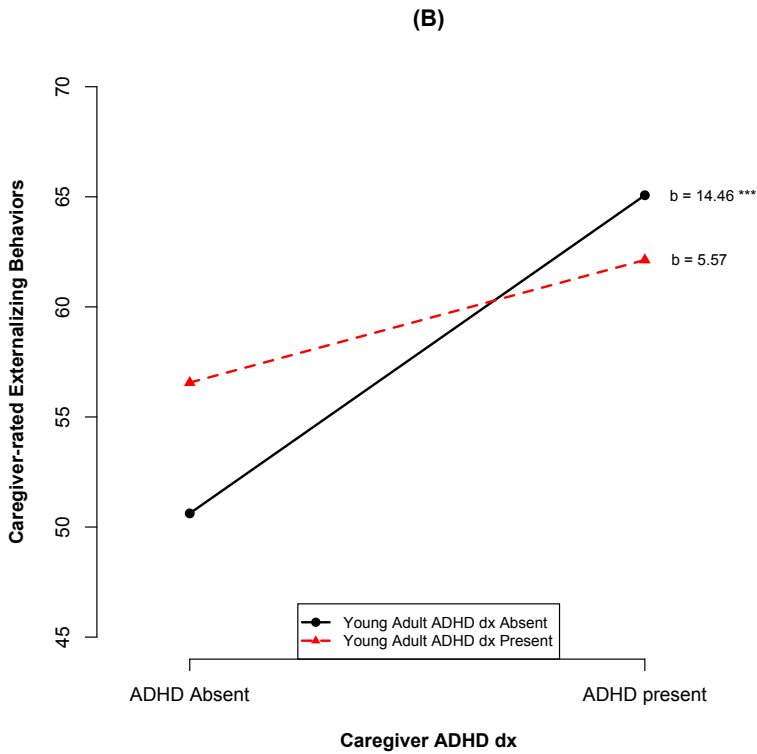
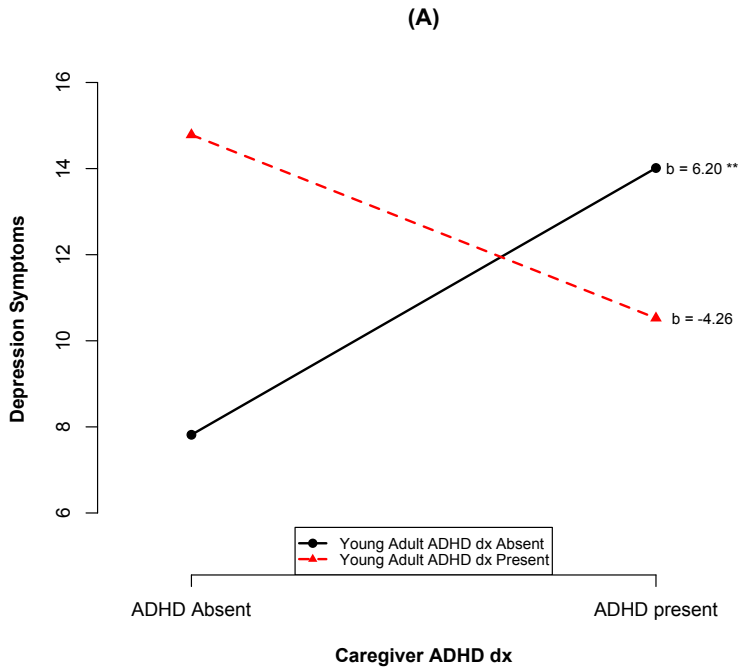


Figure Captions

1. *Moderated effects of young adult ADHD diagnosis on the relationship between caregiver-reported ADHD diagnosis and (A) young adult-reported depression and (B) caregiver-rated externalizing behaviors. ** $p < 0.01$; *** $p < 0.001$.*