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Impact of the Impairment Criterion in the Diagnosis of Adult ADHD: 33-Year Follow-Up Study of Boys with ADHD

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Abstract

Objective—To investigate the relationship between ADHD symptoms and impairment among adults diagnosed as having ADHD in childhood, ages 6–12.

Method—Clinicians blindly interviewed 121 white males, age 41, on average. DSM-IV adult ADHD behaviors were systematically rated, and impairment resulting from symptoms was scored on a 5-point scale.

Results—Correlations between degree of impairment and number of behaviors were high (r 's = .83 to .85, $p < .001$). The Impairment Criterion had no effect on classifying any subject as having, or not having, adult ADHD. All subjects who reported experiencing 5 or more inattention or hyperactive-impulsive behaviors as “often” or “very often” in adulthood were significantly impaired by their symptoms.

Conclusions—Contrary to results reported in children, there is a strong relationship between number of ADHD symptoms and degree of impairment. However, for several reasons (discussed in the article), it should not be concluded that the Impairment Criterion is superfluous.

The official classification system for formulating psychiatric diagnoses in the United States is the *Diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV;* American Psychiatric Association, 1994). In this system of nomenclature, the diagnostic criteria for each mental disorder specify the number and severity (intensity, frequency, duration, etc.) of symptoms needed to fulfill criteria. For example, for Attention Deficit Hyperactivity Disorder (ADHD), 6 of 9 Inattention behaviors and/or 6 of 9 Hyperactivity-Impulsivity behaviors must have been exhibited “often” for at least 6 months. In addition to this

Symptom Criterion, nearly all mental disorders in *DSM-IV* (mood, anxiety, dissociative, personality, etc.) include an explicit Impairment Criterion. For ADHD, this criterion states, “There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning” (APA, 1994, p. 84). Despite this requirement, some investigators have based prevalence estimates on the Symptom Criterion, alone. Gadow et al. (2000) studied 600 10- to 12-year-old Ukrainian children, and compared rates of “ADHD” to those obtained among 443 U.S. children. The authors note, “Because symptom-based rating scales typically do not assess the full list of diagnostic criteria for ADHD (e.g., age at onset or duration of symptoms, degree of impairment), screening cutoff scores are not equivalent to a clinical diagnosis” (p. 1522). Pineda et al. (1999) studied 540 4- to 17-year-old Colombian children to estimate the prevalence of “probable AD/HD”. They refer to their failure to employ the Impairment (and other) Criterion as “a major limitation in interpreting (their) results” (p. 459).

One reason why some investigators have ignored the Impairment Criterion is because it is assumed that, if a certain number of behaviors is exhibited frequently, then those behaviors will have a deleterious functional impact. However, several child studies have reported that, when the Impairment Criterion is applied, rates of ADHD diminish substantially. In their review of 50 epidemiological studies, Faraone, Sergeant, Gillberg, and Biederman (2003) found that studies that reported ADHD rates based on symptoms, alone, and symptoms plus functional impairment, invariably found lower rates for the latter estimate (16.1% vs. 6.8%, 15.8% vs. 0.2%, etc.).

Two reports specifically have addressed the relationship between the Symptom and Impairment Criteria in the *DSM-IV* diagnosis of ADHD. Gordon et al. (2006) studied this association in four, large-scale ADHD research projects (three involving children, and one including adults). Across studies, the average correlation between systematically assessed ADHD symptoms and impairment accounted for less than 10% of the variance. Furthermore, the number of subjects diagnosed as having ADHD based on symptoms, alone, decreased by 77% when the Impairment Criterion additionally was required.

Gathje, Lewandowski, and Gordon (2008) studied 314 5- to 17-year-olds seen at an ADHD clinic. Two symptom measures (rated by parents) and six impairment measures (rated by parents or teachers) were obtained. Nine of the 12 symptom-impairment correlations were below .30, explaining less than 9% of the variance. Based on symptom measures, alone, 60% of subjects were identified as having ADHD. This proportion dropped to 19% when impairment was required.

To our knowledge, only two studies (same investigator) assessed the relationship between ADHD symptoms and impairment in adults. Barkley (described in Gordon et al., 2006) evaluated 158 19- to 25-year-olds who had been diagnosed as having ADHD between ages 4 and 12. At follow-up, *DSM-III-R* (American Psychiatric Association, 1987) and *DSM-IV* symptoms were based on interviews with parents, and measures of impairment were based on interviews with subjects (e.g., self-reported number of driving tickets), high school transcripts (e.g., grade point average), official arrest records (e.g., number of felony arrests), and employer ratings (on job performance). The mean correlation of number of symptoms with specific measures of impairment (based on over 50 coefficients) was .25, with none of the correlations accounting for more than 25% of the variance. In a subsequent analysis of these data, Barkley and colleagues (2006) recoded impairment measures to form dichotomous scores (impaired, not impaired) on 18 items (e.g., failed to graduate high school, fired from 2 or more jobs, 3 or more arrests, and has trouble keeping friends). Scores were totaled (0–18) to form an overall index of impairment. Symptom-impairment correlations (all significant at $p < .001$) were .45 for number of inattention behaviors, .53 for

number of hyperactive-impulsive behaviors, and .53 for number of all ADHD behaviors. Barkley et al. (2006) concluded that, although ADHD symptoms may have only a “modest relationship” with any single measure of outcome, the relationship is “moderate or greater” when overall impairment is represented across functional domains. However, even in the subsequent analyses, only 20–28% of the variance is explained.

In a second report on an independent sample, Barkley, Murphy, and Fischer (2008) studied 146 adults with ADHD, 97 non-ADHD Clinical Controls, and 109 non-ADHD Community Controls (mean ages, 32–38). Individuals in the first two groups were consecutive referrals to an Adult ADHD clinic; Community Controls (described as “relatively normal adults”) were obtained via advertisements. Clinical Controls met criteria for a variety of disorders, but not ADHD. Analyses were conducted on the entire sample, i.e., all groups combined. Two interview impairment measures were studied- number of functional domains showing impairment (6 possible), and clinician rating on the *Social and Occupational Functioning Assessment Scale* (SOFAS; Patterson & Lee, 1995, ranging from 1, grossly impaired to 100, superior functioning). All correlations were high and significant ($p < .001$): number of domains with- number of inattention behaviors ($r = .83$), number of hyperactive-impulsive behaviors ($r = .70$), and number of all ADHD behaviors ($r = .84$); SOFAS rating with- number of inattention behaviors ($r = -.78$), number of hyperactive-impulsive behaviors ($r = -.67$), and number of all ADHD behaviors ($r = -.80$). In addition, all subjects who reported experiencing at least 4 of 9 inattentive and/or 4 of 9 hyperactive-impulsive behaviors as often or very often, also reported being impaired in at least one functional domain.

In summary, studies that have systematically assessed the relationship between ADHD symptoms and functional impairment in children, consistently have shown that the association is modest, at best, implying that symptoms and impairment are independent dimensions that cannot be treated as equivalent when diagnosing ADHD. Also, when the Impairment Criterion is ignored, the number of children diagnosed as having *DSM-IV* ADHD escalates dramatically. However, studies of adults are less consistent. Only two such studies have been conducted, both by the same investigator. One found that, similar to reports in children, the relationship between symptoms and specific measures of impairment was relatively weak (mean $r = .25$), although somewhat higher when an overall measure of impairment is studied ($r = .45-.53$). The other study found that this association was very strong (r 's = .67 to .84). Since the implications of misdiagnosis are considerable, concerning who is treated and how, we addressed the relationship between ADHD symptoms and impairment in our adult data set.

With one exception [Barkley et al.'s (2008) number of functional domains], impairment measures across studies have not been clearly tied to ADHD symptoms. Therefore, it is not known whether the ADHD symptom or some other factor resulted in functional disruption. For example, in his study of children with ADHD followed into adulthood, Barkley (described in Gordon et al., 2006) included number of arrests as a measure of impaired functioning. It is well established that adults with ADHD show considerable comorbidity (Davidson, 2008), and that follow-up studies of children with ADHD consistently have reported an increased risk for antisocial personality disorder (Fischer, Barkley, Smallish, & Fletcher, 2002; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998; Rasmussen & Gillberg, 2000; Weiss, Hechtman, Milroy, & Perlman, 1985). It may be that the comorbid antisocial syndrome, rather than the ADHD symptoms, was associated with criminal history. Similarly, other comorbid disorders (e.g., substance use, mood, and anxiety disorders, all of which have been reported at increased rates among ADHD adults) may have contributed to vehicular offenses, decreased work performance, and lower educational attainment in that study. Another example is the SOFAS rating used by Barkley and colleagues (2008). According to these investigators,

interviewers were instructed to base this rating on the participant's social, occupational, and educational functioning, and impairment was understood to be "a direct consequence of the mental and physical health problems of the individual" (p. 133). Therefore, this rating confounded mental and physical problems, and there is no guarantee that the "mental problems" were specific to ADHD.

The purpose of this study is to investigate the relationship between ADHD symptoms and impairment among adults who were diagnosed as having ADHD in childhood. Different from other studies, we used a measure of impairment that was directly tied to each of the three core ADHD symptoms, Inattention, Impulsivity, and Hyperactivity. For each symptom, trained clinicians who were blind to participant status (ADHD proband or non-ADHD comparison) asked respondents whether the symptom "led to any difficulties at home, at work or with other people" during the follow-up interval (approximately 16 years, from age 25 to present). Clinicians rated each symptom on an anchored, 5-point impairment scale ranging from None to Extreme. Based primarily on findings in children, we hypothesized that: (1) symptom and impairment correlations would be modest, and; (2) compared to individuals fulfilling the ADHD Symptom Criterion, a considerable number of subjects would not be diagnosed as having ADHD as adults when impairment was required.

Method

Participants

Participants were 207 6- to 12-year-old white boys of middle social class, referred to a child psychiatric research clinic in New York between 1970 and 1977 (Gittelman et al., 1980; Gittelman-Klein, Klein, Katz, Saraf, & Pollack, 1976). Criteria were: referral by schools because of behavior problems; elevated ratings on standard scales of hyperactivity by teachers and parents; behavior problems in settings other than school; a diagnosis of *DSM-II* (American Psychiatric Association, 1968) Hyperkinetic Reaction by a child psychiatrist based on interviews with mother and child, and school information; $IQ \geq 85$; no evidence of psychosis or neurological disorder, and; English-speaking parents and a home telephone.

Children were excluded if the referral involved aggressive or other significant antisocial behaviors, or if the psychiatric assessment with parent and child revealed a pattern of antisocial activities. This exclusion was implemented to rule out children with conduct disorders (CD). To determine whether conduct problems were successfully excluded, we examined the ratings on two measures, the Conners Teacher Rating Scale (CTRS) (Conners, 1969) and the Conners Parent Rating Scale (CPRS) (Conners, 1973), whose scoring ranges from 0 (Not at All) to 3 (Very Much). The overall mean of combined parent and teacher ratings on items corresponding to *DSM-IV* CD behaviors (bullying, lying, stealing, truancy, etc.) was very low (mean, 0.7; SD, 0.4), documenting that frequency of conduct problems was extremely scarce.

Probands would have met criteria for *DSM-IV* ADHD Combined Type since: cross-situationality was required; all subjects were clinically impaired by ADHD; relatively severe hyperactivity was required; mean ratings on the CTRS items of restless/overactive, inattentive/distractible, and excitable/impulsive [rated 0 to 3] were 2.8, 2.6, and 2.4, respectively, and; classroom observation ratings made by blind observers showed highly significant differences between index and "normal" children on items related to hyperactivity, inattention, and impulsivity (Abikoff, Gittelman, & Klein, 1980).

A non-ADHD white male comparison group ($n = 178$) matched for age, social class, and geographic residence was recruited at adolescent follow-up (Gittelman, Mannuzza, Shenker, & Bonagura, 1985; Mannuzza et al., 1991).

Previous Prospective Follow-Ups of this Sample

Participants were evaluated in late adolescence (mean age $\pm$ SD, 18.4 ± 1.3 years; 94% retention) and young adulthood (mean age $\pm$ SD, 25.3 ± 1.3 years; 85% retention). At both follow-ups, ADHD probands and non-ADHD comparisons were systematically interviewed by clinicians who were blind to childhood status [details in Gittelman et al. (1985) and Mannuzza et al. (1991) regarding adolescent follow-up, and in Mannuzza et al. (1993, 1998) regarding young adult follow-up].

The Present Adult Follow-Up

Participants and Methods—ADHD probands and non-ADHD comparisons are presently being evaluated in their mid-30s to mid-40s, i.e., 33 years after children with ADHD were seen. This paper presents interim results based on the initial 121 ADHD probands (59% of total childhood cohort; 64% of living). [Although 126 non-ADHD comparisons also were evaluated, this group is not needed to address our current hypotheses.] In review, subjects are white, middle-class males, who are 41.4 years, on average (SD = 2.7), and who had ADHD in childhood.

Subjects were administered comprehensive semi-structured interviews by clinicians (clinical psychologists and advanced-level clinical psychology doctoral candidates) who were blind to group membership (probands, controls). Interviews covered major functional domains (marital, occupational, social, medical, educational, etc.); treatment history; Substance Use, Abuse, and Dependence; ADHD symptoms and syndromes; Antisocial Personality Disorder; and Anxiety, Mood, and Psychotic Disorders. Clinicians formulated *DSM-IV* diagnoses based on these direct assessments. The audiotapes of 75 interviews were selected for inter-rater reliability assessment. The first author (SM) listened to these interviews and formulated independent *DSM-IV* diagnoses. Chance-corrected agreement was excellent for all disorders: kappas were .95 for ADHD (ranging from .88 to 1.0, depending on Type), .84 for Antisocial Personality Disorder, .96 for Alcohol Substance Use Disorder, .97 for Non-Alcohol Substance Use Disorder (e.g., Cannabis Abuse, Cocaine Dependence), .79 for Mood Disorders, .96 for Anxiety Disorders, and .92 for Any *DSM-IV* Disorder.

Assessment of Adult ADHD Behaviors, Symptoms, and Syndromes—The *Assessment of Adult Attention Deficit Hyperactivity Disorder* (AAA; Mannuzza, Klein, & Castellanos, 2004) was administered to all subjects. The AAA was specifically designed for use in the current adult prospective follow-up study of children with ADHD. The AAA includes three parallel sections, each corresponding to one of the three core symptoms of ADHD—Inattention, Impulsivity, and Hyperactivity. Each of the three sections includes subsections on behaviors (those listed in *DSM-IV*), impairment/distress, situationality, onset, and course. Each behavior (e.g., is forgetful in daily activities, has difficulty awaiting turn, talks excessively) is rated 0-Never or rarely, 1-Sometimes, 2-Often, or 3-Very often, for the interval since the last follow-up interview (i.e., age 25 to present). In accordance with *DSM-IV* ADHD Criterion E, behaviors are not rated as present if they are clearly associated with, and limited to, a disorder other than ADHD. For example, if an individual reports concentration difficulties and restlessness that are restricted to a 2-month period of sadness, anhedonia, and sleeplessness, these behaviors would be rated as 0-Never in the AAA since they are “better accounted for by another mental disorder”.

The scaling of the Impairment/Distress item is shown in Table 1. It should be emphasized that, as were all ratings, this was a clinical judgment, i.e., subjects were not asked to rate degree of impairment or distress on a 5-point scale. In addition, we used a rating of “3” as the threshold for clinical significance. For example, ADHD, Predominantly Inattentive,

could not be diagnosed unless the subject was rated "3," "4," or "5" on the Impairment/Distress item for Inattention.

Behaviors (e.g., forgetfulness), symptoms (e.g., inattention), and criteria for ADHD (e.g., clinically significant impairment) were considered present if, based on direct interview (i.e., self-report), the clinician, who was blind to group membership (proband or control), considered the item present at some time since the last interview (age 25). Stated differently, results of "Interval" clinician ratings and diagnoses will be reported in this paper, with an average interval of 16.6 years ($SD = 2.0$).

Reliability and Validity of the Impairment/Distress Ratings—The first author (SM) listened to the audiotapes of 75 interviews and rated the Impairment/Distress item for each of the 3 core ADHD symptoms as present (i.e., rating 3, 4, or 5, signifying clinically significant impairment or distress) or absent (i.e., rating 1 or 2, signifying none, or only mild impairment/distress). Compared to interviewer ratings, chance-corrected agreement was excellent for all 3 symptoms. Kappas were .87 for Inattention, .85 for Impulsivity, and .91 for Hyperactivity.

Validity of Impairment/Distress ratings was examined in 2 ways. First, as with reliability, ratings were dichotomized into present (3, 4, or 5) and absent (1, 2), and the 121 ADHD probands and 126 non-ADHD controls were compared. On all 3 symptoms, significantly more probands than controls had reported experiencing the symptom to a clinically significant degree in adulthood. For Inattention, 42% vs. 17%, $\chi^2(1) = 18.07$, $p < .001$, 2-tailed. For Impulsivity, 37% vs. 14%, $\chi^2(1) = 17.04$, $p < .001$, 2-tailed. For Hyperactivity, 31% vs. 13%, $\chi^2(1) = 12.64$, $p < .001$, 2-tailed. Second, using a Mann-Whitney test (Siegel & Castellan, 1988), we compared the actual Impairment/Distress ratings (1 through 5) and, on all 3 symptoms, probands had significantly higher ratings than controls. For Inattention, $U = 5,204$, $z = 4.60$, $p < .001$, 2-tailed. For Impulsivity, $U = 5,772$, $z = 3.62$, $p < .001$, 2-tailed. For Hyperactivity, $U = 5,328$, $z = 4.55$, $p < .001$, 2-tailed. The results of these group contrasts suggest that the Impairment/Distress item used in the present study had acceptable discriminant validity.

Data Analyses

Data analyses followed the two principal hypotheses.

Hypothesis 1. Symptom and impairment correlations will be modest—

Spearman rank-order correlation coefficients were computed for number of behaviors experienced as "often" or "very often" with the Impairment rating on the corresponding symptom (Table 1). This correlation coefficient estimates the degree of association between two variables, both measured in at least an ordinal scale. Since there is no constant unit of measurement in our Impairment scale (Table 1) [i.e., we cannot state that the difference between 1 and 2 is quantitatively equivalent to the difference between, say, 3 and 4], a Pearson product-moment correlation coefficient (which requires at least interval measurement of both variables) is inappropriate. According to Siegel and Castellan (1988), the relative efficiency of the Spearman coefficient is 91% compared to the Pearson.

Hypothesis 2. The number of subjects meeting the ADHD Symptom Criterion will drop considerably, when clinically significant impairment due to ADHD symptoms is additionally required—

Descriptive, no statistical analyses required.

It was also of interest to determine whether we replicated Barkley et al.'s (2008) finding that all subjects with 4 or more inattentive and/or 4 or more hyperactive-impulsive behaviors were significantly impaired.

Results

Frequency of ADHD Behaviors

Table 2 shows the frequency of inattention and hyperactive-impulsive behaviors that were experienced as “often” or “very often” during the 16-year follow-up interval. Most participants endorsed at least 1 behavior and, on average, 2–3 (of 9) behaviors in each category were experienced in adulthood. Also, 16% (19/121) reported at least 6 inattention, and 17% (21/121) reported at least 6 hyperactive-impulsive behaviors.

Symptom and Impairment Correlations

Spearman correlation coefficients ($df = 119$) were .85, .83, and .84, for Degree of Impairment (rated 1-None to 5-Extreme) with Number of Inattention Behaviors (0 to 9), Hyperactive-Impulsive Behaviors (0 to 9), and All ADHD Behaviors (0 to 18), respectively. All were significant at $p < .001$.

Effect of the Impairment Criterion on Classification

Table 3 shows the classification of participants for each ADHD Type based on the Symptom Criterion, alone, and the Symptom plus Impairment Criteria. Both classification procedures yielded identical results, i.e., the Impairment Criterion had no effect on the classification of any subject.

Relationship between Impairment and Number of ADHD Behaviors

Table 4 shows the relationship between clinically significant impairment (rated as No-Yes, or 1–2 vs. 3–5 on the scale shown in Table 1) and the number of ADHD behaviors. For both inattention and hyperactive-impulsive behaviors, all subjects who reported experiencing 5 or more ADHD behaviors as “often” or “very often” in adulthood were clinically impaired as a result of their symptoms.

Discussion

The purpose of this study was to examine the relationship between adult ADHD symptoms and impairment among individuals who were diagnosed as having ADHD in childhood. Based on previous studies with children, we hypothesized that symptom-impairment correlations would be modest, and that applying the impairment criterion, in addition to the symptom criterion, would substantially decrease the number of adults diagnosed with ADHD. We found that, contrary to results reported in children, correlations were very high (.83 to .85), indicating that there was a strong association between number of ADHD symptoms and degree of impairment. Notably, the impairment measure used in this study was directly tied to the ADHD symptoms and was not a global index of functioning. Therefore, there was no ambiguity concerning other factors unrelated to ADHD that may have had functional impact. Interestingly, and also contrary to findings in children, the impairment criterion had no effect on who was, or was not, diagnosed as having ADHD.

We were initially surprised by our results since they were the opposite of what we had hypothesized. However, they do make good clinical sense, and are consistent with the Adult ADHD literature. Barkley, Fischer, Smallish, and Fletcher (2002) have argued that imposing a fixed threshold on the number of behaviors needed for an ADHD diagnosis is inappropriate when used across the life span since the frequency of ADHD symptoms decreases with age (Hart, Lahey, Loeber, Applegate, & Frick, 1995). Since fixed threshold criteria become less sensitive in detecting ADHD as age increases, the diagnosis of ADHD would be underestimated with increasing age. In their follow-up of children with ADHD who were evaluated at age 27, Barkley and colleagues (2008) found that, using *DSM-IV*

criteria, a threshold of 4 (vs. 6 in *DSM-IV*) Inattention or Hyperactive-Impulsive behaviors was most effective in discriminating ADHD probands from non-ADHD comparisons. In the present study, it appears that the optimal threshold was 5, i.e., all participants who reported at least 5 Inattention and/or at least 5 Hyperactivity-Impulsivity behaviors in adulthood were clinically impaired by their symptoms (Table 4). These findings suggest that the apparent unimportance of the Impairment Criterion (Table 3) resulted from setting the threshold for a diagnosis of ADHD in adults too high. Even 4 or more behaviors were associated with significant impairment in 97% of cases with Inattention behaviors and 93% of cases with Hyperactivity-Impulsivity behaviors (Table 4).

Our findings are also consistent with Barkley et al.'s (2006) contention that, when impairment is measured across functional domains, a stronger relationship between severity of impairment and severity of ADHD symptomatology is apparent. Our measure was not limited to behavior in any particular area. Instead, the subject was asked, "Have [SYMPTOMS OF ADHD] led to any difficulties at home, at work, or with other people? ... For example, have these behaviors diminished your performance at work, or interfered with doing things at home, or affected your relationships with friends?" Based on the information provided and additional probes, a clinical judgment was made, and a rating was assigned (Table 1). Perhaps if our analyses were restricted to functional impact in the home, or work, or social, or marital, etc., domains our findings would be very different.

The high correlations between number of symptoms and degree of functional impairment also make good clinical sense. For example, individuals who experience 1 or 2 Inattention behaviors as "Often" or "Very Often" (e.g., forgetting doctors' appointments, and losing tools at work) would be expected to be less impaired than individuals who report 3 or 4 behaviors (e.g., forgetfulness, losing things, making careless mistakes on the job, and having difficulty sustaining attention in leisure activities when with friends).

Despite our findings, for several reasons, it should not be concluded that the Impairment Criterion (for ADHD or any other disorder) is superfluous. First, although *DSM-IV* states "that no definition adequately specifies precise boundaries for the concept of 'mental disorder'" (p. xxi), "distress" and "disability" (components of the Impairment Criterion) are arguably the most important facets of a clinical syndrome. Particularly for adult disorders, distress or disability, not just symptoms, is what causes the individual to seek, or be referred for, help. It is the principal focus of intervention, and the primary index of treatment success and failure. Second, some individuals report fewer than the required threshold number of behaviors, yet suffer impairment. For example, in the current study, of the 15 individuals who reported 3 Hyperactive-Impulsive behaviors, 7 (47%) were judged to be clinically impaired by their symptoms. These individuals presumably would be diagnosed as ADHD NOS in *DSM-IV* but would have been missed, had impairment not been systematically assessed. Third, we do not know how the ADHD Symptom Criterion will change in *DSM-V*, either in threshold number of behaviors, or in the behaviors, themselves. Barkley et al. (2008) already have recommended fairly radical changes in this criterion. Fourth, at what point is an individual considered "significantly impaired," and what guidelines should be employed to make this determination? Fifth, although symptom-impairment correlations were very high (.83 to .85), they explained about 70% of the variance, which still leaves room for other relationships in any single case. Finally, as Barkley et al. (2008) have indicated, there will always be a small group of patients who report several ADHD behaviors with no significant impairment. Therefore, the Impairment Criterion is needed to rule out, as well as rule in, persons in need of treatment.

Limitations

Although interviewers initially were blind to childhood status, it is possible that, in some cases, the impairment rating unintentionally was influenced by the number of symptoms reported. We emphasized the independence of behaviors and functional impact during interviewer training (i.e., that behaviors did not imply impairment, and that the two should be rated separately), but the possibility of such a bias still exists.

As in any study, results cannot be generalized beyond the specific characteristics of the sample. We studied white, predominantly middle class males of average intelligence, with relatively severe childhood hyperactivity, that would meet criteria for ADHD, Combined Type, but no Conduct Disorder, who were seen at a child psychiatric research clinic. We do not know how any of these factors (gender, ethnicity, IQ, childhood severity, Type, etc.) may have influenced the relationship between symptoms and impairment in adulthood, or whether the same relationship existed in childhood.

References

- Abikoff H, Gittelman R, Klein DF. Classroom observation code for hyperactive children: a replication of validity. *Journal of Consulting and Clinical Psychology* 1980;48:555–565. [PubMed: 7410654]
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 2nd ed.. Washington, DC: Author; 1968.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 3rd ed., rev.. Washington, DC: Author; 1987.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed.. Washington, DC: Author; 1994.
- Barkley RA, Cunningham CE, Gordon M, Faraone SV, Lewandowski L, Murphy KR. ADHD symptoms vs. impairment: Revisited. *ADHD Report* 2006;14:1–9.
- Barkley RA, Fischer M, Smallish L, Fletcher K. The persistence of attention deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. *Journal of Abnormal Psychology* 2002;111:279–289. [PubMed: 12003449]
- Barkley, RA.; Murphy, KR.; Fischer, M. ADHD in adults: What the science says. New York, NY: Guilford; 2008.
- Conners CK. A teacher rating scale for use in drug studies with children. *American Journal of Psychiatry* 1969;126:152–156.
- Conners CK. Rating scales for use in drug studies with children. *Psychopharmacology Bulletin* 1973;9:24–29.
- Davidson MA. ADHD in adults: a review of the literature. *Journal of Attention Disorders* 2008;11:628–641. [PubMed: 18094324]
- Faraone SV, Sergeant J, Gillberg C, Biederman J. The worldwide prevalence of ADHD: Is it an American condition? *World Psychiatry* 2003;2:104–113. [PubMed: 16946911]
- Fischer M, Barkley RA, Smallish L, Fletcher K. Young adult follow-up of hyperactive children: Self-reported psychiatric disorders, comorbidity, and the role of childhood conduct problems and teen CD. *Journal of Abnormal Child Psychology* 2002;30:463–475. [PubMed: 12403150]
- Gadow KD, Nolan EE, Litcher L, Carlson GA, Panina N, Golovakha E, et al. Comparison of attention-deficit/hyperactivity disorder symptom subtypes in Ukrainian schoolchildren. *Journal of the American Academy of Child and Adolescent Psychiatry* 2000;39:1520–1527. [PubMed: 11128329]
- Gathje RA, Lewandowski LJ, Gordon M. The role of impairment in the diagnosis of ADHD. *Journal of Attention Disorders* 2008;11:529–537. [PubMed: 18259000]
- Gittelman, R.; Abikoff, H.; Pollack, E.; Klein, DF.; Katz, S.; Mattes, J. A controlled trial of behavior modification and methylphenidate in hyperactive children. In: Whalen, C.; Henker, B., editors. *Hyperactive children*. Orlando, FL: Academic Press; 1980. p. 221–243.

- Gittelman R, Mannuzza S, Shenker R, Bonagura N. Hyperactive boys almost grown up: I. Psychiatric status. *Archives of General Psychiatry* 1985;42:937–947. [PubMed: 4037987]
- Gittelman-Klein R, Klein DF, Katz S, Saraf K, Pollack E. Comparative effects of methylphenidate and thioridazine in hyperkinetic children. *Archives of General Psychiatry* 1976;33:1217–1231. [PubMed: 971031]
- Gordon M, Antshel K, Faraone S, Barkley R, Lewandowski L, Hudziak JJ, et al. Symptoms versus impairment: The case for respecting DSM-IV's Criterion D. *Journal of Attention Disorders* 2006;9:465–475. [PubMed: 16481663]
- Hart EL, Lahey BB, Loeber R, Applegate B, Frick PJ. Developmental changes in attention-deficit hyperactivity disorder in boys: a four-year longitudinal study. *Journal of Abnormal Child Psychology* 1995;23:729–750. [PubMed: 8609310]
- Mannuzza S, Klein RG, Bessler A, Malloy P, LaPadula M. Adult outcome of hyperactive boys: Educational achievement, occupational rank, and psychiatric status. *Archives of General Psychiatry* 1993;50:565–576. [PubMed: 8317950]
- Mannuzza S, Klein RG, Bessler A, Malloy P, La Padula M. Adult psychiatric status of hyperactive boys grown up. *American Journal of Psychiatry* 1998;155:493–498. [PubMed: 9545994]
- Mannuzza S, Klein RG, Bonagura N, Malloy P, Giampino TL, Addalli KA. Hyperactive boys almost grown up: V. Replication of psychiatric status. *Archives of General Psychiatry* 1991;48:77–83. [PubMed: 1984764]
- Mannuzza, S.; Klein, RG.; Castellanos, FX. Assessment of adult attention deficit hyperactivity disorder (AAA); NYU Langone School of Medicine Department of Child and Adolescent Psychiatry; New York, NY. Orangeburg, NY: Nathan S. Kline Institute for Psychiatric Research; 2004. Unpublished instrument
- Patterson DA, Lee MS. Field trial of the global assessment of functioning scale-modified. *American Journal of Psychiatry* 1995;152:1386–1388. [PubMed: 7653701]
- Pineda D, Ardila A, Rosselli M, Arias BE, Henao GC, Gomez LF, et al. Prevalence of attention-deficit/hyperactivity disorder symptoms in 4- to 17-year-old children in the general population. *Journal of Abnormal Child Psychology* 1999;27:455–462. [PubMed: 10821627]
- Rasmussen P, Gillberg C. Natural outcome of ADHD with developmental coordination disorder at age 22 years: A controlled, longitudinal, community-based study. *Journal of the American Academy of Child and Adolescent Psychiatry* 2000;39:1424–1431. [PubMed: 11068898]
- Siegel, S.; Castellan, NJ, Jr. Nonparametric statistics for the behavioral sciences. New York, NY: McGraw-Hill; 1988.
- Weiss G, Hechtman L, Milroy T, Perlman T. Psychiatric status of hyperactives as adults. *Journal of the American Academy of Child and Adolescent Psychiatry* 1985;24:211–220.

Table 1

Impairment/Distress Item from the Inattention Section of the Assessment of Adult Attention Deficit
Hyperactivity Disorder (AAA)

Questions- You've told me that [CITE EXAMPLES OF CONCENTRATION DIFFICULTIES, DISTRACTIBILITY, SHORT ATTENTION SPAN, ETC.]. Have they led to any difficulties at home, at work, or with other people? How have they affected your life? For example, have these behaviors diminished your performance at work, or interfered with doing things at home, or affected your relationships with friends? Has that been a big problem for you, or bothered you? How would your life have been different without [____]?

Rating	Descriptor	Definition
1	None	Symptom never a problem since last interview.
2	Mild	Somewhat of a problem at times, but does not significantly interfere with functioning, or cause clinically significant distress.
3	Moderate	Definitely a problem at times; or somewhat of a problem on numerous occasions, with some interference in functioning or clinically significant distress.
4	Severe	Definitely a problem on many occasions; or the symptom significantly limited the subject's functioning; or the subject was considerably distressed by the symptom.
5	Extreme	Symptom characterizes functioning and is a major problem.

Note. The identical definitions are used for Impulsivity and Hyperactivity items.

Table 2

Frequency Distribution of the Number of ADHD Behaviors reported as “Often” or “Very Often” among 121 Adult Participants with Childhood ADHD

Number of behaviors	Inattentive N (%)	Hyperactive-Impulsive N (%)
None	48 (40)	34 (28)
1	18 (15)	16 (13)
2	13 (11)	15 (12)
3	9 (7)	15 (12)
4	7 (6)	16 (13)
5	7 (6)	4 (3)
6	8 (7)	7 (6)
7	5 (4)	4 (3)
8	5 (4)	9 (7)
9	1 (1)	1 (1)
Mean (SD)	2.20 (2.6)	2.69 (2.6)

Table 3

Classification of 121 Adult Participants with Childhood ADHD by Symptom Criterion, Impairment Criterion, and Type

Type of ADHD	Symptom Criterion N (%)	Symptom plus Impairment Criteria N (%)
Predominantly Inattentive	10 (8)	10 (8)
Predominantly Hyperactive-Impulsive	12 (10)	12 (10)
Combined	9 (7)	9 (7)
Any of the above	31 (26)	31 (26)

Note. Inattentive and Hyperactive-Impulsive Types required that 6 of 9 behaviors were reported as “Often” or “Very Often”. The Combined Type required that both of these criteria were met. The Impairment Criterion additionally required that ADHD behaviors resulted in clinically significant impairment during the follow-up interval (ages 25 to 41).

Table 4

Proportion of Participants with Clinically Significant Impairment as a Function of Number of ADHD Behaviors

Symptom	Number of Behaviors Reported As “Often” or “Very Often”			
	3 or more N (%)	4 or more N (%)	5 or more N (%)	6 or more N (%)
Inattention	39 (93)	32 (97)	26 (100)	19 (100)
Hyperactivity-Impulsivity	45 (80)	38 (93)	25 (100)	21 (100)

Note. There were 0 to 9 possible Inattentive and 0 to 9 possible Hyperactive-Impulsive behaviors.