

## Young Adults with Attention Deficit Hyperactivity Disorder: Subtype Differences in Comorbidity, Educational, and Clinical History

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The present study sought to examine subtype differences in comorbidity and in antisocial, educational, and treatment histories among young adults (ages 17–27) with attention deficit hyperactivity disorder (ADHD). Comparisons were made between ADHD Combined Type (ADHD-C;  $N = 60$ ) and Predominantly Inattentive Type (ADHD-I;  $N = 36$ ) relative to each other and to a community control group of 64 adults. Both ADHD groups had significantly less education, were less likely to have graduated from college, and were more likely to have received special educational placement in high school. Both groups also presented with a greater likelihood of dysthymia, alcohol dependence/abuse, cannabis dependence/abuse, and learning disorders, as well as greater psychological distress on all scales of the SCL-90-R than the control group. Both ADHD groups were more likely to have received psychiatric medication and other mental health services than control adults. In comparison with ADHD-I, adults with ADHD-C differed in only a few respects. The C-type adults were more likely to have oppositional defiant disorder, to experience interpersonal hostility and paranoia, to have attempted suicide, and to have been arrested than the ADHD-I adults. These results are generally consistent with previous studies of ADHD in children, extend these findings to adults with ADHD, and suggest that the greater impulsivity associated with the ADHD-C subtype may predispose toward greater antisocial behavior and its consequences than does ADHD-I type in adults.

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Attention deficit hyperactivity disorder (ADHD) is characterized by clinically impairing symptoms of inattention, hyperactivity, and impulsivity that arise during childhood, are frequently persistent across development, and result in impairment in multiple domains of adaptive functioning (American Psychiatric Association, 1994; Barkley, 1998). Since 1980, at least two subtypes of ADHD have been distinguished. One is a subgroup having only clinically significant problems with inattention. The second is a subgroup having inattention along with problems with hyperactive-impulsive behavior. In the original formulation of attention deficit disorder with and without hyperactivity, the problem of impulsiveness

was affiliated with the inattention problems rather than with hyperactivity (American Psychiatric Association, 1980). However, subsequent research has shown the opposite to be the case with the impulsive symptoms loading on the same factorial dimension as those for hyperactivity (DuPaul et al., 1997; Lahey et al., 1994). This led to a subsequent reconceptualization of the inattentive type in the *Diagnostic and Statistical Manual*, 4th edition, (DSM-IV) as not involving problems with impulsiveness but to present difficulties in the realm of inattention exclusively. In that version of the DSM, the disorder is viewed as having three subtypes created through the use of these two symptom lists: predominantly inattentive, predominantly hyperactive-impulsive, and combined types (American Psychiatric Association, 1994).

Longitudinal studies suggest that the difficulties with hyperactive-impulsive behavior may emerge first, followed within a few years by symptoms of inattention (Loeber et al., 1992). This implies that the hyperactive-impulsive subtype may be a developmental precursor to the combined type (ADHD-C), at least in some cases, with the combined type emerging from the hyperactive-impulsive type as

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further symptoms of inattention emerge, particularly during the early elementary grades. This may explain why the hyperactive-impulsive type appears to exist primarily among pre-school-age children and is substantially less likely to occur in older ages of clinically referred children (Applegate et al., 1997). The inattentive subtype (ADHD-I) appears to emerge at an even later age of onset than the other two subtypes (Applegate et al., 1997).

The DSM-IV implies that the ADHD-C and ADHD-I subtypes share a common disorder of attention although differing in the degree of associated hyperactive-impulsive behavior. Studies of this issue are inconsistent but sufficient neuropsychological differences have emerged to suggest that the subtypes may not share a qualitatively similar impairment in the same component of attention (Barkley et al., 1990; Lahey and Carlson, 1992; Milich et al., 2002). Attention has been conceptualized, particularly in neuropsychology, as a multi-component process typically including such components as arousal/alertness, selective/focus, sustain/persist, and shift/flexibility (Barkley, 1988; Mirsky, 1996). Some studies of the ADHD-I type suggest that it may involve problems more in the realm of selective or focused attention as well as a sluggish tempo of information processing. The ADHD-C type, in contrast, is more likely to involve problems with response inhibition, persistence of attention, and resistance to distraction (Barkley et al., 1992; Carlson and Mann, in press; Lahey and Carlson, 1992). Two reasons therefore exist for predicting differences between the ADHD-C and ADHD-I types of ADHD in psychiatric comorbidity, developmental course, and adaptive functioning. One is that the ADHD-C type is associated with both more symptoms of ADHD in general, and specifically with more hyperactive-impulsive behavior. Given that hyperactive-impulsive behavior is a known early risk factor of later externalizing and antisocial disorders and their associated consequences (peer rejection, crime, drug use, school disciplinary actions, and so on; Mesman et al., 2001; Moffitt and Caspi, 2001; Patterson et al., 2000), it would not be surprising to find that these same disorders and outcomes would also be found to occur disproportionately in the ADHD-C rather than in the ADHD-I subtype. In fact, studies of children find this to be the case, with the ADHD-I type being less likely to involve co-existing oppositional defiant disorder (ODD) and conduct disorder (CD) and its associated impairments in peer interactions (Eiraldi et al., 1997; Faraone et al., 1998; Hodgens et al., 2000; Milich et al., 2002).

The second reason why differences between the subtypes would be predicted, particularly in the

realm of education, has to do with the possibility already suggested that the ADHD-I subtype has a qualitatively different impairment in attention than does the ADHD-C type, with the former having poorer selective attention and slower information processing (Milich et al., 2002). Although Faraone et al. (1998) found greater educational services being needed by the ADHD-I type, research to date has been inconsistent about whether the patients with ADHD-I are more prone to learning disorders and educational performance problems than the ADHD-C type (Milich et al., 2002).

Nearly all research on subtype differences in ADHD has been performed in children. Only a few studies have examined differences between these ADHD subtypes among clinic-referred adults with ADHD. The largest study to date was that by Millstein et al. (1997) who compared these three subtypes in a sample of 149 clinically diagnosed adults with ADHD. They found that 56% of patients could be classified as ADHD-C type, 37% as ADHD-I type, and only 2% as the hyperactive-impulsive type (HI). Comorbidity was found to be most common among the ADHD-C and HI types, although the sample of HI adults was far too small ( $N = 3$ ) to permit adequate statistical power to evaluate its differences from the other two groups. ODD and substance dependence and abuse disorders for drugs other than alcohol were the most prominent in the ADHD-C type relative to the ADHD-I type. The ADHD-C type was also more likely to have received special educational class placements in their formal schooling. The study is consistent with others showing ADHD adults to be more at risk of these comorbid disorders as well as associated antisocial conduct and its consequences (higher arrest rates, probation status, frequent changes in employment, adverse driving outcomes; Barkley et al., 1996a, 1996b; Murphy and Barkley, 1996a). The Millstein et al. study (1997) was among the first to indicate that such comorbidity was associated with ADHD-C more than with ADHD-I type. Problematic with that study, however, was the absence of a community control group to determine how the clinical groups may have differed from normal controls. No other research could be located on potential subtype differences among ADHD adults in their psychiatric comorbidity and no research seems to have examined for differences in treatment use.

The present study reports on the clinical comorbidity, impairments in adaptive functioning, and history of mental health services in a sample of young adults clinically referred and carefully diagnosed with ADHD. The study had two specific aims. The first was to replicate earlier studies of subtype dif-

ferences in psychiatric comorbidity, particularly that by Millstein et al. (1997). Unlike previous studies, comorbid psychiatric disorders were not only evaluated categorically (psychiatric diagnoses), but also dimensionally (levels of anxiety, depression, hostility, and the like) given that subtype differences may exist along these dimensions that do not rise to the level of clinically diagnosable disorders. A second aim was to examine differences among the subtypes in several domains of adaptive functioning, including antisocial, educational, and treatment histories. We hypothesized that given the greater hyperactive-impulsive behavior and its attendant risks for other externalizing and antisocial disorders associated with ADHD-C compared with ADHD-I in children and adults, the former subtype would also have greater educational services use, impairments, substance use and abuse, and mental health treatment than would the ADHD-I subtype.

## Methods

### Participants

This study involved a comparison of three groups of older adolescents and young adults between the ages of 17 and 28 years: a) a group diagnosed with ADHD-C ( $N = 60$ ), b) a group diagnosed with ADHD-I ( $N = 36$ ), and c) a normal control group ( $N = 64$ ). All participants met the following entry criteria for the study: a) chronological age between 17 years and 28 years; b) composite IQ score of less than 80 on the Kaufman Brief Intelligence Test (Kaufman and Kaufman, 1993); c) corrected or uncorrected visual acuity of no worse than 20/30 based on a brief screening by using a Snelling chart; d) a valid state driver's license; and e) no evidence of deafness, blindness, severe language delay, cerebral palsy, epilepsy, autism, or psychosis as established through medical history and clinical diagnostic interview. The vision requirement and that for a driver's license were imposed because one aim of the larger project in which this study took place was the examination of driving abilities and risks associated with ADHD. The results of that study and those of a set of neuropsychological tasks are reported elsewhere (Barkley et al., in press; Murphy et al., 2001).

Participants in the ADHD group were recruited from consecutive referrals to clinics specializing in child and adult ADHD at a medical school in the northeastern United States. They had to receive an expert clinical diagnosis of ADHD established not only by meeting the DSM-IV diagnostic criteria but also by the judgment of an expert clinician. The DSM criterion for onset of symptoms was amended to age 12 or earlier rather than the threshold of 7 years of

age. This adjustment was based on the consideration that no empirical, historical, or pragmatic evidence exists to show that this criterion of onset by age 7 distinguishes valid from invalid cases (Barkley and Biederman, 1997). Moreover, the DSM-IV field trial (using only children) also found that use of this criterion significantly diminished the reliability of the diagnosis (Applegate et al., 1997). Imposition of such an unjustifiable threshold would create even further difficulties for the reliability of diagnosis in adults given the greater span of time involved in their own retrospective reports of their childhood behavior. Consequently, participants were asked to consider their childhood behavior between 5 and 12 years of age (elementary school years) in answering questions about the onset of their symptoms, as recommended by Barkley and Biederman (1997).

The diagnosis of ADHD was determined through a multistep process. First, all potentially eligible study subjects completed the Adult ADHD Rating Scale (see later discussion) for their current functioning and for recall of childhood, ages 5 to 12 years, as an initial screen for probable ADHD. Whenever possible, these same two rating scales were completed by the participants' parents. Parent information was available for 80 of 105 ADHD participants (76%). Some local norms (*i.e.*, those currently followed in central Massachusetts) were available on this rating scale for both of the self-report forms (Murphy and Barkley, 1996b). These norms were used to determine that the participants displayed clinically deviant levels of ADHD symptoms (at least +1.5 SD more than the normal mean). Second, study subjects passing this screen received a structured clinical diagnostic interview. Whenever possible, this interview included at least one of the participant's parents. This interview was conducted by a licensed clinical psychologist with 9 years of clinical experience evaluating teens and adults with ADHD (K.R.M.). Given that no DSM-IV-based structured interview exists for the determination of ADHD in adults, the investigators created one for this project that explicitly set forth all symptoms and other diagnostic criteria for ADHD (with age of onset criterion modified as already specified). The subject's response to each item was recorded on the interview form. To be eligible at this stage, study subjects had to meet DSM-IV criteria for ADHD with onset of symptoms producing impairment before age 12 years.

Interjudge reliability (agreement) on this same structured interview for ADHD DSM-IV criteria has been established in an unrelated study of an independent sample of adults with ADHD and control adults (ongoing National Institute of Mental Health grant to R.A.B.). In that project, this interview by

this same expert clinician was audio taped. Twenty percent (*i.e.*, 41) of the tapes in that project to date were randomly sampled and received a blinded independent review by another expert (R.A.B.) to determine whether the study subjects' responses to this DSM-based interview met DSM criteria (as amended for onset). Agreement between the two judges on whether the DSM-IV criteria for ADHD were met was 85.3% ( $\kappa = .712$ , approximate  $T^b = 4.76$ ,  $p < .001$ ). If the tapes ( $N = 21$ ) involving study subjects being recruited into the community control group are excluded, agreement was 91.2%.

In the last stage, the expert clinician then based his final judgment of the diagnosis not only on the reports of participants to these explicit DSM criteria but, when available, on those of their parents as well. Furthermore, the expert's final decision also included a review of past school records, where available, and any other sources of information the study subject brought to the evaluation (previous professional reports). It also involved ruling out other more parsimonious explanations for the subject's symptoms in keeping with DSM-IV recommendations to this effect. Using this multistage and multisource approach, 55% of the 105 ADHD participants were diagnosed with ADHD-C type ( $N = 58$ ), 34% as ADHD-I type (36), 2% as predominantly HI type ( $N = 2$ ), and 9% as ADHD not otherwise specified (residual type,  $N = 9$ ). All subtype diagnoses were for current functioning. For this study, the two participants with ADHD HI type were combined with those with the ADHD-C type, given that both groups had significant difficulties with behavioral inhibition that distinguished them from the Inattentive Type. The participants having ADHD not otherwise specified (residual type) were not included in the analyses reported later in this article.

Participants in the community control group were recruited through advertisements placed in the regional newspaper. They were required to have a) no history of a diagnosis of a psychiatric disorder based on an interview with the participant; b) fewer than six symptoms of ADHD rated as occurring "pretty much" or "very much" on the ADHD Rating Scale used to assess current functioning, as discussed previously; and c) no history of receiving mental health treatment services for major psychiatric disorders. These participants could have received counseling for adjustment reactions to life events, such as death of a loved one or breakup of an intimate relationship, and still have been eligible for participation. Those adolescents and young adults within the specified age range who responded to the advertisement were initially screened by their completion of the Adult ADHD Rating Scale described previously.

Scores had to be within the normal range (within 1 SD of the mean on local norms). These participants were interviewed by the same clinician to determine final eligibility for participation.

This project was reviewed and approved by the university's Institutional Review Board.

### *Procedures*

Each potential participant (and his or her parent/guardian in the case of participants younger than 18 years of age) was contacted by telephone to describe the study and to determine whether they desired to participate. If so, they were mailed a packet of forms to complete, including the ADHD Rating Scale (see later discussion). On the day of their initial evaluation, participants (and parents, whenever possible) were interviewed by a clinical psychologist expert in adults with ADHD (K.R.M.) to determine the participant's eligibility for further participation in the study. Each participant then received an extensive battery of measures, including structured clinical interviews about DSM-IV disruptive behavior disorders (ADHD, ODD, CD) by the clinical psychologist, and review of their educational history as well as histories of antisocial activity, drug and alcohol use, and use of various types of mental health services conducted by the research assistant. An unstructured interview was also used by the clinical psychologist to review current psychological status and concerns, including any symptoms of DSM-IV psychiatric disorders. The participants also completed a rating scale of major areas of psychological distress (SCL-90-R, see later discussion), a battery of neuropsychological tests, and a battery of tests of motor-vehicle driving ability. The interviews were conducted during a half-day evaluation, whereas the tests and driving measures were collected during a second half-day appointment conducted within 1 week of the first evaluation. The clinical psychologist conducting some of the interviews was not blind to the group membership of the participants whereas the research assistant conducting the historical interviews was blind to the subtyping of the two ADHD groups but not to whether they were in the ADHD or control group. All participants were paid \$100 for their completion of the interviewing and testing.

### *Measures*

*The Kaufman Brief Intelligence Test.* The Kaufman Brief Intelligence Test (Kaufman and Kaufman, 1993) is a short intelligence test composed of a verbal test (vocabulary) and a nonverbal test (matrix reasoning).

It can be scored to yield separate standard scores for each of these tests and a composite IQ score. The composite score was used here both as a screening criterion for study entry (see *Participants*) and as a covariate in the data analyses (see *Results*).

*Structured Clinical Interview of Disruptive Behavior Disorders.* Given that no published structured interview of the DSM-IV disruptive behavior disorders exists for use with adults, one was created for this project. It consisted of the precise criteria from the DSM-IV for the three disruptive behavior disorders (ADHD, ODD, and CD). The portion of this interview dealing with ADHD was used as part of the selection criteria identifying the groups as ADHD or not, as well as their particular subtype (see *Participants*). Information on the interjudge reliability for ADHD diagnoses by using this interview was reported earlier in this article.

*ADHD Rating Scale for Adults.* The ADHD Rating Scale for Adults (Barkley and Murphy, 1998; Murphy and Barkley, 1996b) is a scale that contains the 18 items from the diagnostic criteria for ADHD in the DSM-IV. Each item is rated on a scale from 0 to 3, representing not at all or rarely, sometimes, often, and very often, respectively. Participants completed two versions of this scale, one being for current symptoms and the other for recall of childhood symptoms between ages 5 to 12 years. Norms for both scales are available for the region in which this study took place. The scores represented the number of items answered as often or very often. For the two ADHD groups, these same rating scales were obtained from parents of these participants whenever possible. Evidence for reliability and internal consistency of this scale is not available. Evidence for validity was obtained by computing correlations between the self-ratings and parent ratings for both the current symptom and childhood symptom versions of these scales by using just these 72 ADHD participants. For current symptoms, the correlation was  $r = .76$  ( $p < .001$ ) whereas for the childhood symptom version, it was  $r = .79$  ( $p < .001$ ). Local norms are available (Murphy and Barkley, 1996b).

*Symptom Checklist 90—Revised.* The Symptom Checklist 90—Revised (Derogatis, 1986) is a scale that provides a Global Severity Index as well as T-scores for nine specific scales of maladjustment (e.g., anxiety, paranoid ideation, interpersonal hostility, depression, and others). It was used here to evaluate comorbidity for various psychopathological dimensions, in addition to the evaluation of psychiatric diagnostic categories provided by the DSM-based clinical interview.

*Structured Interview of Educational, Antisocial, Drug/Alcohol, and Mental Health Services Histories.*

A structured interview was created for this project so as to review with all study subjects their educational history; their history of antisocial activities, including arrests for various offenses; their history of alcohol and drug use, dependence, and abuse; and their history of using various types of mental health services.

## Results

Information on the initial demographic and selection criteria for three groups is presented in Table 1. The groups were compared using analysis of variance or chi square, as appropriate. Where significant ( $p < .05$ ), pairwise comparisons were conducted either using the least significant difference test or chi square, as appropriate. As Table 1 shows, the groups did not differ significantly in their age, their gender composition, marital status, or in their socioeconomic status as determined from the Hollingshead Index of Social Position (Hollingshead, 1975). The two ADHD groups had significantly fewer years of education and had a lower IQ score than the control group. The two ADHD groups did not differ from each other in these respects. As expected from the selection criteria, the ADHD-C group also reported significantly more current and childhood DSM-IV symptoms of ADHD on the Adult ADHD Rating Scale than did the ADHD-I group or the control group. The ADHD-I group also reported having significantly more such symptoms than the control group. Parent ratings on these same two rating scales were available for 40 of the ADHD-C participants and 32 of the ADHD-I participants. Comparisons of these two groups on these two scales are also shown in Table 1. As would be expected from the diagnostic criteria for these two subtypes of ADHD, these analyses indicate that the ADHD-C group were reported by parents to have significantly more ADHD symptoms than the ADHD-I group for both current and childhood symptoms. Fifty percent of the ADHD-C group and 36.1% of the ADHD-I group reported having received a previous diagnosis of ADHD at sometime in their life. This difference was not significant.

### *Educational History*

The educational histories reported by the three groups are shown in Table 2. A family-wise Bonferroni correction was applied to these and all subsequent omnibus analyses to control for type I errors given the large number of statistical tests. Significance was set by dividing .05 by the number of measures analyzed within a given family of out-

TABLE 1  
Information on Demographic and Subject Selection Characteristics by Group

Measure	ADHD-C <sup>a,b</sup>		ADHD-I <sup>a,c</sup>		Control		<i>F</i> / <i>X</i> <sup>2</sup>	<i>p</i> <	Contrasts <sup>d</sup>
	Mean/%	SD	Mean/%	SD	Mean/%	SD			
Age (yrs)	21.3	2.7	20.1	2.1	21.1	2.4	2.95	NS	—
IQ Score (KBIT) <sup>e</sup>	103.9	10.0	106.2	9.8	110.7	7.9	8.78	.001	1,2<3
Education (yrs)	13.0	1.7	13.0	2.0	14.3	1.9	9.86	.001	1,2<3
Gender (% male)	71.7		86.1		68.8		3.80	NS	—
Married (%)	5.0		2.8		3.1		2.13	NS	—
Socioeconomic status <sup>f</sup> (Hollingshead)	18.2	14.5	16.9	15.5	18.9	17.9	0.17	NS	—
Current ADHD symptoms (#) <sup>g</sup>	12.7	2.9	9.6	2.0	0.5	1.1	525.90	.001	1>2>3
Childhood ADHD symptoms (#)	13.9	2.9	10.1	2.6	0.8	1.6	474.70	.001	1>2>3
Current ADHD symptoms: Parents (#)	13.0	2.4	10.0	2.0	—	—	30.57	.001	1>2
Childhood ADHD symptoms: Parents (#)	13.9	2.4	10.0	3.1	—	—	37.26	.001	1>2
Previous diagnosis of ADHD (%)	50.0		36.1		—		1.75	NS	—

<sup>a</sup> ADHD, Attention deficit hyperactivity disorder.

<sup>b</sup> Combined type.

<sup>c</sup> Inattentive type.

<sup>d</sup> Results for pairwise contrasts among groups if significant.

<sup>e</sup> Kaufman Brief Intelligence Test.

<sup>f</sup> Socio economic status as determined by the Hollingshead Index of Social Position.

<sup>g</sup> Current and childhood ADHD symptoms from the Adult ADHD Rating Scale, for both the self-ratings and those provided by parents.

TABLE 2  
Educational History

Measure	ADHD-C <sup>a,b</sup>	ADHD-I <sup>a,c</sup>	Control	$\chi^2$	<i>p</i>	Contrasts <sup>d</sup>
	%	%	%			
High school graduate	81.7	77.8	89.1	2.46	NS	—
Suspended or expelled while in high school	46.7	38.9	23.4	7.50	NS	—
Special education	25.0	16.7	3.1	12.46	.002	1, 2<3
College graduate	7.3	6.3	23.8	8.70	.013	1, 2<3

<sup>a</sup> ADHD, Attention deficit hyperactivity disorder.

<sup>b</sup> Combined type.

<sup>c</sup> Inattentive type.

<sup>d</sup> Results for pairwise contrasts among groups if significant.

comes. For educational history outcomes, significance was set at .013 (.05/4). The groups did not differ in the percentage of each that graduated from high school or had been suspended/expelled in high school. Significantly more members of both the ADHD groups reported having received special educational services in high school than the control group but did not differ from each other in this respect. The two ADHD groups were significantly less likely to have graduated from college. Again, the two ADHD groups did not differ from each other in either of these educational outcomes.

#### Comorbidity for Clinical Psychiatric Diagnoses

The psychiatric comorbidity for each group is shown in Table 3. Significance was set at .01 for the axis I disorders (.05/5), .013 for the personality and drug use disorders (.05/4), and .025 for the eating and learning disorders (.05/2). As this table shows, the ADHD-C group was significantly more likely to have comorbid ODD than the other two groups, which did not differ from each other. The groups did

not differ in their comorbidity for conduct disorder, major depressive disorder, or anxiety disorders. Both ADHD groups reported a higher percentage experiencing dysthymia than did the control group, but the ADHD groups were not different in this respect. Although not shown in Table 3, a higher proportion of the ADHD-C group (15%) reported having attempted suicide in comparison with findings in the control group (0%), with the ADHD-I group not differing significantly from the other two groups (2.8%;  $\chi^2 = 12.56$ ; *df* = 2, *p* = .002). Both ADHD groups reported a higher prevalence of alcohol and cannabis dependence/abuse disorders and learning disorders than did the control group. Even so, the two ADHD groups did not differ significantly from each other in the proportion having any of these disorders.

#### Psychological Maladjustment

The results for the scales from the SCL-90-R are shown in Table 4. Here significance was set at .006

TABLE 3

*Comorbidity of Clinical Psychiatric Diagnoses (American Psychiatric Association's Diagnostic and Statistical Manual, 4th ed.)*

Clinical Disorders	ADHD-C <sup>a,b</sup> %	ADHD-I <sup>a,c</sup> %	Control %	$\chi^2$	<i>p</i>	Contrasts <sup>d</sup>
Axis I disorders:						
Oppositional defiant	45.0	19.4	0.0	38.05	.001	1>2, 3
Conduct disorder	5.0	2.8	0.0	3.19	NS	—
Major depression	13.3	8.3	3.1	4.43	NS	—
Dysthymia	25.0	16.7	1.5	14.91	.001	1, 2>3
Any anxiety disorder	8.3	5.6	1.5	3.08	NS	—
Personality and drug use disorders						
Antisocial personality	6.7	0.0	0.0	6.90	NS	—
Alcohol dep/abuse <sup>e</sup>	36.7	27.8	6.2	17.52	.001	1, 2>3
Cannabis dep/abuse	20.0	19.4	1.5	11.88	.001	1, 2>3
Other drug dep/abuse	6.7	0.0	0.0	6.90	NS	—
Other disorders						
Any eating disorder	6.7	8.3	0.0	5.10	NS	—
Learning disorders	38.3	41.7	0.0	33.82	.001	1, 2>3

<sup>a</sup> ADHD, Attention Deficit Hyperactivity Disorder.<sup>b</sup> Combined type.<sup>c</sup> Inattentive type.<sup>d</sup> Results for pairwise contrasts among groups if significant.<sup>e</sup> Dep/abuse = dependence or abuse disorders.

TABLE 4

*Psychological Maladjustment (SCL-90-R<sup>a</sup> T-scores)*

Measure	ADHD-C <sup>b,c</sup>		ADHD-I <sup>b,d</sup>		Control		<i>F</i> <sup>e</sup>	<i>p</i> <	Contrasts <sup>e</sup>
	Mean	SD	Mean	SD	Mean	SD			
Somatization	58.9	12.3	58.9	12.1	45.3	7.8	31.12	.001	1, 2>3
Obsessive-compulsive	71.8	9.4	70.4	11.3	49.2	9.3	96.81	.001	1, 2>3
Interpersonal sensitivity	69.7	11.3	68.3	10.5	51.2	9.3	57.49	.001	1, 2>3
Depression	67.5	12.2	68.5	9.3	48.3	9.2	66.87	.001	1, 2>3
Hostility	69.7	11.2	64.0	9.6	48.0	7.7	83.65	.001	1>2>3
Anxiety	61.7	12.4	60.8	10.2	48.1	5.1	37.06	.001	1, 2>3
Paranoid ideation	66.0	10.9	61.5	12.8	48.9	9.1	41.85	.001	1>2>3
Psychoticism	65.9	12.7	65.8	10.0	47.9	6.9	60.30	.001	1, 2>3

<sup>a</sup> SCL-90-R = Symptom Checklist 90, revised.<sup>b</sup> ADHD = Attention Deficit Hyperactivity Disorder.<sup>c</sup> Combined type.<sup>d</sup> Inattentive type.<sup>e</sup> Results for pair-wise contrasts among groups if significant.

(.05/8). Both ADHD groups reported substantially greater amounts of psychological distress on all clinical scales than the control group. The two ADHD groups differed significantly from each other on two of these scales: hostility and paranoid ideation.

#### *Criminal, Drug, and Alcohol Histories*

Table 5 shows the results obtained from the interview concerning criminal arrests as well as alcohol and drug use for each group. Significantly more of the ADHD-C group reported having been arrested during their lifetimes than did either the ADHD-I or control groups. Both ADHD groups reported being considered by others as drinking too much relative to the control group. The ADHD-I group did not differ from the other two groups for this respect. More members of both ADHD groups reported using

illegal drugs than in the control group, yet the ADHD groups did not differ from each other. Only the ADHD-C group had more members who had been considered by others to be drug dependent than in the control group.

#### *History of Use of Mental Health Services*

The various types of mental health services received by participants in each group are shown in Table 6. Significance here was set at .008 (.05/6) for the comparisons involving the psychiatric medications and .013 (.05/4) for the other forms of psychiatric treatment. As this table shows, more participants in both of the ADHD groups reported having been prescribed psychiatric medication in the past, and specifically reported using stimulant medication than did members of the control group. Both ADHD

TABLE 5  
*Antisocial, Drug, and Alcohol Histories*

Events	ADHD-C <sup>a,b</sup> %	ADHD-I <sup>a,c</sup> %	Control %	$\chi^2$	<i>p</i>	Contrasts <sup>d</sup>
Arrested	40.0	19.4	12.5	13.32	.001	1>2, 3
Considered self an alcoholic	11.9	3.0	3.3	13.05	NS	—
Drank too much (according to others)	25.4	27.3	1.7	15.81	.001	1, 2>3
Used Illegal Drug	80.0	80.6	51.6	14.67	.001	1, 2>3
Considered self drug dependent	12.5	10.3	0.0	10.10	NS	—
Drug Dependent (according to others)	29.2	13.8	3.0	9.68	.008	1>3

<sup>a</sup> ADHD, attention deficit hyperactivity disorder.

<sup>b</sup> Combined type.

<sup>c</sup> Inattentive type.

<sup>d</sup> Results for pairwise contrasts among groups if significant.

TABLE 6  
*History of Use of Mental Health Services*

Services	ADHD-C <sup>a,b</sup>	ADHD-I <sup>a,c</sup>	Control	$\chi^2$	<i>p</i>	Contrasts <sup>d</sup>
	<i>N</i>	<i>N</i>	<i>N</i>			
Psychiatric medication	34	14	2	42.58	.001	1, 2>3
Stimulants	28	13	0	3.59	.006	1, 2>3
Antidepressants	11	5	2	3.75	NS	—
Antipsychotics	2	0	0	0.98	NS	—
Antihypertensives	1	0	0	0.48	NS	—
Antianxiety	3	0	1	6.04	NS	—
Psychiatric treatment	52	29	22	40.05	.001	1, 2>3
Individual therapy	49	27	17	3.62	NS	—
Group therapy	19	2	5	8.82	.012	1>2
Inpatient therapy	8	2	1	2.49	NS	—

<sup>a</sup> ADHD, attention deficit hyperactivity disorder.

<sup>b</sup> Combined type.

<sup>c</sup> Inattentive type.

<sup>d</sup> Results for pair wise contrasts among groups if significant.

groups reported a higher percentage of participants having received other forms of psychiatric services than the control group. The groups did not differ significantly, however, in the proportion ever having received individual or inpatient therapies. The ADHD-C group, though, had a significantly higher percentage that reported participating in forms of group therapy than the ADHD-I group, but neither ADHD group differed significantly in this respect from the control group.

### Discussion

This study examined the clinical and educational histories of the two major subtypes of ADHD in a sample of clinically referred young adults in comparison to a community control group. Differences between the two ADHD groups and the control group were numerous and quite consistent with past studies of ADHD adults as well as follow-up studies of ADHD children into young adulthood (Barkley, 1998; Weiss and Hechtman, 1993). The ADHD groups had significantly fewer years of education, had re-

ceived more special education, and were less likely to have graduated from college than the community control group. Also in keeping with longitudinal studies (Weiss and Hechtman, 1993) as well as studies of clinic referred adults (Barkley et al., 1996a; Biederman et al., 1993; Millstein et al., 1997; Murphy and Barkley, 1996a), more of the ADHD groups were diagnosed with learning disorders, dysthymia, and alcohol and drug (cannabis) dependence/abuse disorders and reported higher levels of psychological distress on all clinical sub-scales of the SCL-90-R than did control participants. In addition, more ADHD adults had received psychiatric medications (primarily stimulants) and had participated in other psychiatric therapies than had adults in the control group. None of these differences from the control group is surprising in view of past research on ADHD adults and hyperactive children observed during follow-up to adulthood. The overall results of the present study concerning ADHD not only continues to buttress the view that ADHD is a valid disorder in clinically referred adults (Spencer et al.,



1994) but also goes further to show that both subtypes of ADHD share similar risks for most of these clinical outcomes.

The results were only partially supportive of our hypothesis of greater comorbidity, impairment, and treatment use in the ADHD-C than in the ADHD-I type. Supporting our hypothesis, adults with the ADHD-C type had more ODD, were more likely to have been arrested, had more interpersonal hostility and paranoia, and had received more group therapy than the ADHD-I type or control groups. Otherwise, the two ADHD groups were quite similar in all other distinguishing features that emerged here for ADHD relative to the control group. Contrary to our expectations, the two ADHD types did not differ in comorbidity for conduct or antisocial personality disorders, drug use or abuse disorders, educational attainment, special educational services, or most mental health treatments.

Some of these findings are in contrast to the study of ADHD subtypes in adults conducted by Millstein et al. (1997) in some respects. The present study did not find a greater proportion of the ADHD-C type to qualify for bipolar or substance use disorders in comparison with the ADHD-I type as did Millstein et al. (1997). Nor did it find that more ADHD-C adults had received special educational services than had those with ADHD-I type as did the Millstein study (Millstein et al., 1997). The reason for these differences is unclear. The Millstein study (Millstein et al., 1997) had a larger sample of clinic-referred ADHD-C-type adults ( $N = 111$ ) than did the present study ( $N = 60$ ), but not ADHD-I-type adults ( $N = 35$  and  $36$ , respectively). This may have provided that study with greater statistical power than the present one to detect subtype differences. Additionally, Millstein et al. (1997) used a structured clinical interview in which symptoms of most major psychiatric and personality disorders were reviewed with participants, whereas the present study relied primarily on an unstructured clinical interview. Again, this permitted the Millstein et al. study (1997) to cover more disorders in more detail than the present one, thus granting their study a greater ability to detect subtype differences in psychiatric comorbidity that went undetected here. Even so, that study found subtype differences on only five of the 24 psychiatric disorders covered in their interview, suggesting that these subtypes are more alike than different, at least among clinic-referred adults and when using DSM-IV criteria. Finally, the present study corrected the value used for statistical significance given the large number of statistical comparisons it conducted—a practice not used by the Millstein group (Millstein et al., 1997), which could have made the present study

a more conservative test of potential subtype differences.

Several significant problems plague research on the ADHD-I type in children that have implications for future research on these subtypes among clinic-referred adults with ADHD. Chief among them is its lack of conceptual clarity and thus its arguable status as a subtype of ADHD (Milich et al., 2002). The issue of conceptual clarity arises because this subtype is presented in the DSM taxonomy as if it suffered from the qualitatively identical problems with attention that are evident in the ADHD-C subtype. In contrast, reviews of the small amount of empirical literature to date on the ADHD-I subtype suggest that it includes problems in information processing and sluggish cognitive tempo whereas the ADHD-C subtype does not (Goodyear and Hynd, 1992; Lahey and Carlson, 1992; Milich et al., 2002). Clinically, the ADHD-I subtype is more likely to present with problems of staring, daydreaming, confusion, passivity, withdrawal, and sluggishness or hypoactivity (Barkley et al., 1990; Milich et al., 2002) and not so much with distractible and impulsive behavior and poor persistence. If so, this subtype is being defined in the DSM-IV by the wrong set of symptoms given that its predominant symptoms are not contained in that taxonomy. Although present in the field trial, those items were removed from the final item list because of their low correlation with the remaining inattention items (Milich et al., 2002). Had ADHD-I been defined here by these more prominent clinical features of sluggishness and poor focused attention than by the DSM inattention list, larger and more numerous subtype differences might have emerged here. According to the cited study by Milich et al. (2002), a more discriminating item set would need to be established to refine our conceptualization of this disorder and its phenotype, particularly for use in future neuroimaging and molecular genetic research, among other research directions. This would help to draw a sharper distinction between these two disorders that might lead to greater diagnostic discrimination and a clearer understanding of comorbidity, etiologic factors, developmental course, and treatment responsiveness, among other criteria for establishing a disorder as valid and distinct from another.

Another problem for the ADHD-I type rests in the manner of its diagnosis in adulthood. The DSM-IV approach permits it to be contaminated by cases of ADHD-C type that place just one or two symptoms shy of that type in hyperactive-impulsive symptoms. Even so, these patients may have a pattern of inattention qualitatively closer to that of the ADHD-C than the ADHD-I types. The present DSM taxonomy

also permits children to move from the ADHD-C type to the ADHD-I type by adolescence or young adulthood merely because their number of hyperactive-impulsive symptoms declines more steeply with age than do their inattentive symptoms (Hart et al., 1995). However, these formerly ADHD-C-type children may retain the same qualitative nature of their inattentiveness as ongoing ADHD-C-type cases. That inattention may not be similar in kind to that typical of children with the ADHD-I type as conceptualized by sluggish cognitive tempo and poor focused attention (Milich et al., 2002). For this reason, this problem of contamination of the ADHD-I type by formerly ADHD-C-type cases is even more likely to arise in adult than child cases of ADHD in which more time has transpired for ADHD-C-type cases to move to ADHD-I-type cases and thus add to the greater heterogeneity of the ADHD-I type in the adult age group. Perhaps this is why the two subtypes were so similar in the present study in most domains of functioning examined here. Until the diagnostic status of and symptom list for the ADHD-I type is settled, future research on that type will continue to be plagued by this problem of contamination or heterogeneity, thereby precluding a clearer discrimination of this subtype (or distinct disorder) from the ADHD-C type and other disorders.

The results of this study must be tempered by several limitations inherent in its methods. The comorbidity for other DSM-IV psychiatric disorders was not based on a structured interview used to systematically collect information from participants. However, clinical diagnosis following DSM-IV criteria was used. The present study also did not gather information on interjudge agreement concerning these other diagnoses apart from ADHD. As such, the results here might be expected to vary from those of studies using such structured interviews. Even so, the frequency and pattern of these findings are generally consistent with most of those obtained by Millstein et al. (1997) and others (Biederman et al., 1993) in which a structured interview was used for such purposes, thus providing some assurance of the validity of the present results. The examiner in the present study was not blind to the ADHD versus control group membership of the individuals; that could have introduced some bias into these results. Nonetheless, the examiner was blind to the subtyping of the ADHD participants so that such a bias could not account for subtype differences. The consistency of these results with studies of ADHD subtypes in children, follow-up studies of ADHD children to adulthood, and other studies of clinically referred adults with ADHD is also evidence that such potential for bias does not entirely account for

these particular results. Finally, the control group here could be considered to be functioning better than a general population sample given the requirement that they have no history of a diagnosis of a psychiatric disorder or treatment for such disorder. As a consequence, the differences between the ADHD and control groups here may have been greater than had a general population sample not screened for psychiatric disorder been used.

In conclusion, this study found that clinically referred young adults diagnosed with either ADHD-C or ADHD-I subtypes are likely to be experiencing multiple domains of impairment relative to a control group. These subtypes do not differ from each other in most of these domains of functioning. In general, the results also indicate that young adults with ADHD seeking clinical services are not just a reflection of the normal population who are overly sensitive to ordinary difficulties with inattentiveness, as skeptics of adult ADHD in the popular media have sometimes contended. Instead, these young adults experience significantly higher rates of impairment across multiple domains of functioning consistent with the view that ADHD in adults is a valid psychiatric disorder.

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