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Occupational Outcome in Adult ADHD: Impact of Symptom Profile, Comorbid Psychiatric Problems, and Treatment

A Cross-Sectional Study of 414 Clinically Diagnosed Adult ADHD Patients

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Objective: To determine the effects of symptom profile, comorbid psychiatric problems, and treatment on occupational outcome in adult ADHD patients. **Method:** Adult ADHD patients (N = 414) responded to questionnaires rating past and present symptoms of ADHD, comorbid conditions, treatment history, and work status. **Results:** Of the patients, 24% reported being in work, compared to 79% in a population-based control group (N = 359). Combined subtype of ADHD, substance abuse, and a reported history of depression or anxiety were correlated with being out of work. Current and past medical treatment of ADHD was correlated with being in work. Logistic regression analyses showed that stimulant therapy during childhood was the strongest predictor for being in work as adults (odds ratio = 3.2, p = .014). **Conclusion:** Early recognition and treatment of ADHD is a strong predictor of being in work as an adult, independently of comorbidity, substance abuse, and current treatment. *(J. of Att. Dis. XXXX;XX(X) xx-xx)*

Keywords: *ADHD; adults; occupational outcome; comorbidity; treatment history*

Attention-deficit/hyperactivity disorder (ADHD) is one of the most frequently used diagnoses in child psychiatry worldwide (Faraone, Sergeant, Gillberg, & Biederman, 2003). Follow-up studies have shown that between 30% and 60% of children with ADHD continue to experience symptoms and impairment also in adult life (Barkley, Fischer, Smallish, & Fletcher, 2002; P. Rasmussen & Gillberg, 2000; Weiss & Hechtman, 1993). The prevalence of adult ADHD in cross-sectional studies has recently been estimated to be around 2% to 4% (Fayyad et al., 2007; Kessler et al., 2006).

Despite a decline of some ADHD symptoms over time, the functional impairment will often remain (Biederman, Mick, & Faraone, 2000; P. Rasmussen & Gillberg, 2000). The persistency of this functional deficit is important regarding our understanding of the developmental course

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of ADHD. It is also important from psychosocial and socioeconomic perspectives because of the increased burden on individuals and society caused by occupational disability and other consequences of adult ADHD.

Follow-up studies have shown that children with ADHD have significantly lower academic achievements as adolescents when compared to controls (Barkley, 2006; Barkley, Fischer, Smallish, & Fletcher, 2006; Lambert, 1988; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993) and that this trend increases by adulthood (Barkley, 2006). Children with ADHD growing up also show lower work performance and change jobs more often in adulthood than do comparison cases (Barkley et al., 2006; Weiss & Hechtman, 1993). Cross-sectional studies have likewise shown lower occupational functioning in adults with ADHD compared to controls (Barkley, Murphy, & Fischer, 2007; Sobanski et al., 2007).

The severity of childhood ADHD and comorbidity with other psychiatric childhood disorders, in particular conduct disorder, have been correlated with a poor outcome of ADHD (Barkley, Fischer, Edelbrock, & Smallish, 1990; Newcorn et al., 2004). In adult ADHD patients, comorbidity with other psychiatric disorders has also been associated with lower occupational functioning in terms of more unemployment (Sobanski et al., 2007).

The role of treatment with central stimulants in the long-term prognosis of ADHD remains uncertain. Kessler, Adler, Barkley, et al. (2005) found a negative correlation between treatment in childhood and functional outcome in adult life, although they considered treatment to be a confounder of symptom severity. In a recent comprehensive review of both follow-up and cross-sectional studies, Barkley et al. (2007) concluded that no significant factors predicting persistency or occupational outcome of ADHD patients as grown-ups could be identified—other than the ADHD per se.

The objective of this study was to describe occupational functioning in a clinical sample of adult ADHD patients compared to a sample from the general population and to examine the effects of ADHD symptoms, comorbid psychiatric symptoms, and treatment history of ADHD on their occupational outcome. In particular, we hypothesized that (a) adult ADHD patients will have a lower degree of occupational functioning than the general population and that (b) comorbid problems related to affective symptoms, alcohol, and drug problems will correlate negatively with occupational outcome and that (c) treatment of ADHD will predict functioning in adult life.

Method

Participants

National registry of adult ADHD. Between 1997 and 2005, all adult patients (older than 18 years) in Norway who were to receive treatment with central stimulants had to be evaluated and approved by one of three national expert committees for ADHD or hyperkinetic disorder. Clinicians with patients at risk of having ADHD first examined and prediagnosed their patients according to nationally recommended guidelines. These guidelines included systematic assessment of ADHD diagnostic criteria, developmental history, physical examination, evaluation of comorbidity, and, where possible, information from collateral informants. All gathered information was then sent to one of the expert committees for a definitive diagnostic assessment. The committees were constituted by experienced psychiatrists, neurologists, and neuropsychologists. The diagnosis of ADHD was made according to the International Classification of Diseases (ICD-10) research criteria, with two modifications: allowing the inattentive subtype in the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; American Psychiatric Association, 1996) as sufficient for the diagnosis and allowing for the presence of comorbid psychiatric disorders, as long as the diagnostic symptoms of ADHD were present before the appearance of the comorbid disorder. This diagnostic assessment strategy was chosen as a compromise between the fact that ICD-10 is the official diagnostic system used in Norway and the request to have an assessment comparable with the international *DSM-IV* standards. Clinicians were not allowed to prescribe central stimulants without a recommendation from the committee. Approximately 5,000 adults were referred to the committees between October 1997 and May 2005, of whom about 3,500 were considered eligible for treatment with central stimulants (Norwegian population in 2006 = 4.6 million habitants). This evaluation procedure by the committees was mandatory until May 2005.

Patients. Using the address lists of patients evaluated by the committees, patients were offered to participate in the study by posted mail invitation. In addition, to enhance recruitment and to include patients diagnosed also later than May 2005, psychiatrists and psychologists nationwide were asked to recruit formally diagnosed adult patients with ADHD.

The inclusion criteria were a diagnosis of ADHD according to the criteria described above and age older than 18 years. There were no formal exclusion criteria.

The intention behind this strategy was to recruit a clinically representative sample of adult ADHD patients from all over the country.

Approximately 2,000 invitation letters were posted to adult ADHD patients and clinicians from 2004 to 2006. Most of the invitations were sent out during the autumn 2006, mainly targeting patients who were referred after 2000. By December 2006, 473 patients had responded positively to the invitations, and patients satisfying the inclusion criteria and from whom we obtained data from both self-report questionnaires and biological samples were included in this study ($N = 414$). The recruitment of this patient sample has been described in more detail elsewhere (Halleland, Lundervold, Halmøy, Johansson, & Haavik, 2008; Johansson et al., 2008).

Comparison group. A comparison group was recruited using the database of the Medical Birth Registry of Norway (MBRN). The MBRN includes all people born in Norway after January 1, 1967. About 2,000 invitation letters were sent out to a randomly selected sample of people between 18 and 40 years from all over Norway during January and March 2007. The comparison group in this study is composed of the first 357 people who responded positively and from whom we obtained biological samples and completed self-report questionnaires.

Design

All included patients and comparison group cases completed questionnaires regarding past and current ADHD symptoms, comorbid psychiatric problems related to affective disorders and drug abuse, and sociodemographic data, including educational level and occupational activity. For the patients, a questionnaire was also given to their doctors to obtain medical information about diagnosis and treatment.

To certify the validity of the self-reported data on comorbid problems, a subsample of the patient and comparison groups was invited to further psychiatric interviewing (41 patients, 13 comparison cases), and self-reported problems were then compared to formal diagnostic assessment from the interviewing. For feasibility reasons, invitations to psychiatric interviews were primarily addressed to patients and comparison group cases living in the area of the University Centre in Bergen and its surroundings. The psychiatric interview was based on the Mini International Neuropsychiatric Interview (M.I.N.I. Plus, Version 5.0.0.), a module-based semistructured diagnostic interview for *DSM-IV* and ICD-10 Axis 1 diagnoses in adults (Sheehan et al., 1998). The interviews were carried out by two clinical psychiatrists (A.H. and M. Dramsdahl), who were blinded both regarding ADHD diagnosis and the results from the self-report questionnaires of the persons interviewed.

Informed consent based on detailed written information about the project was obtained from all the patients and comparison cases. The study was approved by the Regional Research Ethical Committee of Western Norway.

Reported Measures

The following self-report questionnaires were used in this study: the Wender Utah Rating Scale (WURS), measuring the presence and frequency of childhood ADHD symptoms (Ward, Wender, & Reimherr, 1993), and the Adult ADHD Self-Report Scale (ASRS), which measures the presence and frequency of current symptoms of ADHD (Kessler, Adler, Ames et al., 2005). To assess the potential correlation between affective symptoms and occupational outcome, the Mood Disorder Questionnaire (MDQ), a screening instrument for bipolar disorder, was also used in the study (Hirschfeld et al., 2000).

The WURS is designed to retrospectively assess symptoms and signs of ADHD in childhood. The version of the scale used in this study contains 25 questions, each rated on a 5-point severity scale (where 0 = *not at all* or *very slightly* and 4 = *very much*), yielding a possible score range from 0 to 100. The WURS has been validated by several investigators in different countries and populations (Fossati et al., 2001; Oncu, Olmez, & Senturk, 2005; Rodriguez-Jimenez et al., 2001).

The ASRS is the World Health Organization's rating scale for adult ADHD designed to measure current ADHD symptoms. It consists of 18 items based on *DSM-IV* symptoms or criteria for ADHD that are measured on a 5-point scale (0 = *never* or *seldom* and 4 = *very often*), yielding a possible score range from 0 to 72. Items 1 to 9 cover the symptoms of inattention; Items 10 to 18 the symptoms of hyperactivity and impulsivity. In this study we used both a continuous and a categorical scoring method (21 or more on each subscale for defining subtypes). Both methods have recently been validated by Kessler, Adler, Ames, et al. (2005).

The MDQ is a screening instrument for bipolar spectrum disorders that has been validated for use in the general population and in psychiatric patient populations (Hirschfeld, Cass, Holt, & Carlson, 2005; Hirschfeld et al., 2003). The MDQ consists of 15 items; the first 13 questions concern periods of lifetime symptoms of mania and hypomania and the last 2 co-occurrence of symptoms and ranking of functional impairment caused by the symptoms. A positive MDQ score was defined as

7 or more yes responses on the first 13 items, yes on Question 14 (co-occurrence of symptoms), and level 3 or more on Question 15 (moderate to severe impairment).

In addition, patients and comparison group cases responded to 31 questions concerning sociodemographic factors including educational and occupational levels, childhood medical treatment, and comorbid psychiatric symptoms and problems. Attained educational level was scored as junior high school (compulsory 1st to 9th grade), senior high school (10th to 12th grade), or university level (graduate schools after the 12th year). We did not obtain information about whether the indicated levels of education were achieved, meaning that a marking of university level may reflect that the person had started a higher educational course but not necessarily graduated. The questions regarding comorbid problems and treatment were scored as yes or no (e.g., "Have you ever experienced significant anxiety and/or depression?" and "Did you receive treatment with central stimulants in childhood?" and "If yes; for how long?"). Information regarding formal diagnosis and past and present treatment was also provided by the patients' doctors (mainly psychiatrists) on a separate form.

The WURS, ASRS, and MDQ have not yet been subject to official validations in Norway. However, translated versions exist and are currently being used both in clinical practice, official evaluation projects, and research (K. Rasmussen, Almvik, & Levander, 2001). The ASRS version is the same that was used by The Expert Committees of ADHD/Hyperkinetic disorder in the National Registry. It has been translated and retranslated by a native English-speaking psychologist and finally evaluated by a group of four experienced psychiatrists. The MDQ has been translated by a Norwegian psychiatrist (Dr. P. Bergsholm) and retranslated by an English-native psychologist. This version is currently being used in clinical practice in Norway.

Statistical Methods

The data were initially analyzed by descriptive methods. Logistic regression analyses were then carried out to explore correlations between different variables and occupational level.

The 'Not being in work' dependent variable was constructed by dichotomizing the occupational outcome variables from the self-report questionnaire. 'Being in work' was contrasted with 'Not being in work', the latter including the variables disability pension, vocational rehabilitation, sick leave, unemployment, and 'Other'. The 'Other' category was not specified but included situations varying from being a student to receiving social welfare or being in prison.

Independent variables in the regression model were age, gender, ADHD symptoms in childhood (WURS), current ADHD symptoms (ASRS), ADHD subtype according to ASRS, current and childhood treatment with central stimulants, and the following variables related to comorbid self-reported problems: lifetime history of severe depression and/or anxiety, screening status on the MDQ, alcohol problems, other drug problems, and history of treatment for other mental disorders than ADHD.

The analyses were performed using a backward stepwise (likelihood ratio) method for binary logistic regression. The corresponding odds ratios (ORs) and 95% confidence intervals (CIs) were estimated, both unadjusted by entering factors one at a time and adjusted by entering factors together by a backward stepwise method. A two-tailed significance level of .05 was chosen for statistical significance. All analyses were performed using the Statistical Package for Social Sciences Version 14.01.

Results

Sociodemographic Characteristics

A total of 414 patients and 357 comparison group participants from all regions of Norway were included in the study. The gender distribution in the patient sample was fairly even, with a female proportion of 47.8% (Table 1). The mean age of the patients was 34.5 years ($SD = 10.4$) and did not differ significantly between the female and male patients. The comparison group was younger and included relatively more women than the patient group; the mean age for comparison group cases was 29.9 years ($SD = 6.1$). The proportion of women was 58.5% ($p < .01$ in both instances compared to the patient group).

As shown in Figure 1, the overall educational level was significantly lower among patients than comparison cases; 23.0% of the patients had attained a university-level education compared to 59.0% of the controls ($p < .001$), and 29.0% of the patients had attained only junior high school compared to 6.0% of the comparison cases ($p < .001$). The occupational status was also significantly different in the patient and comparison cases groups (Figure 1); 24.3% of the patients reported being in work compared to 78.8% of the comparison cases ($p < .001$). Unemployment (i.e., the formal status of job seeking but temporarily out of work) was reported by 4.8% of the patients and 1.9% of the comparison group ($p = .024$). More than half of the patients were receiving a disability pension (32.1%) or were under vocational rehabilitation (20.6%), contrasted with 5.0% of the comparison group (2.2% and 2.8% for disability and vocational rehabilitation, respectively; $p < .001$ for both variables). There were no significant differences between men and women in the overall educational or occupational level among patients or comparison cases.

Table 1
Sociodemographic and Clinical Characteristics, All Patients and by Gender

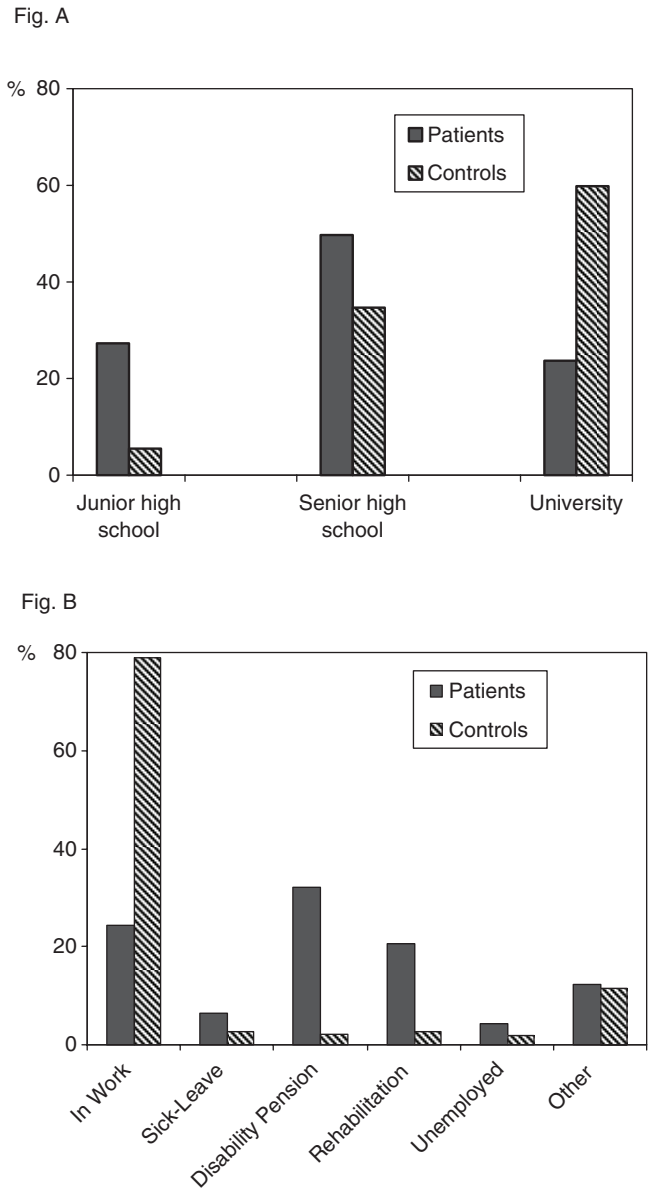
	All Patients		Women		Men		p[a]
Gender (%, *n*)	100.0	414	47.8	198	52.2	216	
Age in years (*M*, *SD*)	34.5	10.4	35.0	10.4	33.6	10.2	.269[b]
Age group (%, *n*)							
18 to 24	21.3	86	18.7	36	23.8	50	.224
25 to 34	32.8	132	31.6	61	33.8	71	
35 to 44	26.6	107	31.1	60	22.4	47	
45 or older	19.4	78	18.7	36	20.0	42	
(missing = 11)							
Educational level (%, *n*)							
Junior high school	28.8	100	26.5	45	31.1	55	.210
Senior high school	48.1	167	53.9	90	46.1	77	
University	23.1	80	20.6	35	25.4	45	
(missing = 67)							
Occupational level (%, *n*)							
In work	24.3	91	20.8	37	27.6	54	.181
Sick leave	6.4	24	6.7	12	6.1	12	
Disability pension	32.1	120	36.5	65	28.1	55	
Rehabilitation	20.6	77	20.2	36	20.9	41	
Unemployed	4.3	16	2.2	4	6.1	12	
Other	12.3	46	13.5	24	12.3	22	
(missing = 40)							
ADHD variables[c]							
Wender Utah Rating Scale total score (365; *M*, *SD*)[d]	59.3	18.2	60.4	18.2	58.4	18.2	.253[e]
Adult ADHD Self-Report Scale total score (387; *M*, *SD*)[f]	45.7	12.4	47.8	11.9	44.0	12.3	.003[e]
ADHD diagnosed in childhood (400; %, *n*)	20.3	81	11.4	22	28.5	59	< .001
Adult ADHD Self Report Scale subtype (%, *n*)							
Subthreshold	22.1	88	18.0	35	25.9	53	.005
Inattentive	17.8	71	15.5	30	20.0	41	
Hyperactive or impulsive	7.8	31	5.2	10	10.2	21	
Combined	52.4	209	61.3	119	43.9	90	
(missing = 15)							
Treatment with central stimulants (%, *n*)[c]							
In childhood (401)	18.7	75	10.4	20	26.4	55	< .001
Current (350)	74.9	262	79.5	132	70.7	130	.074
Lifetime (378)	93.4	353	94.4	169	92.5	184	.579
Comorbidity (%, *n*)[c]							
Depression and/or anxiety (399)	70.2	280	73.1	141	67.5	139	.268
Bipolar disorder (379)	10.0	38	11.1	20	9.1	18	.668
Problems with alcohol (399)	25.1	100	18.4	35	31.1	65	.005
Problems with other drugs (400)	27.3	109	17.7	34	36.1	75	< .001
Problems with alcohol and other drugs (397)	14.4	57	9.0	17	19.2	40	< .001
Treatment for other psychiatric condition than ADHD (398)	40.2	160	50.3	97	30.7	63	< .001
Mood Disorder Questionnaire positive (334)	55.1	184	42.4	78	60.6	106	.045

a. From chi-square test if not otherwise specified.
b. *t* test.
c. Total number of responders for the variable in parentheses.
d. Scale range 0 to 100.
e. Mann–Whitney test.
f. Scale range 0 to 72.

Clinical Characteristics

As shown in Table 1, the female patients reported significantly higher levels of current ADHD symptoms than did the male patients. The reported levels of childhood ADHD symptoms were equal across genders. Of the patients, 93% had a lifetime history of treatment with central stimulants, and 75% were currently receiving such treatment, with no significant gender differences. Of the patients, 20% ($n = 81$) reported that they had been diagnosed with ADHD in childhood, of whom 93% ($n = 75$) reported having received treatment with stimulants

Figure 1
Educational Level (Figure 1a) and Occupational Status (Figure 1b) in ADHD Patients (n = 414) and Controls (n = 357)



Note: Proportions in percentage, $p < .001$ from the Pearson chi-square test for the 2 × 3 table (Figure 1a) and 2 × 6 table (Figure 1b).

as children. Significantly more men than women reported a diagnosis of ADHD and treatment with stimulants during childhood ($p < .0001$).

A lifetime occurrence of significant depression and/or anxiety was reported by 70% of the patients and bipolar disorder by 10% of the patients, without significant differences between genders. Of the patients, 55% screened positive for bipolar disorder on the MDQ, including significantly more men than women. Men also reported more problems with alcohol (31% of males vs. 18% of females, $p = .005$) and other drugs (36% of males vs. 18% of females, $p < .001$). By contrast, significantly more women than men reported that they had been treated for other psychiatric conditions than ADHD (50% of females vs. 31% of males, $p < .001$).

The comparison group reported significantly fewer psychiatric symptoms and substance problems than did patients; depression and/or anxiety was reported by 16.6% of comparison cases, bipolar disorder by 1.7%, lifetime problems with alcohol by 2.5%, and problems with other drugs by 2.2%. The p values from the Pearson chi-square test for each of the above-mentioned items when compared to patients were less than .001, and there were no significant gender differences in the comparison group.

Correlation Between Self-Report Data and Clinical Diagnoses

The subsample of patients who were interviewed (n = 41) did not differ significantly from the total sample of patients (N = 414) regarding gender, age, educational or occupational outcomes, or self-reported levels of comorbid problems. Of the interviewed patients, 30 answered yes to the question, "Have you ever experienced significant anxiety and/or depression?" whereas the diagnostic interview identified 34 of the 41 patients fulfilling the *DSM-IV* criteria for a lifetime major depressive disorder and/or at least one major anxiety disorder (general anxiety disorder, panic disorder, social phobia, agoraphobia, obsessive compulsive disorder, or posttraumatic disorder). Among the interviewed patients who self-reported a history of severe anxiety and/or depression, 92% (24 of 26) fulfilled the above-described *DSM-IV* criteria for a lifetime depression and/or anxiety disorder. Among interviewed patients who did not self-report anxiety or depression on the questionnaire, 62% (8 of 13) actually fulfilled *DSM-IV* criteria of lifetime depression and/or anxiety disorder according to the M.I.N.I. Plus interview. The Pearson correlation was .39 between self-report and formal diagnostic assessment (moderate correlation).

Of the 41 interviewed patients, 8 reported a history of alcohol problems, of which all fulfilled the *DSM-IV* criteria for lifetime alcohol abuse or dependence according to the M.I.N.I Plus. The diagnostic interview also identified 6 more patients with lifetime alcohol abuse or dependence among those who did not self-report alcohol problems. Also, 11 patients answered positively on the question, "Have you ever had problems with other drugs?" The M.I.N.I Plus identified all of those 11, and 6 patients fulfilled the *DSM-IV* criteria for lifetime substance abuse or dependence. The Pearson correlation, r, between self-report and formal diagnostic assessment was .69 (strong correlation).

Table 2
Factors Predicting the Likelihood of Not Being in Work; Results From Binary Logistic Regression Analysis; Odds Ratios (ORs) With 95% Confidence Intervals (CIs) in Parentheses

	Unadjusted OR[a]	95% CI	*p*	Adjusted OR[b]	95% CI	*p*
Demographic variables						
Gender			.134			.294
Male	1.0	ref		1.0	ref	
Female	1.4	0.9–2.3		1.5	0.7–3.1	
Age in years			.244			.786
18 to 24	1.0	ref		1.0	ref	
25 to 34	1.4	0.7–2.6		1.6	0.6–4.0	
35 to 44	2.0	1.0–3.9		1.4	0.5–4.2	
45 or older	1.8	0.8–3.7		1.3	0.4–4.1	
ADHD variables						
Wender Utah Rating Scale score			.019			.803
0 to 36	1.0	ref		1.0	ref	
37 to 46	1.7	0.9–3.2		1.3	0.5–3.2	
47 or more	2.3	1.3–4.0		1.0	0.5–2.3	
Adult ADHD Self Report Scale subtype			< .001*			.045
Subthreshold	1.0	ref		1.0	ref	
Inattention	1.9	1.0–3.9		1.6	0.6–4.4	
Hyperactive or impulsive	1.3	0.5–3.2		0.4	0.1–1.4	
Combined	4.1	2.3–7.2		1.9	0.9–4.3	
Comorbidity						
Depression and/or anxiety	2.9	1.8–4.7	< .001*	1.7	0.8–3.5	.143
Alcohol and drug problems (yes or no)			.011	0.9	0.4–2.2	.063
No problems	1.0	ref		1.0	ref	
Problems with alcohol	1.1	0.5–2.3		0.4	0.2–1.3	.063
Problem with other drugs	1.2	0.6–2.5		1.1	0.4–3.2	
Problems with alcohol and other drugs	4.5	1.6–13.1		5.0	1.0–24.6	
Mood Disorder Questionnaire positive	2.5	1.5–4.3	.001	1.7	0.8–3.6	.206
Treatment with central stimulants						
Treatment in childhood (no or yes)	2.6	1.5–4.6	.001	3.2	1.3–8.1	.014
Current treatment (no or yes)	3.2	1.6–6.5	< .001*	2.3	0.9–6.0	.077

a. From simple logistic regression models; factors entered one by one, *p* value from likelihood ratio test (LR test).
b. From stepwise logistic regression analysis as described in text, Step 1 (i.e., adjusted for all the other variables, except educational level), *p* value from LR test.

The correlation between self-reported and diagnostically assessed lifetime anxiety and/or depression for the control group ($n = 13$) was stronger than for the patient group ($r = .73$ vs. .39). None of the control persons reported problems with alcohol or other drugs, although one of them fulfilled *DSM-IV* criteria for earlier substance abuse. In summary, we found a moderate correlation between self-reported problems and formal diagnoses for anxiety and/or depression and a moderate to strong correlation between self-reported problems and formal diagnostic assessment of alcohol and drug problems among the interviewed patients. Both anxiety and depression and problems with alcohol and other drugs tended to be underreported in this patient sample.

Correlation With Occupational Outcome

To investigate the relationship among severity of reported ADHD symptoms, other psychiatric problems, and occupational functioning, a logistic regression model was applied as described under statistical method.

The results from the analyses are shown in Table 2. The stepwise approach (entering the variables one at a time) showed no significant association between gender or age group and occupational outcome. High scores on childhood and current ADHD symptoms, combined and inattentive subtypes of ADHD, positive screen on the MDQ, reported anxiety and/or depression, and problems

Table 3
Treatment in Childhood and Clinical Variables as Adults

	Treatment in Childhood		No Treatment in Childhood		p[a]
%, *n*	18.7	75	81.3	326	
Sociodemographic variables					
Gender, % women/men	26.7/73.3		53.1/46.9		< .001
Age in years (*M*, *SD*)	25.6	6.1	35.6	9.9	< .001[b]
Age groups (%, *n*)					< .001
18 to 24	46.6	34	15.3	50	
25 to 34	43.8	32	30.4	99	
35 to 44	8.2	6	30.6	100	
45 or older	1.4	1	23.6	77	
Educational level (%, *n*)					.793
Junior high school	32.3	21	28.1	79	
Senior high school	46.2	30	48.4	136	
University	21.5	14	23.5	66	
Occupational level (%, *n*)					.002
In work	41.5	27	20.8	64	
Sick leave	1.5	1	7.5	23	
Disability pension	27.7	18	33.2	102	
Rehabilitation	9.2	6	22.8	70	
Unemployed	4.6	3	4.2	13	
Other	15.4	10	11.4	35	
ADHD variables					
Wender Utah Rating Scale score (*M, SD*)[c]	56.2	18.3	59.9	18.3	.200[d]
Adult ADHD Self Report Scale score (*M, SD*)[e]	41.6	11.7	46.8	12.1	.002[d]
Adult ADHD Self Report Scale subtype (%, *n*)					.006
Subthreshold	36.5	27	18.8	61	
Inattentive	18.9	14	17.8	58	
Hyperactive or impulsive	4.1	3	8.6	28	
Combined	40.5	30	54.8	178	
Treatment with central stimulants (%, *n*)					
Current	76.9	50	74.0	208	.628
Lifetime	100	65	91.9	284	.018
Comorbidity (%, *n*)					
Depression and/or anxiety	58.9	43	72.5	235	.031
Bipolar disorder	4.3	3	11.1	34	.134
Problems with alcohol	10.8	8	28.5	92	.003
Problems with other drugs	24.0	18	28.2	91	.558
Treatment for other psychiatric conditions than ADHD	17.3	13	45.2	145	< .001
Mood Disorder Questionnaire positive	38.3	23	58.8	112	.004
Dyslexia	64.9	48	49.7	160	.026

a. Chi-square test for proportions.
b. *t* test.
c. Score range 0 to 100.
d. Mann–Whitney *U* test.
e. Score range 0 to 72.

with alcohol and other drugs were all significantly associated with a higher risk of being out of work in the unadjusted model. Current treatment and childhood treatment with central stimulants were associated with a lower risk of being out of work.

When adjusted by all the other variables, only two factors remained significantly correlated with occupational outcome: ADHD subtype ($p = .045$) and treatment with stimulants in childhood ($p = .014$). The patients who were not treated in childhood showed a threefold increased risk of being out of work as adults compared to the patients who did receive treatment in childhood (OR = 3.2, 95% CI = 1.3–8.1).

A similar model including educational level among the independent variables was also analyzed. This model showed that educational level was the factor with the

strongest correlation to occupational outcome; that is, the lower the educational level, the higher the risk for being out of work (junior high school OR = 10.7, $p < .001$; senior high school OR = 4.3, $p = .02$, compared to university level). The correlation between occupational level and treatment in childhood also was significant in this model (OR = 2.9, $p = .05$).

A separate model was constructed with educational level as the outcome variable (dichotomized between high school level and university level) and the same set of independent variables as in the main model. Three factors showed significant correlations with the lowest degree of educational level: severity of childhood symptoms (WURS score > 46, OR = 3.2, $p = .01$), female gender (OR = 2.6, $p = .02$), and drug problems (OR = 4.4, $p = .04$). Treatment, past or current, did not significantly correlate with educational level in this model.

Diagnosis and Treatment in Childhood

To further explore the potential effect of childhood treatment on the functional level as adults, patients were grouped and compared according to whether they had been treated in childhood or not (Table 3). In all, 75 patients had received treatment with central stimulants in childhood. These patients were on average 10 years younger than the other patients, and most of them were men. There were no significant differences in childhood symptoms (WURS score) between the two groups, but patients who did not receive treatment in childhood had higher scores on current symptoms according to ASRS (total score 46.8 vs. 41.6, $p = .002$). Patients who did not receive treatment in childhood reported significantly more other psychiatric problems than did those treated during childhood. The proportion of patients with a positive screen for bipolar disorder was also significantly higher in the non-childhood-treated group (59% vs. 38%, $p = .004$). By contrast, dyslexia was more frequently reported in the childhood treated group.

Among patients with a childhood diagnosis ($n = 81$), we found no significant differences between the treated ($n = 75$) and nontreated ($n = 6$) groups with respect to age, gender, educational level, and occupational activity.

Discussion

In this clinical sample of 414 adult ADHD patients, only 24% reported that they were in work, compared to 79% in the comparison group and to an overall employment rate of 70% in the general adult Norwegian population (Statistics Norway, 2005). Of the patients, 81 (20%) had been diagnosed with ADHD in childhood, of whom 75 had received treatment with central stimulants as children. A major finding in our study was the correlation between a lack of treatment for ADHD in childhood and the risk of not being in work as an adult. This effect was not explained by gender or age differences between the groups, and the effect remained significant also when adjusting for self-reported anxiety and depression, alcohol and drug problems, and current treatment with stimulants.

Long-Term Effects of Childhood Treatment

According to this study, recognition and treatment of ADHD in childhood seem to be inversely correlated with and perhaps to be protective against occupational impairment in adulthood. However, considerable caution must be exercised before such a conclusion can be drawn. First, the observed effect could be mediated by factors inaccessible to this study, particularly related to baseline differences between the groups that received treatment and not. As follow-up studies of children with ADHD will only include children diagnosed with ADHD, there is a natural lack of longitudinal information about adults with ADHD where the diagnosis was missed in childhood. However, as part of the National Co-morbidity Survey Replication, Kessler, Adler, Barkley, et al. (2005) addressed the question of possible predictors of persistency of ADHD into adulthood in an interview-based study of 154 adult ADHD patients. They found that among several potential factors, including childhood adversity and childhood and adolescent comorbidity, only severity of childhood ADHD symptoms and childhood treatment were predictive of persistency of clinically impairing ADHD. In our study, the only available information about childhood symptom levels was retrospective data obtained from the WURS, which did not show significant differences between patients treated and not treated in childhood and did not influence occupational outcome in the adjusted model. However, high scores on WURS were significantly correlated with lower educational level in our study.

The observed effects of childhood treatment were opposite in our study and in the study by Kessler, Adler, Barkley, et al. (2005). A priori, one would assume that the most severely affected children were most likely to be diagnosed and treated as children. Thus, the effect of treatment observed by Kessler, Adler, Barkley, et al., predicting persistence of symptoms into adulthood, could represent an underlying bias of symptom severity. If this is the case for our patients, the putative protective effect of childhood treatment is underestimated in our study.

Childhood treatment appeared to have a less strong effect on educational level in our study. ADHD patients often drop out of their education, whether at school or university. Thus, as we did not record academic achievements during education, our data may be considered incomplete. Because the patients in the non-childhood-treated group were older than those in the treated group, both the observed educational level and work status may be biased toward an apparent lower functioning in the treated group.

The literature concerning possible long-term effects of pharmacotherapy in childhood ADHD is not conclusive. Concerns about possible adverse effects of central stimulants, particularly in augmenting the risk for substance abuse, have been raised (Lambert & Hartsough, 1998), whereas other studies have shown neutral (Barkley, Fischer, Smallish, & Fletcher, 2003; Faraone, Biederman, Wilens, & Adamson, 2007) or possible protective effects of treatment against later substance abuse (Wilens, Faraone, Biederman, & Gunawardene, 2003). Our study showed that alcohol problems were more often reported in patients who did not receive treatment in childhood, whereas the proportion of patients reporting drug problems was not significantly different between the two groups. Beneficial effects with reduced comorbidity and improved social functioning have been found for children treated with stimulants who were followed into adulthood (Hechtman & Greenfield, 2003). However, there is still a need for outcome studies of adults who have received treatment since childhood (Wilens & Dodson, 2004). Thus, as far as we know, no studies have addressed the effect of childhood treatment on occupational outcome in adulthood.

In childhood ADHD, comorbidity with conduct disorder and bipolar disorder has been found to be associated with a poor long-term prognosis (Fischer, Barkley, Smallish, & Fletcher, 2002; Pliszka, 1998). Central stimulants have also been reported to have an effect on the development of bipolar disorder by accelerating the onset of manic episodes (DelBello et al., 2001; Reichart & Nolen, 2004). This is contradicted by our findings, which show that patients who received treatment with stimulants in childhood reported less depression and bipolar disorder and had lower scores on the MDQ than did patients who did not receive treatment with stimulants.

Assuming that the observed differences between the patients receiving and not receiving treatment in childhood were explained by differences at baseline not detected by the WURS, one could hypothesize that the symptoms of ADHD were less typical and therefore not recognized in the group of children that did not receive treatment. The fact that they show higher rates of affective symptoms in adulthood could thus be a consequence of not having been treated in childhood, or it could be an inherent characteristic of these children, suggesting a possible subgroup of ADHD patients closer to the affective spectrum of disorders (Faraone, Biederman, Mennin, Wozniak, & Spencer, 1997). Dyslexia, on the other hand, was more often reported in the childhood treated patients. This could represent a bias effect by the fact that children with learning disabilities in school age may be more easily referred for further assessment and treatment. But it could also lend support to a hypothesis that the treated and nontreated groups represent qualitatively slightly different groups of children at an early stage (Bental & Tirosh, 2007). Although this study was not designed to answer such questions, it represents a biologically and clinical relevant issue that should be addressed in future studies.

Occupational Disability and Effect of Comorbid Psychiatric Problems

The presence of self-reported affective symptoms and substance abuse among the adult ADHD patients in this sample was high: Of the patients, 40% reported having been treated for other psychiatric conditions than ADHD, 70% reported a history of significant anxiety or depression, 25% reported problems with alcohol, and 27% reported problems with other drugs. We found that reported anxiety and depression, a positive screen for bipolar disorder, and reported problems of alcohol and substance abuse were strongly correlated with poor occupational outcome. We also found an increased risk for being out of work for patients with the combined subtype of ADHD. These findings confirm results from other studies of adult ADHD showing that both psychiatric comorbidity and the combined subtype of ADHD tend to worsen the patient's outcome on several aspects of life (Grevet et al., 2006; Jacob et al., 2007), although this effect is not consistent when it comes to educational and occupational outcome (Murphy, Barkley, & Bush, 2002; Sobanski et al., 2007).

In our study, the proportion of patients being out of work is relatively high compared to most other studies (Able, Johnston, Adler, & Swindle, 2007; Biederman et al., 2006; Sprafkin, Gadow, Weiss, Schneider, & Nolan, 2007) but more in line with other Norwegian studies of adult ADHD patients (K. Rasmussen & Levander, 2008; Torgersen, Gjervan, & Rasmussen, 2006). This could reflect differences in clinically referred versus community-based samples. However, an American study comparing referred versus nonreferred adult ADHD patients concluded that there were no significant differences in

socioeconomic status or global functioning between the two groups (Biederman et al., 1993). A large epidemiological study comparing 752 "nondiagnosed" to 198 diagnosed adults with ADHD showed that the clinically unrecognized patients showed similar levels of functional and psychosocial impairment as patients diagnosed with ADHD (Able et al., 2007). Other possible explanations for the relatively high proportion of patients out of work in our study could be differences in social welfare policies between countries and differences in diagnostic assessments and thresholds in diagnosing ADHD, as indicated by observed differences in prevalence of ADHD, at least for children (Faraone et al., 2003; Heiervang et al., 2007).

Limitations

There are some limitations that should be taken into account before generalizing the results from this study to other adult ADHD populations. First, the naturalistic design, by which the patients have been diagnosed by many different clinicians, may have yielded a more heterogeneous patient sample compared to other studies recruiting patients from more limited areas. On the other hand, it may be more comparable to patients encountered in clinical practice, as was the intention by choosing this design. Although invitation letters were sent to a nationally referred cohort of patients, only about one of four patients responded to the study invitation. This may have given a selection bias toward the more motivated and less socially deprived patients, although the most obvious explanation for the low response rate is that our address registry was not updated, resulting in failure to reach many of the patients by letter. There is also an overrepresentation of female patients in our study sample compared to the national cohort sample (48% females in the study sample vs. 29% in the national cohort sample), which may reflect a greater willingness among women to participate in health related studies. However, the total number of patients referred for ADHD treatment in Norway is small compared to expected prevalence rates, and there is reason to believe that the patients in the cohort constitute a core group of impaired ADHD patients. Second, our data on psychiatric comorbidity and substance abuse are based on self-report-questionnaires. The self-reported symptoms correlated, however, satisfactorily with *DSM-IV* diagnoses assessed with the M.I.N.I. Plus in the interviewed subsample of patients. The data regarding occupational level and treatment during childhood are likely to be objective and reliable even in a self-report questionnaire form. Third, a considerable fraction of children diagnosed with ADHD recover from the symptoms as adults, whereas we have recruited only the most severely affected, relatively treatment refractory patients, with persistent symptoms as adults. A study sample also including recovered patients who were treated as children may therefore have yielded an even stronger protective effect of childhood treatment. Finally, the cross-sectional nature of this study does not permit any causative conclusions about the observed associations between childhood treatment and later functioning. The prospective studies needed to test such a hypothesis are, however, difficult to envision because of the ethical problems of randomizing children not to get effective treatment in long-term follow-up studies (Vitiello, 2001).

Implications

We found that adult ADHD patients who did not receive drug treatment as children had a threefold higher likelihood of being out of work as adults compared to patients who did receive treatment in childhood and that this effect was true regardless of reported comorbid problems of affective symptoms, substance abuse, and current treatment. Clinically, this finding underscores the importance of recognizing and treating ADHD during childhood to obtain a favorable long-term clinical and occupational outcome. Implications for future research are to further explore potential subgroups of adult ADHD patients and to determine whether they represent qualitatively and developmentally different conditions that can be traced back to childhood.

References

Able, S. L., Johnston, J. A., Adler, L. A., & Swindle, R. W. (2007). Functional and psychosocial impairment in adults with undiagnosed ADHD. *Psychological Medicine, 37*(1), 97-107.

American Psychiatric Association. (1996). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Barkley, R. (2006). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (3rd ed.). New York: Guilford.

Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990). The adolescent outcome of hyperactive children diagnosed by research criteria: I. An 8-year prospective follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*(4), 546-557.

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2002). The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. *Journal of Abnormal Psychology, 111*(2), 279-289.

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2003). Does the treatment of attention-deficit/hyperactivity disorder with stimulants contribute to drug use/abuse? A 13-year prospective study. *Pediatrics, 111*(1), 97-109.

Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2006). Young adult outcome of hyperactive children: Adaptive functioning in major life activities. *Journal of the American Academy of Child and Adolescent Psychiatry, 45*(2), 192-202.

Barkley, R., Murphy, K. R., & Fischer, M. (2007). *ADHD in adults: What the science says*. New York: Guilford.

Bental, B., & Tirosh, E. (2007). The relationship between attention, executive functions and reading domain abilities in attention deficit hyperactivity disorder and reading disorder: A comparative study. *Journal of Child Psychology and Psychiatry, 48*(5), 455-463.

Biederman, J., Faraone, S. V., Spencer, T. J., Mick, E., Monuteaux, M. C., & Aleardi, M. (2006). Functional impairments in adults with self-reports of diagnosed ADHD: A controlled study of 1001 adults in the community. *Journal of Clinical Psychiatry, 67*(4), 524-540.

Biederman, J., Faraone, S. V., Spencer, T., Wilens, T., Norman, D., Lapey, K. A., et al. (1993). Patterns of psychiatric comorbidity, cognition, and psychosocial functioning in adults with attention deficit hyperactivity disorder. *American Journal of Psychiatry, 150*(12), 1792-1798.

Biederman, J., Mick, E., & Faraone, S. V. (2000). Age-dependent decline of symptoms of attention deficit hyperactivity disorder: impact of remission definition and symptom type. *American Journal of Psychiatry, 157*(5), 816-818.

DelBello, M. P., Soutullo, C. A., Hendricks, W., Niemeier, R. T., McElroy, S. L., & Strakowski, S. M. (2001). Prior stimulant treatment in adolescents with bipolar disorder: Association with age at onset. *Bipolar Disorders, 3*(2), 53-57.

Faraone, S. V., Biederman, J., Mennin, D., Wozniak, J., & Spencer, T. (1997). Attention-deficit hyperactivity disorder with bipolar disorder: a familial subtype? *Journal of the American Academy of Child and Adolescent Psychiatry, 36*(10), 1378-1387; discussion 1387-1390.

Faraone, S. V., Biederman, J., Wilens, T. E., & Adamson, J. (2007). A naturalistic study of the effects of pharmacotherapy on substance use disorders among ADHD adults. *Psychological Medicine*, *37*(12), 1743-1752.

Faraone, S. V., Sergeant, J., Gillberg, C., & Biederman, J. (2003). The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry, 2*(2), 104-113.

Fayyad, J., De Graaf, R., Kessler, R., Alonso, J., Angermeyer, M., Demyttenaere, K., et al. (2007). Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. *British Journal of Psychiatry, 190*, 402-409.

Fischer, M., Barkley, R. A., Smallish, L., & Fletcher, K. (2002). 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, 30*(5), 463-475.

Fossati, A., Di Ceglie, A., Acquarini, E., Donati, D., Donini, M., Novella, L., et al. (2001). The retrospective assessment of childhood attention deficit hyperactivity disorder in adults: Reliability and validity of the Italian version of the Wender Utah Rating Scale. *Comprehensive Psychiatry, 42*(4), 326-336.

Grevet, E. H., Bau, C. H., Salgado, C. A., Fischer, A. G., Kalil, K., Victor, M. M., et al. (2006). Lack of gender effects on subtype outcomes in adults with attention-deficit/hyperactivity disorder: Support for the validity of subtypes. *European Archives of Psychiatry and Clinical Neuroscience, 256*(5), 311-319.

Halleland, H., Lundervold, A., Halmøy, A., Johansson, S., Haavik, J. (2008). Association between Catechol O-methyltransferase (COMT) haplotypes and severity of hyperactivity symptoms in adults. *American Journal of Medial Genetics Part B: Neuropsychiatric Genetics*. (Epub ahead of print)

Hechtman, L., & Greenfield, B. (2003). Long-term use of stimulants in children with attention deficit hyperactivity disorder: Safety, efficacy, and long-term outcome. *Paediatric Drugs, 5*(12), 787-794.

Heiervang, E., Stormark, K. M., Lundervold, A. J., Heimann, M., Goodman, R., Posserud, M. B., et al. (2007). Psychiatric disorders in Norwegian 8- to 10-year-olds: An epidemiological survey of prevalence, risk factors, and service use. *Journal of the American Academy of Child and Adolescent Psychiatry, 46*(4), 438-447.

Hirschfeld, R. M., Cass, A. R., Holt, D. C., & Carlson, C. A. (2005). Screening for bipolar disorder in patients treated for depression in a family medicine clinic. *Journal of the American Board of Family Practice*, *18*(4), 233-239.

Hirschfeld, R. M., Holzer, C., Calabrese, J. R., Weissman, M., Reed, M., Davies, M., et al. (2003). Validity of the Mood Disorder Questionnaire: A general population study. *American Journal of Psychiatry, 160*(1), 178-180.

Hirschfeld, R. M., Williams, J. B., Spitzer, R. L., Calabrese, J. R., Flynn, L., Keck, P. E., Jr., et al. (2000). Development and validation of a screening instrument for bipolar spectrum disorder: The Mood Disorder Questionnaire. *American Journal of Psychiatry, 157*(11), 1873-1875.

Jacob, C. P., Romanos, J., Dempfle, A., Heine, M., Windemuth-Kieselbach, C., Kruse, A., et al. (2007). Co-morbidity of adult attention-deficit/hyperactivity disorder with focus on personality traits and related disorders in a tertiary referral center. *European Archives of Psychiatry and Clinical Neuroscience, 257*(6), 309-317.

Johansson, S., Halleland, H., Halmøy, A., Jacobsen, K., Landaas, E., Dramsdahl, M., et al. (2008). Genetic analyses of dopamine related genes in adult ADHD patients suggest an association with the DRD5-microsatellite repeat, but not with DRD4 or Dat1 VNTRs. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*. Dec 5;147B(8):1470-5.

Kessler, R. C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., et al. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS): A short screening scale for use in the general population. *Psychological Medicine, 35*(2), 245-256.

Kessler, R. C., Adler, L., Barkley, R., Biederman, J., Conners, C. K., Demler, O., et al. (2006). The prevalence and correlates of adult ADHD in the United States: Results from the National Comorbidity Survey Replication. *American Journal of Psychiatry, 163*(4), 716-723.

Kessler, R. C., Adler, L. A., Barkley, R., Biederman, J., Conners, C. K., Faraone, S. V., et al. (2005). Patterns and predictors of attention-deficit/hyperactivity disorder persistence into adulthood: Results from the national comorbidity survey replication. *Biological Psychiatry, 57*(11), 1442-1451.

Lambert, N. M. (1988). Adolescent outcomes for hyperactive children. Perspectives on general and specific patterns of childhood risk for adolescent educational, social, and mental health problems. *American Psychologist, 43*(10), 786-799.

Lambert, N. M., & Hartsough, C. S. (1998). Prospective study of tobacco smoking and substance dependencies among samples of ADHD and non-ADHD participants. *Journal of Learning Disabilities, 31*(6), 533-544.

Mannuzza, S., Klein, R. G., Bessler, A., Malloy, P., & LaPadula, M. (1993). Adult outcome of hyperactive boys. Educational achievement, occupational rank, and psychiatric status. *Archives of General Psychiatry, 50*(7), 565-576.

Murphy, K. R., Barkley, R. A., & Bush, T. (2002). Young adults with attention deficit hyperactivity disorder: Subtype differences in

comorbidity, educational, and clinical history. *Journal of Nervous and Mental Disease, 190*(3), 147-157.

Newcorn, J. H., Miller, S. R., Ivanova, I., Schulz, K. P., Kalmar, J., Marks, D. J., et al. (2004). Adolescent outcome of ADHD: Impact of childhood conduct and anxiety disorders. *CNS Spectrums, 9*(9), 668-678.

Oncu, B., Olmez, S., & Senturk, V. (2005). Validity and reliability of the Turkish version of the Wender Utah Rating Scale for attention-deficit/hyperactivity disorder in adults [Article in Turkish. Abstract in English]. *Türk Psikiyatri Dergisi, 16*(4), 252-259.

Pliszka, S. R. (1998). Comorbidity of attention-deficit/hyperactivity disorder with psychiatric disorder: An overview. *Journal of Clinical Psychiatry, 59*(Suppl. 7), 50-58.

Rasmussen, K., Almvik, R., & Levander, S. (2001). Attention deficit hyperactivity disorder, reading disability, and personality disorders in a prison population. *Journal of the American Academy of Psychiatry and the Law*, *29*(2), 186-193.

Rasmussen, K., & Levander, S. (2008). Untreated ADHD in Adults: Are there sex differences in symptoms, comorbidity, and impairment? *Journal of Attention Disorders*. Epub ahead of print March 26, 2008. DOI: 10.1177/1087054708314621.

Rasmussen, P., & Gillberg, C. (2000). 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, 39*(11), 1424-1431.

Reichart, C. G., & Nolen, W. A. (2004). Earlier onset of bipolar disorder in children by antidepressants or stimulants? An hypothesis. *Journal of Affective Disorders, 78*(1), 81-84.

Rodriguez-Jimenez, R., Ponce, G., Monasor, R., Jimenez-Gimenez, M., Perez-Rojo, J. A., Rubio, G., et al. (2001). Validation in the adult Spanish population of the Wender Utah Rating Scale for the retrospective evaluation in adults of attention deficit/hyperactivity disorder in childhood. [Article in Portuguese. Abstract in English]. *Revista de Neurologia, 33*(2), 138-144.

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., et al. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*(Suppl. 20), 22-33; quiz 34-57.

Sobanski, E., Bruggemann, D., Alm, B., Kern, S., Deschner, M., Schubert, T., et al. (2007). Psychiatric comorbidity and functional impairment in a clinically referred sample of adults with attention-deficit/hyperactivity disorder (ADHD). *European Archives of Psychiatry and Clinical Neuroscience*, *257*(7), 371-377.

Sprafkin, J., Gadow, K. D., Weiss, M. D., Schneider, J., & Nolan, E. E. (2007). Psychiatric comorbidity in ADHD symptom subtypes in clinic and community adults. *Journal of Attention Disorders, 11*(2), 114-124.

Statistics Norway. (2005). *Labour Market.* Retrieved January 2008 from http://ssb.no/emner/06/arbeid/

Torgersen, T., Gjervan, B., & Rasmussen, K. (2006). ADHD in adults: A study of clinical characteristics, impairment and comorbidity. *Nordic Journal of Psychiatry, 60*(1), 38-43.

Vitiello, B. (2001). Long-term effects of stimulant medications on the brain: Possible relevance to the treatment of attention deficit hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology*, *11*(1), 25-34.

Ward, M. F., Wender, P. H., & Reimherr, F. W. (1993). The Wender Utah Rating Scale: An aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. *American Journal of Psychiatry, 150*(6), 885-890.

Weiss, G., & Hechtman, L. (1993). *Hyperactive children grown up: ADHD in children, adolescents, and adults* (2nd ed.). New York: Guilford.

Wilens, T. E., & Dodson, W. (2004). A clinical perspective of attention-deficit/hyperactivity disorder into adulthood. *Journal of Clinical Psychiatry, 65*(10), 1301-1313.

Wilens, T. E., Faraone, S. V., Biederman, J., & Gunawardene, S. (2003). Does stimulant therapy of attention-deficit/hyperactivity disorder beget later substance abuse? A meta-analytic review of the literature. *Pediatrics, 111*(1), 179-185.

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