

# Associations Between Childhood ADHD and Other Mental Disorders in Young Women

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## Abstract

***Objective:** To evaluate the prevalence rates of Attention-Deficit Disorder (ADHD) and comorbidity in a representative sample of young women.*

***Methods:** 2064 young women, aged 18–25 years, living in Dresden (Germany), were interviewed with a structured psychological interview, F-DIPS, for diagnosing axis-I disorders according to DSM-IV (Diagnostic and Statistical Manual of Mental Disorders 4<sup>th</sup> Ed.).*

***Results:** The lifetime prevalence of ADHD was 1.5% (31 women), with only 0.14% still suffering from ADHD since childhood. Since ADHD affects boys 3–4 times more often than girls, the prevalence rate found in this sample is approximately in accordance with overall prevalence rates of about 3–10% in children. Lifetime prevalence of conduct disorders, somatoform disorders, and PTSD was significantly higher in women fulfilling once the diagnosis of ADHD than in other women. Moreover, women with (past or current) ADHD were almost twice as likely to suffer from depressive disorders and specific phobic disorders as compared with women without ADHD.*

***Conclusion:** ADHD in childhood might lead to an increased prevalence of other psychiatric disorders in adolescence and adulthood, even if diagnostic criteria of ADHD are no longer fulfilled (German J Psychiatry 2009; 12: 8-13).*

*Keywords:* ADHD; comorbidity; lifetime and point prevalence; young women

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## Introduction

Attention Deficit Disorder with or without hyperactivity (AD(H)D) is the most extensively studied mental disorder in

childhood. ADHD affects an estimated 3–10% of school-age children. However, ADHD does not only occur in childhood and adolescence. Approximately 30–60% of children with ADHD have symptoms that persist into adulthood (Krause et al., 1998; Wender et al., 2001). Different types of rating scales are used to diagnose ADHD in adult-

hood, most of which are modelled on the criteria laid out in the DSM-IV (APA, 1994). According to the DSM-IV, ADHD can be divided into three subtypes: predominantly inattentive; predominantly hyperactive-impulsive; and the combined type, for which a patient must fully meet the criteria of the other two subtypes. Boys are three to four times more likely to suffer from ADHD than are girls (Wender, 1998; Biederman, 2005). In clinic-referred samples the male-to-female ratio increases to 10 to 1 (Biedermann et al., 2002). Gender differences in dopamine receptor density (Andersen and Teicher, 2000), effects of hormones (Arnold, 1996; Sawada and Shimohama, 2000), and a poorer self-perception of women (Arcia, 1998) may contribute to these differences. Girls with ADHD are more likely to have the predominantly inattentive subtype of ADHD than are boys (Biedermann et al., 2002). They display lower levels of hyperactivity and externalizing behaviours (Gaub, 1997). Inattention symptoms include failure to pay close attention to detail, to listen when spoken to, to follow through on instructions or to finish tasks; difficulty in sustaining attention and in organizing; reluctance to engage in activities that require sustained mental effort; losing of things; easy distraction; and forgetfulness (APA, 1994). Age of onset is also an important adult ADHD diagnostic criterion. Symptoms must date back to the age of 7 or younger. Individuals with ADHD show an increased risk for comorbid disorders (Marks et al., 2000; Sobanski, 2006). The presence of ADHD is an important risk factor for psychoactive substance abuse disorders (Disney et al., 1999; Mannuzza et al., 2001; Sobanski, 2006). A high proportion of ADHD among children also meets criteria for conduct/oppositional disorders. Adults with ADHD are at greater risk for psychiatric problems, including higher rates of anxiety and depression, as compared with their non ADHD counterparts (Biedermann, 1994; Biedermann, 2001; Cuffe et al., 2001; Kessler et al., 2006; Milberger and Biedermann, 1995; Pliszka, 1998; Sobanski, 2006). Still, the existence of adult ADHD is almost ignored in Germany (Krause et al., 1998). Both the epidemiological and the clinical (therapy, comorbidity) research have not sufficiently considered the question of the persistence of ADHD or ADHD symptoms so far. Psychostimulants, e.g., methylphenidate, still do not meet with approval for treating adults with ADHD (e.g., Novartis Pharma, 2003). Women with the predominantly inattentive type have a higher risk of being underdiagnosed than their male counterparts (Rucklidge and Kaplan, 2000). There is a lack of gender-specific studies about ADHD. Most longitudinal investigations about the course of ADHD are based on male samples (Manuzza et al., 1993; Weiss and Hechtman, 1993).

This study was initiated with the aim to evaluate the prevalence rates of ADHD in a representative sample of young female adults. Moreover, the point- and lifetime prevalence of co-occurring mental disorders are investigated. A strength of this study is that the interviewers did not focus on specific mental disorders. One of the questions we will concentrate on is whether comorbid diagnoses might represent independent diagnostic entities or if comorbid diagnoses might be direct consequences of ADHD.

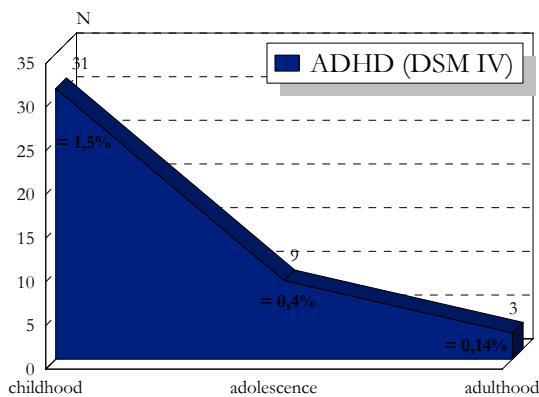
## Material and Methods

### Sample

In the course of two projects supported by the German Federal Ministry of Education and Research [project A4: predictors of mental health in young women; project C4: investigation of the application of medicines in the region of Dresden (Germany)], a prospective epidemiological study was performed to evaluate prevalence rates, incidences, development, and risk factors of mental disorders (DSM-IV) in young women. The baseline study was conducted from July 1996 to September 1997 (T1), and a follow-up investigation (T2) from December 1997 to February 1999 (standardized interview F-DIPS). As a random sample, 9000 young women (between 18 and 24 years of age) were chosen from the persons registered in the City of Dresden. 3796 of the addresses found were no longer valid at the time of the investigation; of the remaining 5204 people, 2064 participated in this study. The majority of the women were not married (94.9%), but did have a partner (66.5%). About half of the women were living with their parents, about a third with a partner, and about 14% alone. Very few dropped out of school without a degree (3.3%), consistent with mandatory-school law. The minority went to a "Hauptschule" (6.5%), the lowest level of school education. About one third attended the medium level of schooling ("Realschule" and "Polytechnische Schule") and about half ended schooling with a degree allowing them to enter university ("Abitur"). Almost half of the young women were working: 31.5% of the whole sample full-time, 15.3% part-time. A few women were still at school (4.3%), about 40% were university students, and about 5% were currently unemployed.

### Diagnostic assessment

The women were interviewed twice (T1: lifetime prevalence and point prevalence of mental disorders; T2: one-year prevalence and point prevalence) by using the research version of the Diagnostic Interview for Mental Disorders (Margarf et al., 1996). The F-DIPS is a structured interview to obtain Axis I diagnoses according to DSM-IV, to investigate lifetime prevalences as well as point prevalences. However, it is not able to detect schizophrenias and personality disorders. It is a modified version of the DIPS (Margarf et al., 1991) and the ADIS-IV (Brown et al., 1994). The retest- and inter-rater reliability of the DIPS was tested in an unselected sample of 201 patients, mostly of an internal medicine-psychosomatic clinic (Schneider et al., 1992). The retest reliabilities across the groups of disorders were between .68 and .79 (Kappa coefficient) and .67 and 1.0 (Yule's Y-coefficient). Besides a few exceptions, the single diagnoses also reach satisfactory values (Kappa-coefficient between .68 and .73 and Yule's Y between .71 and 1.0). Interviewers were either medical doctors or psychology students in their last year of training. All had undergone extensive training lasting about one week and received bi-weekly supervision. Spe-

**Figure 1. Lifetime prevalence of ADHD in a representative sample of young women (N=2064)**

cially-trained supervisors proof-read every interview. Information regarding the origins of the disorder in childhood and adolescence was given in retrospect; the age (in years) at the beginning of the disease is quoted.

#### Statistical Analyses

Data was analysed using the Statistical Package for Social Sciences (SPSS), German Windows Versions 8.0 and a relational database (Paradox 7.0, Borland). Between-group comparisons were done with a statistical procedure on the basis of the comparison of likelihoods of two binominal distributions.

## Results

Retrospectively, 31 women (life-time prevalence: 1.5%) fulfilled diagnostic criteria of ADHD in childhood (0–12

years of age). In adolescence (13–17 years of age), 9 women (29%) were still suffering from ADHD. However, only 3 (= 10%) of formerly affected women were showing ADHD at T1 (point prevalence) (Fig. 1).

Those women with ADHD were examined concerning other mental disorders. Tab. 1 shows the point and lifetimeprevalence rates of all diagnosed psychiatric disorders at T1.

Conduct/oppositional disorders were highly frequent lifetime diagnoses. Almost 40% of women with ADHD showed these disorders. Specific phobias, depressive disorders and posttraumatic stress disorders were also highly prevalent. More than 40% of women with ADHD had psychiatric disorders at T1. Phobic anxiety disorders were mostly prevalent. Every 6th of these women had already experienced a depressive episode during lifetime. The frequency of major depression between T1 and T2 (1-year prevalence) was significantly higher in women with ADHD (18%) in comparison to women without ADHD ( $p < 0.01$ ) (not shown in table). In all cases ADHD was diagnosed earlier than the other mental disorders.

Differences in lifetime prevalence rates between women with and those without ADHD are shown in Tab. 2. Only mental disorders which affected at least 9.7% of women with ADHD (>3 women) were chosen for those comparisons, because the expected cell frequencies should not be neither smaller than 5 nor blank to estimate the probabilities with sufficient precision (Everitt, 1977; Hays, 1988).

Women with ADHD suffer twice as much from the mentioned mental disorders. There are significant differences in the prevalence of conduct/oppositional disorders, PTSD, and somatoform disorders. Because of performing multiple statistical significance tests on the same data, the Bonferroni adjustment was applied to test statistically significance (Abdi et al., 2007). Even after the Bonferroni adjustment every test results in a p-value of less than .01 and can be considered statistically significant.

**Tab. 1. Point and lifetime prevalence rates of mental disorders\* in women with ADHD (n=31)**

Diagnosis	Point prevalence (T1) % w	Lifetime prevalence % w
Alcohol dependence syndrome	-	3.2
Sedatives or hypnotics dependence syndromes	3.2	-
Bipolar affective disorders	3.2	6.4
Eating disorders	6.4	3.2
Depressive episodes	-	16.1
Cyclothymia	-	3.2
Phobic anxiety disorders	35.5	19.7
Other anxiety disorders	-	3.2
Posttraumatic stress disorders	3.2	16.1
Somatoform disorders	9.7	6.4
ADHD	9.7	100
Conduct/oppositional disorders	3.2	38.7
Enuresis	-	3.2

\* without personality disorders and schizophrenia

**Tab. 2. Differences in lifetime prevalence rates of mental disorders\* between women with or without ADHD**

Diagnosis	W/ADHD (n=31)		W/o ADHD (n= 2033)		$\chi^2$ Test
	% w	CI	% w	CI	
Depression	16.1%	3.2–29.1	8.7%	7.5–9.9	n.s.
Conduct/Oppositional Disorder	38.7%	21.6–55.9	2.6%	1.9–3.2	p<0.001
Specific phobias	19.7%	5.4–33.3	10.8%	9.4–12.1	n.s.
Posttraumatic Stress Disorder	16.1%	3.2–29.1	5.1%	4.2–6.1	p<0.01
Somatoform Disorder	9.7%	0–20.1	1.2%	0.7–1.7	p<0.001

\* without personality disorders and schizophrenia

## Discussion

This study was started with the goal to evaluate prevalence rates of ADHD and other mental disorders in a representative sample of German females in young adult age.

One limitation of this study is its methodology: The diagnosing of ADHD was done retrospectively relying on the accurate recall of women. Moreover, a prospective study would yield lower rates of comorbidity. A second limitation is that no reports from parents or teachers were available. Murphy and Schachar (2000) stated that adults are more able to give a true account of their current symptoms of ADHD than are children. By examining adults, their partners, and their parents about ADHD symptoms, the authors found remarkable correlations between subject and observer scores. Although no ADHD-specific diagnostic instrument (e.g., Wender Utah Rating Scale; Retz-Junginger, 2002) was used in our study, the F-DIPS is a structured interview, strictly following DSM-IV criteria for ADHD. Hence, the authors conclude that the diagnostic instrument is valid to detect ADHD.

ADHD occurs rather rarely in adult German women, with lifetime prevalence being low. ADHD affects 1.5% of females in childhood. In about a third of affected women ADHD persists into adolescence. Only 10% of affected females fulfil diagnostic criteria in adulthood. These results differ from other studies. Research indicates that ADHD persists into adulthood in 30–60% of affected individuals (Krause et al., 1998; Manuzza et al., 1993; Weiss and Hechtman, 1993). Non-gender-specific lifetime prevalence is estimated to be between 3–10% (Wender et al., 2001), and in a community sample of adolescents and young adults a prevalence of only 1.5% for ADHD was found. Males were 4–5 times more affected than females (0.54%) (Cuffe et al., 2001). Nevertheless, our results show less prevalence in adulthood than expected. Is the full dimension of the gender-specific bias still unknown? Andersen and Teicher (2000) named differences in the dopamine system between male and female rats which might attribute to gender differences in ADHD. Male D2 receptor density shows a sharp decrease (minus 55%) during transition from adolescence to adulthood. The D4 and D2 receptor genes have been implicated in increasing the susceptibility of subjects to ADHD (Sunohara et al., 2000; Swanson et al., 2000; Swanson, 2000). The possible influence and neuroprotective effects of hormones and their role in psychiatric disorders was sometimes dis-

cussed in recent reviews (Arnold, 1996; Kölsch & Rao, 2002; Sawada and Shimohama, 2000), but never proved. Savada and Shimohama (2000) showed that estradiol provides neuroprotection in mesencephalic dopaminergic neurons. They suggested that this neuroprotective effect might lead to lower prevalence rates of ADHD in women. Hence, the strong decrease in the prevalence of ADHD in adulthood in our study might be an indicator for hormonal changes. But we did not evaluate appropriate parameters to verify this assumption. Rucklidge and Kaplan (2000) found that more women with ADHD represented a learned helplessness attributional style than their female non-ADHD counterparts. They stated that repeated failure experiences of women with ADHD in childhood (caused by not being identified as ADHD subjects) lead to a learned helplessness response. In turn, the likelihood of depression and anxiety might increase, because affected women tend to exhibit more internalizing comorbid disorders: the women with ADHD in our study show significantly more other mental disorders than do women without ADHD. Almost 40% are comorbid for conduct/oppositional disorder. Conduct disorders/problems are often found in individuals with ADHD (Biederman, 2001; Dalsgaard et al., 2002; Marks et al., 2000; Rucklidge and Kaplan, 2000; Weiss and Hechtman, 1993; Weiss, 2003; Wender et al., 2001). As about 50% of children with conduct disorders later develop an antisocial behaviour disorder; an existing conduct disorder is also an important prognostic sign (Wender et al., 2001). However, F-DIPS is not able to detect personality disorders. Diagnoses on claim forms of ambulant-treating doctors did not report antisocial behaviour personality disorders at all (Hach et al., 2003), which may indicate a low prevalence of those disorders in this sample. Substance abuse, another common comorbid disorder in subjects with ADHD (Biederman, 2001; Manuzza et al., 1993; Marks et al., 2000), could not be found in our study either. One woman had suffered from an alcohol dependence syndrome (lifetime diagnosis), and one woman reported an existing sedative dependency syndrome at T1. It is noteworthy that substance-related disorders in this study were very rare (lifetime prevalence 1.9%; point prevalence T1: 0.9%, T2: 1.2%). Hence, interpretations should be done with care (Becker et al., 2000). The likelihood of developing PTSD and a somatoform disorder was three and eight times, respectively, higher with women with ADHD than without ADHD. Even in large reviews of recent literature and studies with population-based samples, respectively (Lieb et al., 2000; Marks et al., 2000; Wender, 2001), no data is available about associations between ADHD and PTSD and somatoform disorders. As a hypothesis, somatoform disorders could be typical comorbid-

ities of ADHD, exhibited after internalizing processes. In cases of posttraumatic stress disorder, a higher risk for accidents and injuries (caused by inattention and hyperactivity) in combination with an existing mental disorder (ADHD) could lead to a higher vulnerability for developing a PTSD. Mostly, the reason for an acute PTSD is a sexual abuse. Affective and anxiety disorders are often associated with ADHD (Wender, 2001; Marks et al., 2000; Rucklidge and Kaplan, 2000). Similar symptoms are found in ADHD as well as depression (e.g., impaired concentration, restlessness, impulse control deficits) (APA, 1994). Moreover, both are associated with a dysfunction of similar neurotransmitters. Questions have been raised regarding the degree to which the high incidence of comorbidity is simply a by-product of overlapping symptoms (Pliska, 1998). Milberger & Biederman (1995) examined subjects with ADHD and comorbid psychiatric disorders (major depression, bipolar disorder, anxiety disorder). To determine the degree to which a possible symptom overlap influences these diagnoses, each individual was re-diagnosed on the basis of two different techniques. The results showed that both ADHD and the comorbid conditions themselves were not artefacts of symptoms shared with the other psychiatric disorder. Although the prevalence-rates of both depression and specific phobias in women with ADHD doubled the prevalence rate of non-ADHD women, no significant correlations were found in our study. An interesting fact is that, except for the conduct disorders, the disorders mostly associated with ADHD (depression and phobias) did not occur significantly more frequently than other mental disorders (PTSD, somatoform). As a consequence, all mental disorders found in this study seem to represent independent diagnostic entities. The role of neurobiological processes, maladaptive attribution styles, and perhaps hormonal changes in developing other comorbid mental disorders remains unclear, although, in young adult life, those “comorbid” disorders are highly prevalent. Regarding the fact that ADHD was always the “first” occurring mental disorder, treatment strategies should still consider its possible, existing symptoms.

## Summary

The prevalence rates of ADHD in young, adult women are unexpectedly low. The prevalence of somatoform disorders, PTSD, and conduct/oppositional disorders is significantly higher in women with lifetime diagnoses of ADHD than in their counterparts without ADHD. Moreover, women with ADHD are about twice as likely to suffer from major depression and specific phobias as compared to women without ADHD. The results indicate that suffering from ADHD in childhood increases the risk of “comorbidity” in adolescence and young adulthood, even if ADHD is then no longer present.

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