

## ORIGINAL PAPER

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# Attention deficit/hyperactivity disorder in female offenders: prevalence, psychiatric comorbidity and psychosocial implications

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**Abstract** Attention deficit-/hyperactivity disorder (ADHD) is associated with social maladaptation and delinquency in later life. This study was conducted to determine the prevalence of ADHD and comorbid conditions in female prison inmates. One hundred and ten adult female prison inmates of a German prison for women were investigated. SCID-I and -II interviews and standardized German instruments for the assessment of ADHD in adults (HASE) were used. The lifetime prevalence of ADHD was 24.5 and 10% for persisting ADHD according to DSM-IV criteria. A decline of the prevalence of persisting ADHD with age from 17.9% (age <25 years) to 10% (age 26–45 years) and 0% (age >45 years) was observed. Female prisoners with ADHD were younger at their first conviction as compared with females without ADHD and they showed longer incarceration periods in relation to age. The prevalence of other axis I disorders was high in both the ADHD and the non-ADHD female population, but significantly higher in ADHD females. Mean number of axis I diagnoses was 3.6 in females with ADHD and 2.3 in females without ADHD. No differences were found between females with and without ADHD regarding the prevalence of psychotic, affective, anxiety, somatization and posttraumatic disorders. Substance use disorders and in particular the use of stimulants were more frequent in females with ADHD as well as borderline personality disorder and eating disorders. The results suggest a high prevalence of ADHD in female prisoners that exceeds the prevalence estimates from epidemiological studies in general female populations. Moreover, it appears that ADHD is particularly frequent in adolescent and

young adult female offenders and increases the risk for further psychiatric morbidity. The results indicate the need of adequate psychiatric support of female prison inmates including therapeutic programs for ADHD.

**Key words** ADHD · comorbidity · female offender · forensic psychiatry · personality disorder

## Introduction

There is overwhelming evidence that attention deficit/hyperactivity disorder (ADHD) is a chronic disease which starts usually in preschool life, continues into school age and adolescence and is still present in the majority of cases in adult life. According to recent epidemiologic research the transnational prevalence of ADHD in adults was 3.7%. In the US a prevalence of 4.4% and in Germany a prevalence of 3.1% was found, respectively [15, 21]. The transnational prevalence of ADHD in men was 4.1 and 2.7% in female persons [15].

In adulthood ADHD can lead to widespread limitations regarding activities of daily living and adaptation in social life. It has been shown that ADHD is associated with marital and vocational problems [3, 4]. The risk of accidents during work and leisure activities is increased as well as the risk of traffic accidents. The prevalence of ADHD is increased particularly in traumatic events with severe injuries [17, 20].

Driving under alcohol and without driver licence as well as speeding are typical rule breaking behaviours and occur frequently in ADHD individuals [2, 19]. The above mentioned risk factors and certain comorbid conditions might affect the capability to adapt sufficiently on different social situations. Conduct disorder is present in about 50% of childhood and adolescent ADHD. Antisocial personality disorder is a frequent

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**Table 1** Different types of delinquency in male and female incarcerated offenders

	Adult female offenders <i>N</i> = 110	Young male offenders <i>N</i> = 129
Theft (%)	8	54
Robbery (%)	4	32
Assault (%)	5	40
Fraud (%)	21	4
Murder/manslaughter (%)	1	5
Drug related offences (%)	81	35
Sexual offences (%)	0	3
Other (%)	15	15

disorder in adult ADHD and can be diagnosed in 50% of those who had an earlier combination of ADHD and CD [23, 46]. The diagnosis of these comorbid conditions implies the presence of severe social disturbances including delinquent behaviour.

In forensic and criminal populations the prevalence of ADHD seems to be much higher as compared with the normal population. In his review of the available literature Vermeiren [42] found a widespread variation of the prevalence in adolescent offenders between 4% [31] and 72% [40]. The majority of studies revealed prevalence rates between 20 and 30%. In an own study of young imprisoned men (mean age 19 years) we found an ADHD prevalence of 45% according to DSM-IV criteria [35]. In additional 26% of the individuals we diagnosed ADHD in partial remission. Regarding subtypes of ADHD the combined type and the predominant hyperactive/impulsive subtype were found in 21.7% each, whereas the inattentive subtype was underrepresented with 1.5%.

The data base regarding the situation in female delinquents and forensic cases leaves much to be desired. To our knowledge, no study has been conducted so far in Germany or other European countries concerning the prevalence of ADHD in female offenders. In a Canadian study the prevalence of ADHD in female adolescent incarcerated offenders was 18% [41].

**Table 2** Basic characteristics of the three populations under investigation

	Incarcerated women (1)	Incarcerated young men (2)	Female controls (3)	Statistics <i>t</i> test/chi-square ( <i>df</i> ) <i>P</i>
<i>N</i>	110	129	45	
Age	34 ± 12 years	19.5 ± 2 years	26.7 ± 9.6 years	1 versus 2, 1 versus 3, 2 versus 3: 0.000
Education (years)				1 versus 2: 56.9 (3) 0.000
Special education	1.8%	14.0%	0.0%	1 versus 3: 64.3 (3) 0.000
Grade school	3.6%	35.7%	0.0%	2 versus 3: 80.4 (3) 0.000
Unfinished	91.8%	47.3%	42.5%	
Grade school	2.7%	3.1%	57.5%	
High school				
Professional training				1 versus 2: 36.2 (2) 0.000
No training	10.9%	46.5%	10.0%	1 versus 3: 30.7 (2) 0.000
Training unfinished	78.2%	45.0%	37.5%	2 versus 3: 42.6 (2) 0.000
Training succeeded	10.9%	8.5%	52.5%	
Family status				1 versus 2: 29.1 (3) 0.000
Single	82.7%	69.8%	76.3%	1 versus 3: 2.43 (3) n.s.
Partner	5.5%	28.7%	10.5%	2 versus 3: 14.7 (3) 0.002
Married	5.5%	0.8%	7.9%	
Divorced	6.4%	0.8%	5.3%	

It was the objective of the present study to examine the prevalence of ADHD and comorbid disorders in a larger sample of female offenders, who were sent to prison by a criminal court. Moreover, we examined the psychosocial and forensic implications of ADHD.

## Participants

A total of 110 female subjects participated in the study after they were introduced to the aims of the study and having obtained written informed consent. Furthermore consent of the legal authorities and the local ethic committee were obtained.

The individuals were incarcerated at the State prison for females of Zweibrücken. In this facility all women serve their prison sentence when decreed by a court of the Saarland and Rheinland-Pfalz, which are two states of the Federal Republic of Germany with approximately 5 million inhabitants. The type of offences is shown in Table 1.

Women who had no sufficient command over the German language were excluded from the study. Twenty-nine females (21%) were not willing to participate.

Participants of the above mentioned earlier study regarding very young male offenders [35] served as control group. A second control group consisted of female healthy volunteers, who were randomly recruited by public postings. General information concerning the different study populations are presented in Table 2.

The two prison populations differed in terms of age, school education and vocational training. The female group was older, had better school graduations and had more years of vocational training as compared with our young men imprisoned group. The healthy volunteers showed superiority in almost all criteria referring to school and vocational training.

## Methods

All participants underwent a standardized examination with ADHD-specific rating instruments and self-report scales referring to general psychopathology, which were validated on German populations (HASE) [37]. ADHD was diagnosed according to DSM-IV criteria. In order to validate the manifestation of ADHD psychopathology in childhood, a WURS-k score above the cut-off score of 30 points was required for the diagnosis of ADHD [29]. ADHD in partial remission was diagnosed, if ADHD psychopathology was present in the past (WURS-k score  $\geq 30$ ), but the current state did not fulfil DSM-IV criteria.

Attention deficit/hyperactivity disorder psychopathology was assessed by the following instruments: the Wender-Utah-Rating Scale—German short version (WURS-k) is a self rating instrument focussing on childhood ADHD psychopathology retrospectively [27–29, 44]. The German short version—WURS-k comprises 25 items. Twenty-one items refer to the ADHD psychopathology and four serve as control items. The instrument has been validated in different German populations. The psychometric properties of the scale were found adequate. They have been comprehensively published elsewhere [37]. There is a cut-off score of 30 points indicating that childhood ADHD symptoms could be present [28, 29].

The ADHD Diagnostic Checklist (ADHD-DC) [37] was designed as an expert rating to establish the diagnosis of ADHD in accordance to DSM-IV or ICD-10 research version. An already existing scale of this type is the ADHD-RS-IV [14]. Unfortunately, this scale exists only in English language. Our German scale consists of 18 items concerning features of inattention, impulsivity and hyperactivity, which are rated on a 0–3 Likert Scale. Four additional items refer to age of onset, subjective complaints and functional impairment. According to the well known algorithm of DSM-IV the diagnosis of ADHD combined type and two additional diagnoses—ADHD inattentive subtype and ADHD hyperactive/impulsive subtype—can be made. The psychometric properties of the ADHD-DC have been found appropriate and were reported elsewhere [36, 37].

The Wender-Reimherr interview (WRI) is the authorized German version of the Wender Reimherr attention deficit disorder scale (WRAADDS) [37, 47], which was designed to assess the Utah criteria of adult ADHD. This concept goes beyond DSM-IV and has been developed prior to the publication of DSM-III in 1980. The semi-standardized interview consists of seven psychopathological domains including inattention, hyperactivity, hot temper, affective lability, emotional overreactivity, disorganization and impulsivity. Each domain comprises 3–5 items, which are rated 0 (not present), 1 (somewhat true), and 2 (very true or often true). For our statistical analyses we used the total score (28 items) and the subscores of the above mentioned psychopathological domains. The psychometric properties of the WRI have been published elsewhere [36, 37].

Regarding general psychopathology all subjects underwent a comprehensive psychiatric examination including a standardized battery of psychopathological rating scales. The German versions of the SCID-I and SCID-II interviews were used to establish axis I and axis II diagnoses according to DSM-IV. Both instruments are used widely in psychiatric epidemiology [48].

All statistical evaluations were done by SPSS-version 15.0. The following procedures were used: chi-square test, Fisher's exact test, Mann-Whitney test, ANOVA and regression analysis. A correction for multiple testing (Bonferroni) was not applied due to the exploratory character of the investigation.

**Table 3** Prevalence of ADHD according to DSM-IV in three populations: incarcerated women, incarcerated young men and healthy volunteers

Diagnosis	Incarcerated women <i>N</i> = 110 (%)	Incarcerated young men <i>N</i> = 129 (%)	Non-convicted female controls <i>N</i> = 45 (%)	Statistic chi-square ( <i>df</i> ) <i>P</i>
ADHD DSM-IV	10	45	0	56.6 (2) 0.0001
ADHD—in partial remission	14.5	26.4	4.4	12.4 (2) 0.002
ADHD lifetime	24.5	71.4	4.4	85.0 (2) 0.0001

## Results

### ■ ADHD prevalence

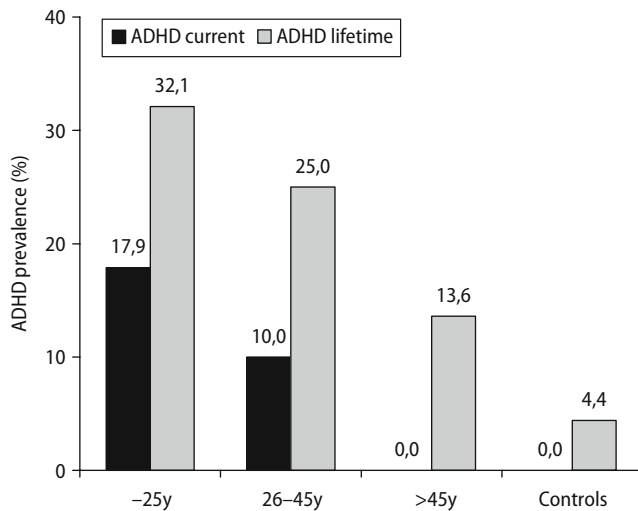
Of the 110 subjects 11 (10%) had a diagnosis of ADHD according to DSM-IV. Six (5.5%) displayed ADHD combined type and another five suffered either from ADHD inattentive type (*N* = 2, 1.8%) or ADHD hyperactivity/impulsivity type (*N* = 3, 2.7%). ADHD in partial remission was diagnosed in 16 cases (14.5%) (Table 3). The mean scores of the WURS-k and the ADHD-DC were  $41.9 \pm 12.8$  and  $29.0 \pm 7.6$  in females with persisting ADHD and  $42.7 \pm 10.7$  and  $15.5 \pm 7.1$  in the females with ADHD in partial remission. Females without ADHD had mean scores of  $13.1 \pm 9.2$  and  $10.9 \pm 9.2$ . The mean scores differed significantly between the groups by non-parametric pairwise compare (Kruskal-Wallis tests, *P* < 0.05), except WURS-k mean scores of females with persisting ADHD and ADHD in partial remission.

The prevalence of ADHD in our control group representing young male prison inmates was 45%. The prevalence for ADHD combined type and ADHD hyperactive/impulsive subtype was 21.7% each. ADHD inattentive subtype was detected in 1.5%. Moreover 26.4% of the young men had ADHD in partial remission. In our second control group of healthy female volunteers no full ADHD case could be detected and 4.4% demonstrated ADHD in partial remission (Table 3).

The prevalence of ADHD in the female prison populations was correlated with age. In incarcerated women until the age of 25 years the prevalence of the full clinical syndrome of ADHD was 17.9 and 10% for the individuals between 26 and 45 years. Among individuals older than 45 years no case of ADHD according to DSM-IV was observed (Fig. 1).

### ■ Impact of ADHD on social functioning and forensic parameters

According to the rules of the SCID-I interview social adaptation and functioning has been assessed by means of partner and family relations, social surrounding, school and vocational affairs, activities at home, financial and health problems, criminality and other aspects. There was no difference between females with and without ADHD with one exception. The incarcerated women with ADHD reported sig-



**Fig. 1** Prevalence of ADHD according to DSM-IV with and without partial remitted ADHD syndrome in different age classes of incarcerated women and non-convicted controls

nificant more problems with their social surrounding in comparison with individuals without ADHD (90.9 vs. 47.6%, chi-square  $P = 0.02$ ).

When we compared incarcerated females with and without ADHD regarding age at first and number of earlier convictions, delinquency before the age of 14 years, other delinquent persons in the family, type of offence, duration of incarceration and prior psychiatric treatment, we detected three major differences. The females with ADHD were much younger (19.2 years) when they had their first conviction as compared with females without ADHD (27 years; ANOVA  $P = 0.03$ ). A regression analysis showed that the age of first conviction is influenced additionally by a lifetime diagnosis of SUD (Odds Ratio -5.9, 95% CI: -1.23 to -10.6). Furthermore the time being incar-

cerated in relation to the age was significantly higher in individuals with ADHD (ANOVA  $P = 0.029$ ). A third finding was a trend to a lower prevalence of individuals with persistent and partial remitted ADHD in fraud offences (8.3 vs. 29.4%, Fisher's exact test  $P = 0.036$ ).

#### ■ ADHD and axis I disorders according to DSM-IV

We found a significant higher prevalence (ANOVA  $P = 0.016$ ) of axis I diagnoses in persons with ADHD (mean 3.6 diagnoses per person) compared to individuals without ADHD (mean 2.3 diagnoses per person). Among the group of incarcerated females without ADHD only 6.3% were without any axis I disorder. All females with ADHD had at least one comorbid axis I disorder. The prevalence rates of different axis I diagnostic categories derived from the SCID-I interview are presented in Table 4.

There were no differences between ADHD and non-ADHD individuals in terms of affective or psychotic disorders. Furthermore we could not find differences regarding anxiety, somatization and posttraumatic disorders. Nevertheless, the prevalence of eating and substance use disorders was increased significantly in ADHD persons. All subtypes of eating disorders binge eating disorder, anorexia and bulimia were present more frequently in presence of ADHD. Concerning the substance use disorders we found a significant higher prevalence for any SUD in ADHD females (81.8 vs. 47%,  $P = 0.05$ ), but we could not detect differences regarding the prevalence of lifetime diagnoses referring to alcohol, cannabis, opioid and cocaine, hallucinogens, sedatives and other drugs. The only significant difference (Fisher's exact test;  $P = 0.04$ ) was found regarding lifetime amphetamine use disorders in females with and without ADHD (63.6 vs. 31.3%).

**Table 4** Prevalence of comorbid conditions (axis I disorders) in incarcerated women with and without ADHD

SKID-I lifetime diagnoses	ADHD <i>N</i> = 11 (%)	No ADHD <i>N</i> = 83 (%)	Fisher's exact test; <i>P</i>	Odds ratio (95% CI)
Affective disorder	72.7	54.2	n.s.	
Psychotic disorder	18.2	20.5	n.s.	
Anxiety disorder	72.7	50.6	n.s.	
Somatization disorder	9.1	4.8	n.s.	
Eating disorder total	72.7	18.2	0.000	12.1 (2.9–51.0)
Anorexia	36.4	8.4	0.023	6.2 (1.5–26.5)
Bulimia	54.5	8.4	0.001	13.0 (3.2–53.7)
Binge eating disorder	36.4	8.4	0.023	6.2 (1.5–26.5)
Posttraumatic disorder	18.2	12.0	n.s.	
Any SUD including alcohol	81.8	48.2	0.05	4.8 (1.0–23.8)
Alcohol	54.5	22.9	n.s. (0.06)	
Sedatives	36.4	33.7	n.s.	
Cannabinoids	45.5	26.5	n.s.	
Stimulants	63.6	31.3	0.04	3.8 (1.0–14.3)
Opioids	45.5	26.5	n.s.	
Cocaine	27.3	19.3	n.s.	
Hallucinogens	18.2	19.3	n.s.	
Other	18.2	4.8	n.s.	



## ■ ADHD and personality disorders

Two females (18%) with ADHD had no diagnosis of a personality disorder, whereas 19 persons without ADHD (23%) did not fulfil the criteria of any personality disorder diagnosis (chi-square, n.s.).

Borderline personality disorders (BPD) were found more frequently in individuals with ADHD (63.6%; chi-square  $P = 0.015$ ) as compared to persons without ADHD (25.3%). The remaining three personality disorders of cluster B including the antisocial personality disorder were not different between the two groups (Table 5).

Cluster A personality disorders like schizoid, paranoid or schizotypal personality disorders displayed no differences between the groups. Among the cluster C personality disorders there was a trend for an elevated prevalence of the avoidant personality disorder in ADHD females (54.5 vs. 28.4%; chi-square,  $P = 0.09$ ).

## Discussion

There is substantial evidence that the prevalence of ADHD is not only increased in young adult male incarcerated individuals but also in imprisoned young female offenders. In German male imprisoned subjects with a mean age of 19.5 years we detected an ADHD prevalence of 45% [35], which strongly exceeds the prevalence of 3.1% in the general population of Germany [15]. Concerning the prevalence of ADHD in incarcerated women, the finding of 17.9% young females with ADHD aged up to 25 years also clearly indicates an excess of ADHD in female offenders compared to the general population, even to a somewhat lower extend. This finding is in line with the results of a Canadian study, which found a prevalence of ADHD according to DSM-III-R of 18.2% in 13–17 years old incarcerated females [41]. A much higher prevalence of 68% in female incarcerated adolescents was described by Timmons-Mitchell et al.

[40]. An Australian study by Dixon et al. [12] regarding ethnically mixed adolescents with a mean age of 16 years revealed 6% full ADHD cases and 7% ADHD in partial remission compared with 1% full ADHD cases and no ADHD in partial remission in a healthy and age matched non-offender control group. In contrast, an US study [33] found in 28% of 161 incarcerated females aged between 12 and 18 years evidence of ADHD psychopathology. Another US investigation by Teplin et al. [39] detected in 21.4% of 656 detained females between the age 10 and 18 years suffering from ADHD.

Regarding possible gender differences, our data together with those of Timmons-Mitchell et al. and Ulzen et al. [40, 41] seem to indicate a lower prevalence in young females in comparison with young males. But the studies by Robertson et al. [33] and Teplin et al. [39] achieved inverse results with a higher prevalence for adolescent females in comparison with adolescent males. Thus definite conclusion cannot be drawn from the current data basis.

Our knowledge regarding the prevalence of ADHD in adult incarcerated females older than 25 years leaves much to be desired. There is a wide variety of studies dealing with the prevalence of psychiatric disorders in adult female offender populations [1, 7, 9, 10, 16, 18, 25, 32, 43, 45]. Unfortunately the authors of these studies did not investigate for adult ADHD.

One of the major findings of our study was the remarkable decline of the prevalence of ADHD with increasing age. Until the age of 25 years the prevalence of ADHD was 17.9%. In the group of females aged 26–45 years the prevalence of ADHD declined to 10%, but this was still higher than the rate expected from the general population. After the age of 45 years only ADHD cases in partial remission were found, but no full clinical cases. The decline of ADHD with growing age in female incarcerated offenders raises the question whether this is a true decrease of the disorder or only a shift from full clinical pictures to ADHD in partial remission. It is not easy to find a definite answer for this problem when only cross-sectional and no longitudinal data are available. It is possible that both alternatives may play a role. Our results presented in Fig. 1 demonstrate a robust decline of full ADHD diagnoses over the three age classes and to a minor extend a decline of ADHD in partial remission.

Difficulties of individuals with ADHD regarding social adaptation are well known [4, 34]. Interestingly, the presence of ADHD affected the burden of problems related to the social environment in female prison inmates, although prison inmates are generally subjected to social problems. Females with ADHD had more problems in terms of loss of friends, inadequate social support, living alone and with the adjustment to life-cycle transitions according to DSM-IV axis IV criteria. No differences between incarcerated females with and without ADHD were detected regarding

**Table 5** Prevalence of different personality disorders assessed by the SCID-II interview in incarcerated women with and without ADHD

Personality disorder	ADHD N = 11 (%)	No ADHD N = 83 (%)	Fisher's exact test; P	Odds ratio (95% CI)
Avoidant	54.5	28.9	0.09	3.0 (0.8–10.6)
Dependent	36.4	19.3	n.s.	
Obsessive–compulsive	18.2	38.8	n.s.	
Paranoid	33.7	36.4	n.s.	
Schizotypal	0	7.2	n.s.	
Schizoid	27.3	21.7	n.s.	
Histrionic	9.1	6.0	n.s.	
Narcissistic	9.1	4.8	n.s.	
Borderline (BPD)	63.6	25.3	0.015	5.2 (1.4–19.4)
Antisocial (ASPD)	36.4	24.1	n.s.	
PD nos	9.1	10.8	n.s.	

CI confidence interval

problems with the primary support group, education, occupation, housing, economic situation, health care, the legal system and others.

Looking more specifically to the impact of ADHD on forensic parameters it was found that female offenders with ADHD are much younger than others without ADHD, when they were convicted the first time. This is in line with earlier research [22, 35]. In addition, females with ADHD have longer periods of incarceration in relation to their age when compared with females without ADHD.

Regarding the distribution of comorbid psychiatric conditions it is evident that ADHD is a risk factor for psychiatric multimorbidity [5]. Incarcerated women with ADHD have significantly more axis I disorders than those without. In this respect the results of our prison population are very similar to clinically referred populations [38]. These studies found in 80% at least one additional axis I disorder. Among incarcerated women “pure” ADHD seems not to occur. But even among the non-ADHD female population of our study the prevalence of axis I disorders was very high. This is a finding which has been described by many authors from different countries [1, 9, 16, 43].

Looking to diagnoses in detail, no differences between ADHD and non-ADHD individuals were detected regarding bipolar, manic, depressive and anxiety disorders. This might be somewhat surprising because mood and anxiety disorders are known to be frequent comorbid conditions in patients with ADHD [5]. Moreover, no differences concerning psychotic disorders, somatization and posttraumatic disorder were found between the two groups. In a case control family study an increased prevalence for eating disorders in adolescent females with ADHD was demonstrated [6]. Aware of this finding it was not unexpected, that we found a high prevalence of eating disorders (72.7%) among the ADHD group. Non-ADHD females had a significant lower prevalence (18.2%) thus indicating that ADHD is a risk factor for eating disorders even in forensic populations.

The prevalence of lifetime substance use disorders was high in the non-ADHD and very high in the ADHD incarcerated female population. In our earlier study we detected any SUD diagnosis in 85.5% in a sample of young male offenders [35]. In our female study population we revealed 67.3%. Another German investigation by von Schönfeld et al. [43] reported 71.4% SUD in 63 imprisoned women, which is an almost identical result. Among the group of females without ADHD the prevalence of any SUD was significantly lower than in females with ADHD (47.3 vs. 81.8%). This result corroborates a large body of evidence suggesting that ADHD is an important risk factor for SUDs. Our finding of an increased prevalence of stimulant use in incarcerated females with ADHD was not present in young incarcerated males [30].

It is well documented, that the prevalence of personality disorders is high in female offender

populations. A transnational prevalence of antisocial personality disorder in sentenced females of 21% has been reported, whereas the transnational prevalence of BPD was 25% [16]. In German female imprisoned offenders an even higher prevalence of personality disorders has been reported. Von Schönfeld et al. [43] found a prevalence of BPD of 42.9%. Antisocial and paranoid personality disorder were diagnosed in 30.2 and 33.3%, respectively. In our study we also found high rates of DSM-IV personality disorders. However, the most important finding was the absence of differences between individuals with and without ADHD regarding different personality disorders. We found only one exception, which was the overrepresentation of BPD in ADHD females. A similar finding has been reported earlier by Burket et al. [8] from a clinically referred female adolescent population, where they found BPD in 70% of cases with ADHD in comparison with 23% of the cases without ADHD. The results of [24] point in the same direction. They found in persons with ADHD recruited from a community population an increased prevalence of cluster B personality disorders in general and of BPD in particular. Moreover they revealed a gender effect. Women with ADHD were more likely than men to have BPD. When interpreting these results, it is necessary to mention that ADHD and BPD share some core diagnostic items in terms of their psychopathology [11, 13]. The partial overlap of psychopathology may favour the comorbid combination of ADHD and BPD. Nevertheless more than 40% of adult females with BPD seeking for treatment demonstrated evidence of childhood ADHD psychopathology thus raising questions regarding the valid discrimination of adult ADHD and BPD [26].

There are several limitations of the study which should be taken into account before generalizing the results. We cannot definitely rule out a selection bias despite our attempt to examine a representative female prison population of two states of Germany. The number of persons included in our study was limited. It is difficult to recruit large numbers of incarcerated females, because not more than 4–5% of the total imprisoned population in Germany are women. The limited number of patients decreased the statistical power of our investigation. Detailed evaluations of rare psychopathological conditions are limited due to small sample sizes. Therefore, only exploratory research is possible in this respect.

Another problem refers to the structure of female criminality. The predominance of drug related offences and fraud profoundly differs from the offences of our young male comparison group (Table 1), where the most frequent offences were theft, assault and robbery. These differences are not only present in our study population, but reflect a general phenomenon. The relatively low proportion of violent females compared to the situation in males, is a further aspect of this problem. Thus, comparisons between male and

female offenders cannot be free from methodological problems and have to consider narrow limitations.

Regarding possible consequences of the findings of this study, the aspect of sufficient treatment programs for incarcerated women seems to be important. In particular, the treatment of ADHD is a rare event in German prison populations. In the most cases the diagnosis of ADHD has not been established. However, our data indicate a considerable number of female prison inmates suffering from ADHD and seeking for treatment. We would like to speculate that these individuals might benefit from an ADHD treatment program not only in terms of their ADHD psychopathology but also in terms of social adaptation.

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