

ORIGINAL PAPER

Wolfgang Retz · Petra Retz-Junginger · Georges Hengesch · Marc Schneider · Johannes Thome · Frank-Gerald Pajonk · Anusche Salahi-Disfan · Oliver Rees · Paul H. Wender · Michael Rösler

Psychometric and psychopathological characterization of young male prison inmates with and without attention deficit/hyperactivity disorder

Received: 12 May 2003 / Accepted: 7 November 2003

Abstract There is considerable evidence that attention deficit/hyperactivity disorder (ADHD) is associated with conduct problems, social maladaptation and delinquent behavior. The “Ottweiler Study” was performed to elaborate the prevalence of ADHD and comorbid disorders in 129 young adult detainees of the juvenile prison of Ottweiler (Germany) according to DSM-IV and ICD-10 criteria. Here we report psychopathological characteristics of 28 inmates, who fulfilled the diagnostic criteria for persisting ADHD, and 37 individuals with neither a history nor current ADHD symptoms. Childhood ADHD symptoms but no current ADHD were present in 64 individuals. The Wender-Reimherr Interview (WRI) based on the Utah criteria for adult ADHD, the NEO-five factor personality inventory (NEO-FFI) and the youth self report/young adult self report (YSR/YASR) according to Achenbach were used for the assessment of psychopathology and the description of behavioral problems. Regarding WRI and YSR/YASR we found a significant increase of emotional

and internalizing problems in the ADHD group compared to delinquents without ADHD or ADHD history. ADHD delinquents scored higher on the personality dimension neuroticism, and showed lower scores on the dimensions agreeableness and consciousness. Using discriminant analysis, high scores on the WRI subscales disorganization and attention difficulties and NEO-FFI neuroticism were the best predictors of ADHD diagnosis. The results support prior findings of high ADHD prevalence in prison inmates and suggest that emotional and internalizing abnormalities are prominent problems in this population. Further studies are needed to elucidate the role of ADHD as an independent factor for life-persistent criminality, since specific treatment may help to ameliorate the legal prognosis.

Key words attention deficit/hyperactivity disorder · adults · delinquency · personality · behavior · psychopathology

Dr. W. Retz (✉) · P. Retz-Junginger · G. Hengesch · M. Schneider · A. Salahi-Disfan · O. Rees · M. Rösler
Neurozentrum
Institut für Gerichtliche Psychologie und Psychiatrie
Universität des Saarlandes
66421 Homburg/Saar, Germany
Tel.: +49-6841/162-6350
Fax: +49-6841/162-6335
E-Mail: wolfgang.retz@uniklinik-saarland.de

J. Thome
Central Institute for Mental Health
Mannheim, Germany

F.-G. Pajonk
Psychiatric Department
University of the Saarland
Homburg/Saar, Germany

P. H. Wender
Harvard Medical School
Boston, Massachusetts, USA

This study has been supported by the authorities of the State of the Saarland/Germany

Introduction

Mental health problems are a common phenomenon in delinquents and prisoners. Recently, a systematic review of 62 surveys worldwide on serious mental disorders reported 3.7% psychotic illnesses, 10% major depression and 65% personality disorders, including 47% antisocial personality disorder in male prisoners (Fazel and Danesh 2002). Research with juvenile delinquents revealed that the majority exhibit a mental health disorder and that more than half of delinquent youths suffer from more than one disorder (Haapsalo and Hamalainen 1996; Ulzen and Hamilton 1998; Pliszka et al. 2000; Vermeiren et al. 2000). Teplin et al. 2002 found that 66.3% of male detainees met diagnostic criteria for one or more psychiatric disorders, including affective (18.7%), psychotic (1%), anxiety (21.3%), attention-deficit/hyperactivity disorder (ADHD) (16.6%), disruptive behavior (41.4%), and substance use disorders (50.7%).

The frequent association of conduct problems and antisocial behavior with ADHD suggests that ADHD may be highly prevalent in delinquents. Indeed, epidemiological studies in delinquent adolescents consistently reported high prevalence rates of ADHD. The reported rates range between 14–19% in adjudicated delinquents (Doreleijers et al. 2000; Vermeiren et al. 2000) to 20–72% in incarcerated adolescents (Haapsalo and Hamalainen 1996; Hollander and Turner 1985; Milin et al. 1991; Plizka et al. 2000; Timmons-Mitchel et al. 1997; Ulzen and Hamilton 1998). The literature consistently indicates that childhood ADHD is associated with an earlier age of onset of disruptive behavior, persistence of offending into adulthood and a higher risk of arrest and imprisonment during early adulthood (Mannuzza et al. 1998; Moffit 1990; Satterfield and Schell 1997).

Prospective follow-up studies of children with ADHD have further emphasized the close connection between ADHD, conduct problems and delinquency. They have also shown a large spectrum of comorbid psychiatric disorders of ADHD patients in early adulthood, namely personality disorders, drug use disorders, mood disorders and anxiety disorders (Weiss et al. 1985; Mannuzza et al. 1993; Marks et al. 2001). On a dimensional level, a wide range of psychopathological abnormalities has been reported in a study with young adult students with a history of ADHD using the SCL-90 (Chang and Huang 2000). Greatest differences to normal controls were found on the subscales “depression”, “hostility” and “interpersonal sensitivity”.

Primary aim of the “Ottweiler Study” was the evaluation of prevalence rates of ADHD and comorbid disorders in young adults with considerable problems regarding social adaptation. The results are reported by Rösler et al. (Ottweiler Study: Part I, submitted). In the

second part of the study presented here, psychopathological characteristics of individuals with persisting ADHD were elaborated. In this investigation we used a dimensional instead of a categorial view, due to the fact that up to date it is still unclear whether comorbidity in ADHD refers to co-occurrence of distinct disorders, subtypes of one disorder, or (age-dependent) variations in the presentations of one or more disorders based on a unique developmental disturbance. Therefore, we generally hypothesized that subjects with persisting ADHD exhibit more psychopathological abnormalities than inmates without ADHD. Improving our knowledge about psychopathology of ADHD combined with social maladaptation may contribute to more precise identification and a better understanding of these individuals. This might be of particular impact concerning the possibility of psychoeducational and therapeutical interventions, especially regarding young adult male prison inmates.

Methods

■ Probands

A total of 129 young male delinquents detained in the juvenile prison of Ottweiler (Saarland/Germany) entered the study after giving informed consent. Mean age of the entire group was 19.5 years (SD 2.0 years; range 15–28 years). IQ estimation with HAWIE-R (subtest general knowledge) was 91.6 (SD 17.9). Demographic and forensic data are given in Tables 1 and 2. Diagnosis of ADHD comprised two steps: 1) assessment of childhood ADHD history and 2) evaluation of adult diagnostic criteria, which both have been assessed using standardized procedures by well trained investigators. Individuals with both childhood history and current ADHD symptomatology were assigned to the index group; individuals without history of childhood ADHD and no current ADHD were assigned to the control group. Individuals with a history of childhood ADHD related symptoms (CARS) but no persistent ADHD constituted a third group (n = 64).

Table 1 Socio-demographic data. CARS: Childhood ADHD related symptoms. p is given for Chi² and t-tests

	ADHD (n = 28)	CARS (n = 64)	nonADHD (n = 37)	p
Age (years)	18.8 (SD 1.7)	19.3 (SD 1.9)	20.1 (SD 2.3)	0.014
Broken home %	42.9	39.7	27.0	n. s.
Delinquents in the family %	60.7	31.3	25.7	0.009
Stable partnership %	17.9	52.4	29.7	n. s.
Low educational status %	67.9	53.1	29.7	0.012
No professional training %	92.9	92.2	89.2	(0.075)
Unemployment %	60.7	40.6	35.1	0.041
Psychiatric treatment %	32.1	35.9	21.6	n. s.

Table 2 Forensic data. CARS: Childhood ADHD related symptoms. p is given for Chi² and t-tests

	ADHD (n = 28)	CARS (n = 64)	nonADHD (n = 37)	p
Previous convictions (n)	5.1 (SD 8.5)	4.0 (SD 5.7)	2.8 (SD 2.1)	n. s.
Age at first conviction (years)	15.5 (SD 1.4)	15.7 (SD 1.8)	17.5 (SD 2.3)	0.000
Delinquency prior to age 14 (%)	51.9	58.7	24.3	0.040
Duration of incarceration (months)	15.0 (SD 11.2)	18.1 (SD 14.3)	17.3 (SD 13.8)	n. s.

They did not fulfill all ICD-10 criteria for adult ADHD, but the total score of the WURS-k exceeded 30.

All participants underwent a standardized psychometrical battery, which comprised ADHD-specific (ADHD-DC, WURS-k, WRI) and non-specific psychometrical instruments (NEO-FFI, YSR/YASR).

■ Psychometric scales

Wender Utah Rating Scale – German short version (WURS-k)

The German short form of the Wender Utah Rating Scale (WURS-k) was used for the assessment of a childhood history of ADHD-related psychopathology (Retz-Junginger et al. 2003). The WURS-k is a retrospective dimensional measure of ADHD symptomatology, which is characterized by attention problems, motor hyperactivity and high impulsivity. This self-rating instrument is based on the widely used Utah criteria for the diagnosis of ADHD and the original version of the Wender Utah Rating Scale (Ward et al. 1993; Wender et al. 1995). It consists of 25 items, including 5 control items, which are rated from 0–3. It has been shown that sensitivity and specificity of the WURS-k for detection of childhood ADHD were 86% and 80%, respectively, when a cut-off score of 30 was used (Retz-Junginger et al., in press).

■ ADHD Diagnostic Checklist (ADHD-DC)

This instrument was designed for the diagnosis of ADHD according to DSM-IV and ICD-10 Hyperkinetic Syndrome research criteria (Rösler et al., in press). It consists of 18 items concerning attention problems, hyperactivity and impulsivity, which are rated on a 0–3 Likert scale, and 4 additional items according to DSM-IV and ICD-10. Diagnosis of Hyperkinetic Syndrome according to ICD-10 was accepted when 1) at least 6 out of 9 “attention items” were rated 1 or higher and the sum score was at least 12 points, and 2) at least 3 out of 6 “hyperactivity items” were rated one or higher and the sum score was at least 6 points and 3) at least one out of 3 “impulsivity items” was rated one or higher and the sum score was at least two points. DSM-IV diagnosis of ADHD “combined type” differed from this algorithm concerning the complex of “hyperactivity/impulsivity items”. According to DSM-IV, ADHD “combined type” was diagnosed when at least 6 out of 9 “attention items” and at least 6 out of 9 “hyperactivity/impulsivity items” were rated one or higher and the sum score was at least 12 points in each area. In addition, in accordance with DSM-IV and ICD-10 symptomatology had to be already present in childhood and during the last 6 months, and must have been of pervasive and disturbing character. This information has also been rated and documented using the ADHD-DC.

■ Wender-Reimherr Interview (WRI)

The Wender-Reimherr Interview has been designed as a semi-standardized interview based on the Utah criteria for adult ADHD (Wender 1995). The original version of the Wender Reimherr Attention Deficit Disorder Scale (WRAADDs) was used in a German translation, authorized by P.H. Wender. It consists of 7 psychopathological domains, including “attention difficulties”, “hyperactivity/restlessness”, “temper”, “mood instability”, “overreactivity”, “disorganization” and “impulsivity”. Each complex comprises 3–5 items, which are rated 0 (none or slight), 1 (somewhat or sometimes true) or 2 (very true or often true). In addition a global rating of each domain from 0–4 (not at all or rarely true – very true or true very much of the time) was performed by the interviewer. In this study we used the relative sum scores of each domain for statistical analyses, which is the ratio of sum score and number of items.

■ NEO Five Factor Inventory (NEO-FFI)

The NEO Five Factor Inventory (NEO-FFI) is a shortened version of the NEO-PI-R, designed to give measures of the five domains of adult personality according to the personality model of Costa and McCrae

(1992; Borkenau and Ostendorf 1993). These “big five” are neuroticism, extraversion, openness to experience, agreeableness, conscientiousness. The 60 items are rated on a five point scale and transformed to standard scores. The NEO-FFI scales show correlations of 0.75 to 0.89 with the NEO-PI validimax factors. Internal consistency factors range from 0.74 to 0.89.

■ Youth Self-Report/Young Adult Self-Report (YSR/YASR)

The Youth Self-Report (YSR) and the Young Adult Self-Report (YASR) are designed to be self-administered by youths aged 11–18 years and young adults age 18–30 years, respectively (Achenbach 1991, 1997). The second part of these instruments comprises 112 and 119 items on the YSR and the YASR, respectively, tapping a wide range of emotional problems and social characteristics. The items are scored following a 0 (not true) – 2 (very true or often true) Likert format. The items constitute 8 syndrome scores, which contribute to two broadband scales. The internalizing problem scale reflects internal distress and comprises the subscales “anxious/depressed”, “withdrawn”, and (only for YSR) “somatic complaints”. The externalizing subscale reflects conflicts with other people and their expectations of the individual and comprises the subscales “aggressive behavior”, “delinquent behavior”, and (only for YASR) “intrusive”. Three additional subscales were not categorized into a specific group and describe “social problems”, “thought problems”, and “attention problems”. For statistical use, the scores of the syndrome scales, the internalizing and externalizing behavior scales and the total score were transformed into T-scores.

■ Statistical analysis

All statistical evaluations were performed with SPSS for Windows. Non-parametric Mann-Whitney-U tests were used to compare mean values of psychopathological dimensions between individuals with and without ADHD. Accepted p-values were corrected by α -adjustment using the Bonferroni method for multiple tests.

Other tests used were Chi² and t-test. Discriminant function analyses using a stepwise method were performed to evaluate the ability of YSR/YASR, WRI and NEO-FFI subscales to discriminate individuals who received the diagnosis of ADHD from those who did not, and to identify combinations of predictor variables which provide the best contribution to the diagnosis of ADHD.

Results

A total of 28 individuals (21.7%) fulfilled both the diagnostic criteria for ADHD combined type according to DSM-IV and for ICD-10 Hyperkinetic Syndrome. The mean WURS-k score of this group was 46.7 (SD 11.1), which was more than one standard deviation above the cut-off of 30 points and clearly indicated childhood ADHD-related symptomatology in this population. 64 probands did not fulfill all ICD-10 criteria for adult ADHD, but their WURS-k score was 30 or more points (mean 45.2, SD 9.2), suggesting childhood ADHD related symptoms (CARS), which were at least partially remitted. The mean WURS-k score of the third group (n = 37) was 20.3 (SD 6.2). Probands of this group did not fulfill the diagnostic criteria of ADHD, nor could we detect childhood ADHD related symptoms (nonADHD group). Prevalence rates of ADHD subtypes according to DSM-IV and comorbid disorders are reported elsewhere (Rösler et al., submitted).

Concerning sociodemographic data, ADHD subjects were significantly younger, had a lower education and a

higher rate of unemployment compared to the non-ADHD group (Table 1). Moreover, their age at first conviction was lower and the rate of delinquent behavior prior to age of criminal discretion higher than in the group of young prisoners without ADHD (Table 2).

Comparison of the mean WRI scores revealed significant differences between ADHD and nonADHD subjects regarding the mean total score ($p = 0.000$) and subscores of all psychopathological domains of this instrument ($p = 0.000$) (Fig. 1).

Significant differences between ADHD and non-ADHD subjects were also found regarding the YSR/YASR (Fig. 2). Low scores on the “withdrawn” subscale and high scores on the “delinquent behavior” subscale were found in both groups. After correction for multiple testing, there was no significant difference between the groups on these subscales. Differences on a low level of significance were found on the subscale “intrusive” ($p < 0.05$), which was more accentuated in the index group. The most prominent psychopathological problems in ADHD subjects were detected on the subscales “anxious/depressed”, “somatic complaints”, “thought problems”, “attention problems” and “aggressive behavior” ($p = 0.000$). Significant differences between the ADHD and non ADHD group were also found on the broad-band scales “internalizing” and “externalizing” and the total problem score (Fig. 3).

Three of the 5 personality dimensions on the NEO-FFI significantly differed between the ADHD group and nonADHD subjects (Fig. 4). Higher mean scores of “neuroticism” ($p = 0.000$) and lower scores on the domains “agreeableness” ($p = 0.025$) and “consciousness” ($p = 0.000$) were found in the ADHD group. No mean score of either personality dimension and either group was out of normal range.

Individuals with ADHD symptomatology in child-

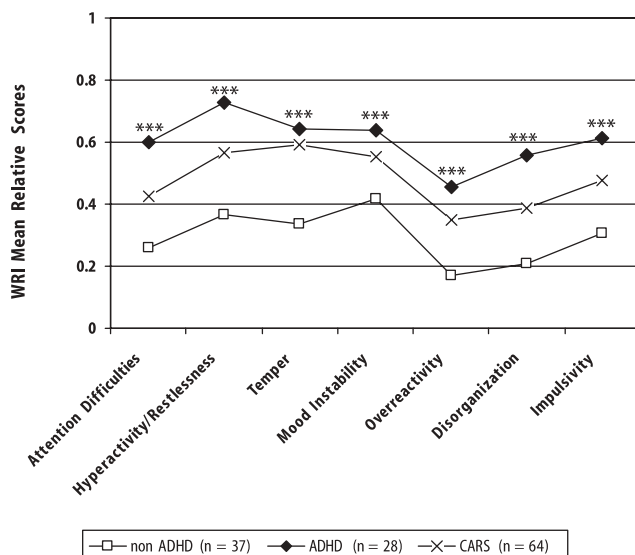


Fig. 1 Mean relative scores on the Wender-Reimherr-Interview (WRI) subscales of individuals with ADHD, childhood ADHD related symptoms (CARS) and without ADHD (nonADHD). Mann-Whitney-U test (ADHD vs. nonADHD): *** $p = 0.000$

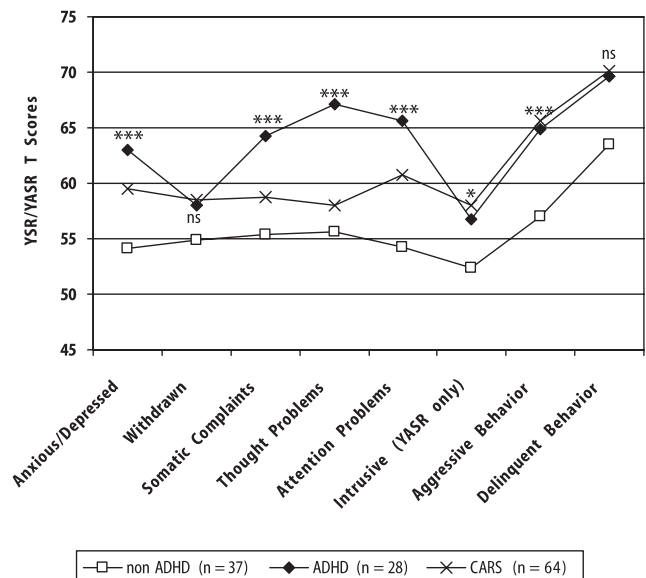


Fig. 2 Mean syndrome T scores on the Young Adult Self-Report (YASR) and the Youth Self-Report (YSR) subscales of individuals with ADHD, childhood ADHD related symptoms (CARS) and without ADHD (nonADHD). Since the subscale “intrusive” is not available on the YSR, mean scores of this syndrome scale are given only for individuals of age 18 or older (ADHD $n = 22$; Controls $n = 33$). Mann-Whitney-U test (ADHD vs. nonADHD): * $p \leq 0.05$, *** $p = 0.000$ (after Bonferroni correction for multiple testing)

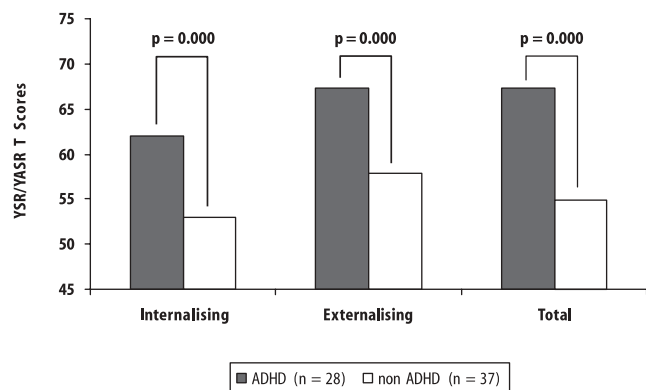


Fig. 3 Mean T scores of the Young Adult Self-Report (YASR) and the Youth Self-Report (YSR) “internalising” and “externalising” broad-band scales and the mean total problem T scores of individuals with and without ADHD. Mann-Whitney-U test: *** $p = 0.000$

hood, but who did not fulfill the diagnostic criteria of persisting ADHD (CARS) showed similar sociodemographic and forensic data as the ADHD group or intermediate to the index and the nonADHD group (Tables 1 and 2). The same was found concerning mean scores on the subscales of the WRI, the YSR/YASR and the NEO-FFI (Figs. 1, 2 and 4).

Separate analyses discriminating offenders with ADHD from those without ADHD have been performed for WRI, YSR/YASR and NEO-FFI measurements. Detailed statistical data are given in Table 3. Using the WRI subscales and a stepwise method, discriminant analysis produced a model that comprised the subscales “atten-

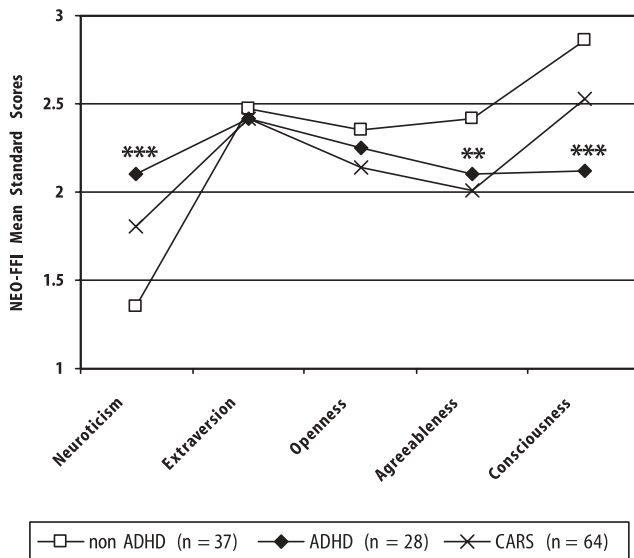


Fig. 4 Mean standard scores of the 5 NEO-FFI personality domains ("big five") of individuals with ADHD, childhood ADHD related symptoms (CARS) and without ADHD (nonADHD). Mann-Whitney-U test (ADHD vs. nonADHD): ** $p = 0.025$, *** $p = 0.000$ (after Bonferroni correction for multiple testing)

tion difficulties", "temper" and "disorganization" ($\chi^2 = 56.98$, $p = 0.000$). The canonical correlation was 0.78, Wilk's Lambda was calculated at 0.396. Correlation with the discriminant function (r) were 0.79 for "disorganization", 0.73 for "attention difficulties" and 0.51 for "temper". Based on this model 89.2 % of the cases were classified correctly.

Using the YSR/YSAR, the subscales "attention problems" ($r = 0.84$) and "thought problems" ($r = 0.63$) were included into the discriminant model ($\chi^2 = 45.24$, $p = 0.000$). The canonical correlation was 0.72, Wilk's Lambda 0.48. Following this model 86.2 % of cases were classified correctly.

Concerning NEO-FFI, the discriminant analysis model that comprised the subscales "neuroticism" ($r = 0.86$) and "conscientiousness" ($r = -0.75$) significantly separated ADHD offenders from controls ($\chi^2 = 31.07$,

$p = 0.000$). The canonical correlation was 0.63, Wilk's Lambda 0.61. This model produced correct classification of 83.1 % of cases.

The combination of all potential predictive variables resulted in a rate of 92.3 % correctly classified cases, when the WRI subscales "disorganization" ($r = 0.74$), "attention difficulties" ($r = 0.68$) and "temper" ($r = 0.47$) and the NEO-FFI subscale "neuroticism" ($r = 0.52$) were included into the model ($\chi^2 = 62.07$, $p = 0.000$, canonical correlation 0.80, Wilk's Lambda 0.36). The YSR/YSAR subscale "attention problems" also showed moderately high correlation with the discriminant function ($r = 0.61$). However, this variable contained redundant information about attention deficits and did not improve the discriminant power. Therefore this subscale was not included into this statistical model.

Discussion

Longitudinal studies have shown that ADHD persists in 30–60 % of the cases into adulthood and that ADHD is associated with or precedes a number of mental disturbances, like mood and anxiety disorders, personality disorders, substance abuse and addiction (Faraone et al. 2000; Mannuzza et al. 1993, 1998; Pliszka 1998). Moreover, conduct problems are a very common phenomenon linked to ADHD (Angold et al. 1999) and several studies have indicated that ADHD is associated with social maladaptation and delinquent behavior (Mannuzza et al. 1993; Vermeiren 2003). In agreement with these observations and studies of ADHD prevalence in young offenders performed in other countries (Doreleijers et al. 2000; Haapasalo and Hamalainen 1996; Hollander and Turner 1985; Chae et al. 2001), we now found a high prevalence of ADHD among young adult offenders in a German juvenile prison (21.7 %). Detailed information about prevalence rates of ADHD and comorbid disorders found in the "Ottweiler Study" are reported by Rösler and coworkers ("Ottweiler Study": Part I, submitted).

Table 3 Discriminant analyses, independently calculated for the WRI, YSR/YSAR and NEO-FFI. Discriminant functions were statistically accepted ($p = 0.000$) when marked with an asterisk (*) subscales were included. r = correlation between subscale and discriminant function

WRI	r	YSR/YSAR	r	NEO-FFI	r
attention difficulties	0.728*	anxious/depressed	0.391	neuroticism	0.860*
hyperactivity/restlessness	0.366	withdrawn	0.352	extraversion	-0.360
temper	0.506*	somatic complaints	0.500	openness	-0.080
mood instability	0.382	thought problems	0.626*	agreeableness	-0.400
overreactivity	0.229	attention problems	0.844*	conscientiousness	-0.751*
disorganization	0.794*	intrusive	0.333		
impulsivity	0.416	aggressive behavior	0.404		
		delinquent behavior	0.393		
canonical correlation	0.777		0.720		0.628
Wilk's Lambda	0.396		0.482		0.606
correct identification	89.2 %		86.2 %		83.1 %

This second part of the "Ottweiler Study" was focused on the psychopathological characteristics of individuals with ADHD, using the ADHD-specific WRI and non-specific psychometric instruments (YSR/YASR and NEO-FFI).

The Wender-Reimherr Interview, which we used in this study, has been designed as a tool for the diagnosis of ADHD in adults and falls back on the Utah criteria of ADHD (Wender 1995). Since these comprise attention problems, hyperactivity/restlessness and impulsivity, which are also the basis for the diagnosis of ADHD according to DSM-IV and ICD-10, it was not a surprise that these WRI subscales were significantly elevated in our ADHD subjects. However, the WRI describes additional psychopathological dimensions, which are not required by ICD-10 or DSM-IV for ADHD diagnosis. The significant differences between the ADHD and the non-ADHD group on the WRI subscales "temper", "mood instability", "overreactivity" and "disorganization" suggest that emotional problems and disturbances of situational adaptability are not a general phenomenon in this considerable socially conspicuous study population, but might reflect specific ADHD-related symptomatology.

The notion of prominent emotional problems in young adults as a psychopathological characteristic of persisting ADHD is further supported by the results from the YSR and YASR, respectively, which have shown significant higher scores of internalizing problems in the ADHD group, e. g. feelings of anxiety, depression, social withdrawal and somatic complaints. Also the higher scores on the personality dimension "neuroticism" on the personality inventory NEO-FFI, which describes the subjects as more anxious, depressed, vulnerable, but also more hostile, self-conscious and impulsive compared to the control group, argues in the same direction. The accentuations of these personality dimensions correspond with the high rate of conduct problems and personality disorders within the ADHD group (78.6%; Rösler et al., submitted). Due to quantitative and qualitative variations of comorbid personality disturbances among these probands, it was not unexpected that at least the mean scores of all NEO-FFI personality dimensions were within the normal range.

It has been reported that ADHD and particularly symptoms of hyperactivity-impulsivity in ADHD children may be an independent risk factor for criminal behavior during adolescence and adulthood (Foley et al. 1996; Babinski 1999). Our data of higher scores on the YSR/YASR "externalizing" scale and the syndrome scales "intrusive" and "aggressive behavior" in the ADHD group compared to other delinquents support this suggestion. Moreover, the literature consistently indicates that ADHD is associated with an earlier onset of disruptive and criminal behavior and contributes to life-persistent criminality rather than to transient delinquency during adolescence (Moffitt 1990; Loeber et al. 1995; Vermeiren 2002). The lower age of offenders with ADHD at first conviction and the higher rate of crimes prior to

criminal discretion at age 14 years found in our study agree with these former findings.

Whereas ADHD and control subjects showed prominent differences regarding sociodemographic, forensic and psychopathological data, the group of inmates with ADHD symptoms in childhood, but no persisting ADHD concerning ICD-10 or DSM-IV criteria, was either closely linked to the index group or was placed intermediate between both study groups. This finding is in accordance with the suggestion of ADHD as a dimensional disorder and indicates that forensic aspects of this disease are linked to the age-dependent course of ADHD psychopathology.

The results of our study indicate that the use of psychometric instruments may be helpful for the identification of ADHD in adults. In our study population each subscale of the WRI discriminated ADHD and non-ADHD cases significantly and discrimination analysis revealed the subscales "disorganization", "attention difficulties" and "temper" as most helpful for the identification of ADHD cases according to current DSM-IV and ICD-10 criteria. Concerning psychometric instruments, which were not specifically designed for ADHD diagnosis, our index group scored higher on all YSR/YASR subscales compared to nonADHD subjects and the "externalizing" and "internalizing" broad-band scales were elevated in this group. The subscales that comprise attention and thought problems showed the highest correlation with the calculated discriminant function and were included into the statistical model, indicating high contribution of these syndrome scales to ADHD. These findings agree with former investigations in adolescents on the convergence of ADHD with syndrome scores of the YSR and the related Child Behavior Checklist (CBCL) (Eiraldi et al. 2000; Weinstein et al. 1990). Discriminant analyses of NEO-FFI subscales indicated that high "neuroticism" and low "consciousness" were most suitable for a correct diagnostic assignment of ADHD subjects. Recently, nearly identical findings have been described by other investigators in large clinical and community samples (Nigg et al. 2002; Ranssen et al. 1998).

Some limitations of the study should be noticed. First, it has to be emphasized that the results of this study can not be generalized to all ADHD patients. According to our diagnostic procedure only severe ADHD cases were included and we did not regard of the DSM-IV inattentive, hyperactive/impulsive subtypes in this analysis. Moreover, our population is characterized by considerable antisocial behavior and conduct problems. Therefore, stratification effects should be considered. However, since we did not compare our index group to normal individuals, but to young adults with a comparable load of conduct problems and antisocial behavior, the psychopathological differences revealed in this study may rather be related to ADHD than to dissocial and criminal behavior. Another shortcoming of the study is the – disease-related and therefore unavoidable – mismatch of the index group and the nonADHD con-

trols concerning sociodemographic and forensic basic data. Thus, we can not rule out that other factors (e.g. duration of incarceration, age-dependent interaction with environment) than ADHD may contribute to the psychopathological abnormalities in our index group. However, the results of this study are in line with findings in clinical samples and suggest that emotional problems are a prominent component of persisting ADHD (Wender 1995). At least, the problems in diagnosing ADHD in adulthood should be mentioned. In the "Ottweiler study" we used standardized instruments based on the diagnostic research criteria of the ICD-10 (ADHD-DC) and the WURS-k for the retrospective assessment of childhood ADHD symptoms. Due to limited sensitivity and specificity of these diagnostic instruments, false positive or false negative classification of some probands was unavoidable. However, the predictive power of diagnostic instruments depends not only on their quality, but also on the prevalence of the disorder in the population under investigation (Mannuzza et al. 2002). Rare events are more difficult to predict than frequent ones. Regarding the high prevalence of ADHD in delinquent populations, an acceptable reliability of the diagnostic assignment in this study can be assumed.

The high prevalence of persistent ADHD in young adult prison inmates underlines the necessity of early diagnosis and therapy to prevent ADHD children from starting a criminal career. However the impact of ADHD on the continuation of antisocial behavior with increasing age remains unclear. This question needs further elucidation, since adequate treatment possibilities for adult ADHD are at hand and special treatment programs in juvenile prisons might help to lower the risk for recurrent criminality in young offenders with ADHD. Concerning the results of this study, emotional problems of young adult ADHD patients should be considered in this context.

■ **Acknowledgment** This study was supported by the Government of the Saarland, Germany. The authors thank Ms. Junker, Director of the Jugendstrafanstalt Ottweiler and all attendants for their support for this study.

References

- Achenbach TM (1991) Manual for the youth self-report and 1991 profile. Burlington, VT: University of Vermont Department of Psychiatry
- Achenbach TM (1997) Manual for the young adult self-report and young adult behavior checklist. Burlington, VT: University of Vermont Department of Psychiatry
- Angold A, Costello EJ, Erkanli A (1999) Comorbidity. *J Child Psychol Psychiatry* 40:57–87
- Babinski LM (1999) Childhood conduct problems, hyperactivity-impulsivity, and inattention as predictors of adult criminal activity. *J Child Psychol Psychiatr* 40:347–355
- Borkenau P, Ostendorf F (1993) Neo-Fünf-Faktoren Inventar (NEO-FFI). Hogrefe, Göttingen, Verlag für Psychologie
- Chae PK, Jung H-O, Noh K-S (2001) Attention deficit hyperactivity disorder in Korean juvenile delinquents. *Adolescence* 36: 707–725
- Chang H-L, Huang H-Y (2000) Adolescent hyperactivity and general psychopathology. *Psychiat Clin Neurosci* 54:139–146
- Costa PT, McCrae RR (1992) Revised NEO Personality Inventory and NEO Five-Factor Inventory. Professional manual. Odessa, FL, Psychological Assessment Resources
- Doreleijers TA, Moser E, Thijs P, van Engeland H, Beyaert FH (2000) Forensic assessment of juvenile delinquents: prevalence of psychopathology and decision-making at court in the Netherlands. *J Adolesc* 23:263–275
- Eiraldi RB, Power TJ, Karustis JL, Goldstein SG (2000) Assessing ADHD and comorbid disorders in children: the Child Behavior Checklist and the Devereux Scales of Mental Disorders. *J Clin Child Psychol* 29:3–16
- Faraone SV, Biederman J, Spencer T, Wilens T, Seidman LJ, Mick E, Doyle AE (2000) Attention-deficit/hyperactivity disorder in adults: an overview. *Biol Psychiatry* 48:9–20
- Fazel S, Danesh J (2002) Serious mental disorder in 23000 prisoners: a systematic review of 62 surveys. *Lancet* 359(9306): 545–550
- Foley HA, Carlton CO, Howell RJ (1996) The relationship of attention deficit hyperactivity disorder and conduct disorder to juvenile delinquency: legal implications. *Bull Am Acad Psychiatry Law* 24:333–245
- Haapasalo J, Hamalainen T (1996) Childhood family problems and current psychiatric problems among young violent and property offenders. *J Am Acad Child Adolesc Psychiatry* 35: 1394–401
- Hollander HE, Turner FD (1985) Characteristics of incarcerated delinquents: relationship between development disorders, environmental and family factors, and patterns of offense and recidivism. *J Am Acad Child Psychiatry* 24:221–6
- Loeber R, Green SM, Keenan K, Lahey BB (1995) Which boys will fare worse? Early predictors of the onset of conduct disorder in a six-year longitudinal study. *J Am Acad Child Adolesc Psychiatry* 34:499–509
- Mannuzza S, Klein RG, Bessler A, Malloy P, LaPadula M (1998) Adult psychiatric status of hyperactive boys grown up. *Am J Psychiatry* 155:493–498
- Mannuzza S, Klein RG, Klein DF, Bessler A, ShROUT P (2002) Accuracy of adult recall of childhood attention deficit hyperactivity disorder. *Am J Psychiatry* 159:1882–1888
- Marks DJ, Newcorn JH, Halperin JM (2001) Comorbidity in adults with attention-deficit/hyperactivity disorder. *Ann N Y Acad Sci* 931:216–238
- Miln R, Halikas JA, Meller JE, Morse C (1991) Psychopathology among substance abusing juvenile offenders. *J Am Acad Child Adolesc Psychiatry* 30:569–574
- Moffitt TE (1990) Juvenile delinquency and attention deficit disorder: boys' developmental trajectories from age 3 to age 15. *Child Dev* 61:893–910
- Nigg JT, John OP, Blaskey LG, Huang-Pollock CL, Willcutt EG, Hinshaw SP, Pennington B (2002) Big five dimensions and ADHD symptoms: links between personality traits and clinical symptoms. *J Pers Soc Psychol* 83:451–469
- Pliszka SR (1998) Comorbidity of attention-deficit/hyperactivity disorder: an overview. *J Clin Psychiatry* 59(suppl 7):50–58
- Pliszka SR, Sherman JO, Barrow MV, Irick S (2000) Affective disorder in juvenile offenders: A preliminary study. *Am J Psychiatry* 157:130–132
- Ranseen JD, Campbell DA, Baer RA (1998) NEO PI-R profiles of adults with attention deficit disorder. *Assessment* 5:19–24
- Retz-Junginger P, Retz W, Blocher D, Weijers HG, Trott GE, Wender PH, Rösler M (2002) Wender Utah rating scale. The short-version for the assessment of the attention-deficit hyperactivity disorder in adults. *Nervenarzt* 73:830–838
- Retz-Junginger P, Retz W, Blocher D, Stieglitz R-D, Georg T, Supprian T, Wender PH, Rösler M (2003) Validity and reliability of the German short version of the Wender-Utah rating scale for the retrospective assessment of attention deficit/hyperactivity disorder. *Nervenarzt* 74:987–993

28. Rösler M, Retz W, Retz-Junginger P, Thome J, Supprian T, Nissen T, Stieglitz R-D, Blocher D, Hengesch G, Trott GE (2003) Diagnosis of attention deficit/hyperactivity disorder in adulthood with a self rating instrument (ADHS-SB) and a diagnostic check list (ADHS-DC) *Nervenarzt*, online 11/2003
29. Rösler M, Retz W, Retz-Junginger P, Hengesch G, Schneider M, Thome J, Supprian T, Schwitzgebel P, Pinhard K, Dovi-Akue N, Wender PH (2003) Prevalence of attention deficit-/hyperactivity disorder (ADHD) and comorbid disorders in young male prison inmates – Ottweiler Study: Part I. *Eur Arch Psych Clin Neurosci* (submitted)
30. Satterfield JH, Schell A (1997) A prospective study of hyperactive boys with conduct problems and normal boys: adolescent and adult criminality. *J Am Acad Child Adolesc Psychiatry* 36: 1726–1735
31. Teplin LA, Abram KM, McClelland GM, Dulcan MK, Mericle AA (2002) Psychiatric disorders in youth in juvenile detention. *Arch Gen Psychiatry* 59:1133–1143
32. Timmons-Mitchell J, Brown C, Schulz SC, Webster SE, Underwood LA, Semple WE (1997) Comparing the mental health needs of female and male incarcerated juvenile delinquents. *Behav Sci Law* 15:195–202
33. Ulzen TP, Hamilton H (1998) The nature and characteristics of psychiatric comorbidity in incarcerated adolescents. *Can J Psychiatry* 43:57–63
34. Vermeiren R, De Clippele A, Deboutte D (2000) A descriptive survey of Flemish delinquent adolescents. *J Adolesc* 23:277–285
35. Vermeiren R (2003) Psychopathology and delinquency in adolescents: a descriptive and developmental perspective. *Clin Psychol Rev* 23:277–318
36. Ward KE, Wender PH, Reimherr FW (1993) The Wender Utah rating scale: an aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. *Am J Psychiatry* 150: 885–890
37. Weinstein SR, Noam GG, Grimes K, Stone K, Schwab-Stone M (1990) Convergence of DSM-III diagnoses and self-reported symptoms in child and adolescent inpatients. *J Am Acad Child Adolesc Psychiatry* 29:627–634
38. Weiss G, Hechtman L, Milroy T, Perlman T (1985) Psychiatric status of hyperactives as adults: a controlled prospective 15-year follow-up of 63 hyperactive children. *J Am Acad Child Psychiatry* 24:211–220
39. Wender PH (1995) Attention deficit hyperactivity disorder in adults. Oxford University Press, USA