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Effects of diagnostic comorbidity and dimensional symptoms of attention-deficit–hyperactivity disorder in men with antisocial personality disorder

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Abstract

Objective—Although children with attention deficit hyperactivity disorder (ADHD) are at increased risk for later onset of antisocial personality disorder (APD) as adults, the utility of ADHD as either a comorbid diagnosis (ADHD^c) or dimensional symptoms (ADHD^d) in predicting behaviour and substance use problems in APD subjects has not been examined.

Method—A total of 105 adult male offenders with Structured Clinical Interview for Axis II Disorders (SCID-II)-based DSM-III-R APD were studied in terms of: (i) psychopathy scores on the Hare Psychopathy Checklist–Revised (PCL-R); (ii) ADHD^c diagnostic comorbidity on clinically administered DSM-IV questionnaire; and (iii) ADHD^d dimensional symptoms by means of Wender Utah Rating Scale (WURS) and Conners Adult ADHD Rating Scale (CAARS) during a 12 month study period (May 2005–May 2006).

Results—Sixty five per cent of APD subjects met criteria for ADHD^c diagnostic comorbidity with significantly increased rates of childhood neglect, parental divorce and suicide attempt, but not of psychopathy. APD subjects with ADHD^d symptoms were noted to have earlier onset and

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increased rate of self-injurious behaviour (SIB), suicide attempt, and psychopathy. The psychopathy scores, in turn, were predictive of earlier onset of SIB and behavioural problems.

Conclusion—Both ADHD^c diagnostic comorbidity and ADHD^d symptoms need to be assessed in APD subjects and the dimensional measures may be better in detecting earlier onset SIB, suicide attempt and other behavioural problems.

Keywords

antisocial personality disorder; attention-deficit–hyperactivity disorder; comorbidity; psychopathy

Attention-deficit–hyperactivity disorder (ADHD) is one of the most common and important neurodevelopmental disorders of childhood and it carries subsequent risk for comorbidity with antisocial personality disorder (APD) in young adult years. However, longitudinal studies that have followed children with ADHD into adult life have reported varying results. Weiss and Hechtman followed children with ADHD to 25 years of age and found that <60% continued to present with ADHD symptoms, and 25% developed an APD [1]. A similar series of follow-up studies found that at age 26, 11% of the subjects had ADHD symptoms with a considerable proportion having APD and non-alcohol substance abuse (18% and 16%, respectively) [2–4]. Wender *et al.* concluded that one-third to two-thirds of children with ADHD continue to have symptoms as adults, and in 30–40% of subjects symptoms tend to persist during adulthood years [5]. Adult ADHD is deemed to be important because it causes social, marital and occupational impairments with comorbidity not only with APD, but also with many other conditions including anxiety, major affective and substance use disorders (SUD) [5,6].

Previous literature indicates a strong association between ADHD, childhood conduct disorder and APD [reviewed in 7]. Comorbid conduct and antisocial symptoms in ADHD may represent a clinically important taxonomic subgroup. Antisocial behaviour that begins early in childhood as part of conduct disorder is seen predominantly in male subjects and is often associated with neurodevelopmental difficulties and hyperactivity [8]. Total number of ADHD symptoms is also an important marker not only of severity of ADHD, but as an index of risk for adverse psychosocial outcomes in young adulthood [9]. The type of ADHD symptoms is also relevant for prediction of antisocial behaviours, for example, hyperactivity and impulsivity are more important than inattention symptoms [7]. Family adversity and deviant peer relations are associated with both ADHD and APD and may be important mediating factors [10]. In adult APD patients almost 55% of the subjects had a history of childhood-onset neuropsychiatric disorders, ADHD (39%) being the most common [11,12]. In fact, ADHD alone, without associated conduct disorder, is an independent risk factor for SUD, and may also be associated with early onset and longer duration of use [13–15]. Further, among SUD subjects, prevalence of ADHD tends to be significantly overrepresented [16,17].

Psychopathy traditionally is defined by a cluster of personality traits and socially deviant behaviours. A universally accepted standard for the reliable and valid assessment of psychopathy is the Psychopathy Checklist–Revised (PCL-R) [18]. These attributes measured by the PCL-R, however, differ in important ways from the DSM criteria for APD. There is a heavy emphasis on delinquent and antisocial behaviour in the DSM criteria for APD, early onset delinquency being a cardinal symptom of the disorder [19]. In forensic populations the prevalence of APD is much higher than that of psychopathy, resulting in an asymmetric association between the PCL-R and APD [20]. In this respect it is noteworthy that APD is strongly associated with the PCL-R lifestyle and antisocial factors, but only weakly associated with the PCL-R interpersonal and affective factors. Most psychopaths meet the criteria for APD, but most of the offenders with APD are not psychopaths [18]. The PCL-R

tends to be superior to any DSM definition of personality disorder in identifying traits linked with violence [11,12]. Thus, it is important to independently evaluate psychopathy in studies considering APD.

Although it has been known that ADHD is associated with APD, SUD and psychopathy, the effect of ADHD on SUD as well as other behaviours such as self-injurious behaviour (SIB), suicide attempts and criminality is not clear. The first aim of the present study was to define the relationship between DSM-III-R APD and PCL-R-based psychopathy scores with comorbid diagnosis of ADHD (ADHD^c) and dimensional ADHD symptoms (ADHD^d) in a group of male offenders. The second aim was to examine the relationship of ADHD measures within the study population with SUD, SIB, and record of suicide attempts and criminal behaviours. A third aim was to further investigate the relationship of ADHD measures with history of social and familial adversity, including parental separation and divorce, history of childhood physical and emotional abuse and neglect, sexual abuse, as well as educational and occupational attainments.

Method

Sample and diagnostic procedure

The current study was conducted in the psychiatry department of a military, tertiary-care health centre located in Istanbul, Turkey. A total of 105 adult male offenders were consecutively admitted during a 12 month study period (May 2005–May 2006) for assessment of antisocial behaviour. Subjects were either referred for mental status examination because of their maladaptive and criminal behaviour (stealing, fighting, injuring others, disobedience to superiors and disregard for rules) or consulted the psychiatrist at their own request with complaints of self-mutilation, suicidal tendencies or chronic conflict with their surroundings. All male citizens without an evident physical or mental illness are obliged to complete military service in Turkey. The military conscripts are not professional soldiers and are not paid for military service. Therefore, they are not considered employed during their service. Soldiers are considered to be unsuitable for military service when they are diagnosed with APD.

All subjects were diagnosed with DSM-III-R APD using Structured Clinical Interview for Axis II Disorders (SCID-II; Turkish version) [21]. Subjects who suffered from severe cognitive impairments and severe physical illness were excluded. Psychopathy was evaluated on the Hare PCL-R [18], a 20-item, reliable and valid scale used for assessment of dimensional and categorical aspects of psychopathy. PCL-R utilizes a semi-structured interview, case history information, and specific scoring criteria to rate each of the 20 items on a 3-point scale (0, 1, 2). Total scores range from 0 to 40 and reflect the extent to which an individual matches a prototypical definition of psychopathy implied in the scale. For research and diagnostic purposes, a cut-off score of 30 typically is used for psychopathy [22]. The items could be organized into two clusters or factors: Factor 1, interpersonal/affective problems, callousness, and domination seeking; and Factor 2, social deviance. It has been argued that Factor 1 reflects core psychopathology [18]. Recent research suggests that the construct underlying the PCL-R is dimensional in nature rather than categorically taxonomic [23]. The administration of the PCL-R was completed by the same attending psychiatrist who personally examined each subject.

A comorbid ADHD^c diagnosis was ascertained by administration of a structured DSM-IV symptom-checklist. For dimensional ADHD^d measures the Wender Utah Rating Scale (WURS), and Conners' Adult ADHD Rating Scale (CAARS) were obtained. WURS [24] is a self-report assessment tool with 61 items, for which adults rate the presence of symptoms of childhood ADHD as 'not at all or very slight', 'mild', 'moderate', 'quite a bit', or 'very

much'. Twenty-five of these items are most helpful in separating ADHD subjects from normal controls. A cut-off score of ≥ 36 is 96% sensitive and 96% specific for detecting adult ADHD patients [24]. WURS was translated to Turkish by Oncu *et al.* [25] and the Turkish form has adequate validity and reliability (Cronbach's $\alpha = 0.88$). CAARS has a symptom checklist with ratings of 'not at all', 'just a little', 'pretty much', and 'very much' [26]. Both the self-report and observer versions of the CAARS are also available and yield four factors: inattention, hyperactivity, impulsivity/emotional lability, and problems with self-concept. Test-retest reliability of the four factors ranges between 0.80 and 0.91 [26,27]. CAARS scores have high correlation with WURS scores, as well as the DSM-IV ADHD diagnosis [26,28]. The WURS evaluates past ADHD symptoms and childhood history of ADHD while the CAARS give information on the current problems of the individual. Combination of WURS and CAARS is recommended for a better evaluation of adult ADHD [29]. To be diagnosed with ADHD^c diagnosis an adult subject must have (i) more than six current inattention or hyperactivity/impulsivity symptoms on the DSM-IV symptom checklist; (ii) WURS score >36 , a cut-off score validated by Ward *et al.* [24] and Oncu *et al.* [25]; CAARS total score >80 ; and (iii) onset of symptoms before age 7, as evaluated by the parental interviews, whenever possible. We also screened all subjects for current and lifetime psychosis, schizophrenia, major depression, substance abuse (other than smoking, because smoking is very common in the Turkish population) and bipolar affective disorder by the corresponding Structured Clinical Interview for DSM-IV Diagnosis (SCID-I) [30] modules. SCID-I is a semi-structured interview for DSM-IV axis I diagnoses, which is completed by trained interviewers. It consists of six modules and usually takes 25–50 min to complete. It was translated into Turkish by Ozkurkcugil *et al.* [31], and found to have good reliability.

Data on the frequency, time of onset, duration, severity and methods of SIB, substance abuse, criminal behaviours (as evaluated by a combination of self-report and criminal records) and suicide attempts were also collected as part of a semi-structured interview. Detailed data on childhood history of abuse and neglect, including physical, emotional abuse and neglect, sexual abuse, family structure, and occupational and educational attainment were also collected. In this interview 'physical abuse' was defined as severe parental aggression, including recurrent and chronic forms of physical violence by parental figures that could have hurt the child physically. 'Sexual abuse' was defined as any pressure to engage in or any forced sexual contact before age 16, originally ranging from fondling to penetration. 'Neglect' was defined as parental dysfunction or unavailability resulting from recurrent illness, nervousness, depression, alcohol misuse, and use of sedatives. 'Early separation' was defined as the loss of, or separation from, a natural parent or caretaker by death, divorce, illness, foster care, or other reasons before age 12 during a period of at least 6 months. Raters who were blinded to the ADHD status of the subjects conducted these assessments.

Data analysis

Mean onset, duration, severity and frequency of SIB, SUD, criminal behaviours and suicide attempts; PCL-R, WURS and CAARS total and factor scores of APD patients with or without ADHD were compared using analysis of variance (ANOVA). The incidence of psychopathy, SUD, criminality, childhood abuse and neglect, broken family structure, unemployment of APD cases with or without ADHD were compared with χ^2 tests. Correlation of age of onset of SUD, SIB, age at first suicide attempt and criminal behaviour and the number, duration and severity of the mentioned disorders with number of ADHD symptoms fulfilled, WURS, CAARS and PCL-R total scores were computed using Pearson's correlation; $p < 0.05$ was reported as significant. SPSS 13.0 (SPSS, Chicago, IL, USA) was used for the analysis.

Results

Sample characteristics

Demographic and clinical characteristics of 105 subjects with APD are presented in Table 1. The subjects were mostly young adult men (age 20–36 years, mean±SD = 22.7±2.9 years); 77% (n = 81) were single. Almost 55% (n = 58) completed elementary school education or less; 60% (n = 63) reported low income, and only 13% (n = 14) had regular employment. Ninety-two per cent (n = 97) reported childhood history of abuse or neglect, with emotional neglect being most common (78%) followed by physical abuse (72%). Report of sexual abuse was relatively rare (7%).

Ninety-two per cent of the subjects (n = 97) reported SIB. In decreasing order these included: self-cutting (82%), hitting (51%), burning (37%), and biting (14%). Sixty-five per cent (n = 68) of the subjects had received medical treatment for SIB, indicating the serious and persistent nature of these self-inflicted wounds. The mean duration of SIB was 7.2±3.8 years. Onset of SIB ranged from 5 to 23 years of age with mean onset at 14.8±3.5 years. Thirty-three per cent (n = 35) of the subjects reported SIB frequency as more than one incident per week; a further 21% (n = 22) reported frequency as more than once per month. A total of 60 subjects (57%) reported more than 10 episodes of SIB.

Suicide attempts were also very common among the study subjects: 59% (n = 62) reported at least one suicide attempt. The most common method was drug overdose (40%), followed by wrist slashing (37%), hanging attempt (24%) and use of weapons (24%). Ninety-eight subjects (93%) had a criminal record for burglary (66%), assault and battery (51%), murder or attempted murder (33%), and rape (12%). Ninety-seven per cent (n = 102) and 79% (n = 83) of the subjects had nicotine and alcohol abuse, respectively. Ninety-nine patients (94%) reported other substance use with decreasing order of frequency as follows: cannabis (96.1%), ecstasy (51%), inhalants (31%), cocaine (16%), and heroin (7%). Age range for onset of substance use was 7–23 years, with a mean age of onset 15±3 years. Mean duration of substance use was 7.1±4.0 years. Seventy-seven per cent of the subjects fulfilled DSM-IV criteria for substance abuse, and 13% fulfilled criteria for substance dependence.

Of these 105 APD subjects, 42 (40%) met the DSM-III-R criteria for at least one other axis II disorder, including borderline (n = 18), narcissistic (n = 17), paranoid (n = 11), histrionic (n = 9), and passive-aggressive (n = 3) personality disorders. Sixty-eight subjects (65%) fulfilled DSM-IV ADHD^c diagnostic criteria; the most frequent subgroup was combined type (n = 33, 49%), followed by inattentive (n = 22, 32%) and hyperactive impulsive (n = 13, 19%) types, respectively. Mean PCL-R score was 29.0 (SD = 4.2, range = 19–38, median = 29). Thirty-seven patients (35%) had a PCL-R total score ≥30, indicating severe cut-off for psychopathy.

Effects of DSM-IV ADHD^c comorbid diagnosis

Table 1 lists measures assessed in all the DSM-III-R APD study subjects with (n = 68) and without (n = 37) DSM-IV ADHD^c comorbid diagnosis. The rate of unemployment, other comorbid Axis II disorders, and history of childhood physical or sexual abuse were not significantly different in APD subjects with or without ADHD^c comorbidity. The history of childhood neglect ($\chi^2 = 7.8$, $p = 0.009$), parental divorce ($\chi^2 = 4.7$, $p = 0.03$), and early separation ($\chi^2 = 3.8$, $p = 0.053$) were significantly more common in subjects with comorbid ADHD^c; these variables did not significantly differ across combined, inattentive, or hyperactive-impulsive subtypes (Table 2).

The APD subjects with comorbid ADHD^c did not have significantly increased frequency of SIB or criminal behaviours but they reported an increased rate of suicide attempts (70% vs

43%; $\chi^2 = 6.8$, $p = 0.009$), again not related to combined, inattentive or hyperactive-impulsive subtype (Table 2). SUD was not more common in subjects with ADHD^c and there was only a trend of lower frequency of SUD among ADHD^c hyperactive-impulsive subtype ($\chi^2 = 5.9$, $p = 0.053$).

As expected, APD subjects with comorbid ADHD^c had higher WURS ($F(1,102) = 23.4$, $p < 0.001$) and CAARS total scores ($F(1,102) = 45.5$, $p < 0.001$), but PCL-R total ($F(1,75) = 0.62$, $p = 0.80$), Factor 1 ($F(1,75) = 0.59$, $p = 0.44$) and Factor 2 ($F(1,75) = 1.30$, $p = 0.31$) scores were not significantly higher in APD subjects with comorbid ADHD^c. WURS and CAARS scores were significantly different among the three ADHD^c subtypes ($F(2,66) = 6.3$, $p = 0.003$; $F(2,66) = 3.7$, $p = 0.03$), with highest scores in the combined type subjects as expected. However, PCL-R Total, Factor 1 and Factor 2 scores did not significantly differ among the three ADHD^c subtypes ($F(2,66) = 1.1$, $p = 0.35$; $F(2,66) = 1.3$, $p = 0.28$; $F(2,66) = 1.0$, $p = 0.37$, respectively).

Effects of ADHD^d symptoms evaluated on WURS and CAARS

The number of ADHD^d symptom criteria endorsed was significantly correlated with frequency of SIB ($r = 0.32$, $p = 0.002$). WURS total score was significantly correlated with frequency of SIB ($r = 0.38$, $p < 0.001$), number of suicide attempts ($r = 0.28$, $p = 0.011$), number of criminal behaviours ($r = 0.26$, $p = 0.016$), PCL-R total ($r = 0.28$, $p = 0.016$) and Factor 2 scores ($r = 0.36$, $p = 0.002$), and negatively correlated with age at onset of SIB ($r = -0.23$, $p = 0.023$), age of first criminal behaviour ($r = -0.23$, $p = 0.026$), and age at onset of substance abuse ($r = -0.20$, $p = 0.04$). CAARS total score was significantly correlated with frequency of SIB ($r = 0.34$, $p < 0.001$) and number of suicide attempts ($r = 0.32$, $p = 0.007$; Table 3).

Effects of psychopathy

PCL-R total score was significantly correlated with frequency of SIB ($r = 0.27$, $p = 0.024$) and negatively correlated with age at onset of SIB ($r = -0.39$, $p < 0.001$), age of first criminal behaviour ($r = -0.33$, $p = 0.006$), and age at onset of substance use ($r = -0.23$, $p = 0.04$). PCL-R Factor 1 and Factor 2 scores were negatively correlated with age at onset of SIB ($r = -0.27$, $p = 0.024$ and $r = -0.39$, $p < 0.001$, respectively) and age of first criminal behaviour ($r = -0.34$, $p = 0.05$ and $r = -0.30$, $p = 0.013$, respectively). In contrast, Factor 2 score was significantly and positively correlated with age at onset of substance use ($r = -0.25$, $p = 0.04$; Table 3).

Discussion

In this study of male military recruits who met DSM-III-R criteria for APD, more than half the study subjects (65%) met DSM-IV criteria for ADHD^c, the most common comorbidity being with that of the combined subtype. History of childhood neglect, parental divorce, early maternal separation and suicide attempts were more common in APD subjects with comorbid ADHD^c. But history of SIB and criminal behaviour were not associated with ADHD^c comorbidity. The ADHD^d symptoms as assessed on the number of criteria fulfilled, as well as WURS and CAARS scores, indicated that APD subjects with greater symptom number, and higher WURS and CAARS scores, had higher frequency of SIB, suicide attempts and criminal behaviour, as well as earlier onset of these behaviours. The ADHD^d symptoms were also correlated with PCL-R scores, indicating a higher severity of psychopathy with increased symptom loading. PCL-R scores, in turn, were correlated with the frequency of SIB as well as the earlier onset of behavioural problems.

Previous studies have shown that diagnosis of ADHD^c, particularly comorbid with conduct disorder during childhood, is correlated with increased risk of antisocial behaviours, including criminal behaviours and substance abuse in adult life [10,32]. Comorbidity with ADHD^c has also been predictive of earlier onset of SUD among adolescents in treatment for substance abuse [33,34]. In contrast, the effect of comorbidity with ADHD^c in adult subjects with APD has not been adequately examined. Consistent with previous follow-up studies of ADHD^c during childhood, the present results show that the comorbidity of ADHD^d with APD is predictive of earlier onset not only of SUD but of criminal behaviours as well. And, as suggested by Fergusson *et al.*, the total number of ADHD^d symptoms assessed dimensionally is itself an important marker of the severity of the ADHD^c diagnosis [9]. Moreover, the ADHD^d dimensional measures reflect the distribution of symptoms within a given population, for example the APD subjects, with the number of ADHD^d symptoms endorsed, including the WURS and CAARS scores, being significantly correlated with the age of onset and severity of behavioural problems noted in the present study.

Previous studies reported that 39% of samples consisting of offenders had ADHD diagnosis [11,12]. PCL-R scores were generally low in those samples, ranging from 0 to 27 with a median of 8. In the present sample the mean PCL-R score was 28.2, indicating greater severity of psychopathy. The high rate of comorbid ADHD^c in the present APD sample might be due to more severe psychopathy in the subjects, because the WURS scores were significantly correlated with the PCL-R scores. Consistent with this finding, Soderstrom *et al.* had already observed that the diagnoses of ADHD and conduct disorder and high PCL-R scores were strongly interlinked [12].

The rates of both the SIB and suicide attempts were also common in the present sample of APD subjects. The US National Comorbidity Survey data showed that suicide attempts and psychopathology were correlated, and the odds ratio for APD was noted to be as high as 5.7 [35]. Other studies also have indicated that externalizing disorders, such as APD as well as SUD, were associated with suicidal behaviour [36,37]. These studies have shown that even in the absence of internalizing disorders, externalizing disorders were significant risk factors for suicidal behaviour (adjusted odds ratio = 5.98) [37]. SIB has also been shown to be more common in individuals with personality disorders [38]. Thus, the present results are consistent with the findings of these previous studies, and the high frequency of SIB and suicide attempts might be due to severe psychopathy in the present APD subjects.

We found that patients with higher rate of ADHD^d symptoms and higher WURS and CAARS scores had more frequent SIB, suicide attempts, and criminal behaviours, and earlier onset of these respective behaviours. Early initiation of offending has been strongly associated with impulsivity as well as attention deficit and hyperactivity symptoms [39]. It has also been shown that among prisoners, history of SIB was associated with childhood hyperactivity [40]. Another very recent study reported that SIB may be more common in junior high school students with hyperactivity [41]. Furthermore, ADHD, categorically or dimensionally assessed, is a known risk factor for suicide [42]. James *et al.* concluded that the combination of major depressive, conduct and substance use disorders with ADHD represents a particularly high-risk group for suicide [42]. The present results add to these observations by showing that ADHD^d symptoms may be related to earlier onset of SIB, suicide attempts and criminal behaviours, in male study subjects with APD. These results therefore suggest the importance of early assessment of not only ADHD^c, but assessment of ADHD^d symptoms as an early indicator of severity risk as well as onset of associated problem behaviours.

Another important issue is the greater risk of antisocial behaviours and arrest, particularly associated with drug-related activities in hyperactive children during young adulthood [15].

First-line treatment of ADHD is psychostimulants, which may have some abuse potential [43]. This raises a dilemma in the treatment of adult ADHD, particularly in patients with antisocial behaviours. The present findings also showed that the subjects with high levels of psychopathy were at very high risk for SIB, which will make the treatment of these individuals even more complicated.

The findings must be interpreted in the light of a number of limitations. First, because this was a cross-sectional study the present results do not provide prospective information on the evolving nature and course of the association between ADHD^d symptoms and APD. This would require a prospective large-scale epidemiological study, which would be difficult to establish given the difficulties in obtaining adequate numbers of APD subjects in the general population. In this respect the present study, which involved a relatively large sample, was very useful in that it made use of an important resource involving recruits who were part of a compulsory national military service pool. Second, the study involved only male subjects; although APD is more prevalent among male subjects the condition also exists among female subjects and the present results therefore cannot be generalized to all subjects with APD. Nevertheless, given the higher male risk factor for ADHD (as well as APD) it was deemed reasonable to restrict the study to men. Third, the present sample consisted of a high-risk sample of recruits referred to a tertiary care military health centre with a higher than usual base rate of psychopathy scores. Again, in this respect the present study sample may not be representative of the overall distribution of psychopathy scores with APD in the general population, but may be representing severe cases in the APD spectrum. Fourth, to determine possible confounding effects, a clinically more relevant research strategy might be inclusion of other comorbid axis II disorders as a covariate in the statistical analysis. Finally, we were not able to interview the parents of the recruits, which may have helped to validate the childhood onset of ADHD diagnosis and symptoms. Therefore diagnosis relied on the retrospective self-reports of the patients, which might be fallible.

Consequently, the present results have implications for clinical practice in suggesting the importance of investigating childhood history or current ADHD symptoms in the offender population. Understanding that the origins of some antisocial behaviours in male offenders may be associated with comorbid ADHD could be critical to the diagnosis and treatment of behavioural disturbances in this group. Furthermore, the present findings indicate the importance of assessment not only of diagnostic comorbidity with ADHD^c, which may be intuitive, but of the need for using dimensional measures of ADHD^d symptoms because these may be better predictive of the severity and age of onset of associated behavioural and substance use problems in APD subjects.

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Table 1

APD subject characteristics according to comorbid ADHD

Clinical characteristics	Total sample (n = 105) n (%)	APD subjects with ADHD (n = 68) n (%)	APD subjects without ADHD (n = 37) n (%)	Analysis	P
Education level (\leq / $>$ than elementary school)	58/47	38/30	20/17	0.03 [‡]	1.00
Marital status (single/married)	81/24	51/17	30/7	1.3 [‡]	0.52
Income status (low/moderate/high)	63/29/13	41/17/8	22/12/5	0.8 [‡]	0.62
Employed/unemployed	14/91	8/61	6/30	0.9 [‡]	0.36
Parental divorce	24/81	20/48	4/33		0.03 ^a
Early separation	56 (53)	41 (60)	15 (41)	3.8 [‡]	0.053
Childhood physical abuse	76 (72)	53 (78)	23 (62)	3.4 [‡]	0.074
Childhood sexual abuse	7 (7)	6 (9)	1 (3)		0.42 [*]
Childhood neglect	96 (91)	66 (97)	30 (81)	7.8 [‡]	0.009
Any SIB	97 (92)	64 (94)	33 (89)	0.8 [‡]	0.45
Any criminal record	98 (93)	64 (94)	34 (92)	0.02 [‡]	1.00
Suicide attempt	62 (59)	48 (70)	16 (43)	6.8 [‡]	0.009
Substance use	99 (94)	63 (93)	36 (96)	0.96 [‡]	0.42
Other comorbid Axis II disorders	42 (40)	29 (43)	13 (35)	0.45 [‡]	0.53
WURS score	60.5 ± 18.9	66.5 ± 16.2	49.5 ± 18.7	23.4 [‡]	<0.001
CAARS total score	78.6 ± 11.5	83.0 ± 7.7	70.2 ± 13.1	45.5 [‡]	<0.001
PCL-R total score	29.0 ± 4.2	28.6 ± 4.4	29.9 ± 3.6	0.6 [‡]	0.80
PCL-R Factor 1 score	11.6 ± 2.0	11.6 ± 2.0	11.7 ± 2.1	0.6 [‡]	0.44
PCL-R Factor 2 score	14.5 ± 2.1	14.3 ± 2.2	14.7 ± 1.9	1.3 [‡]	0.31

ADHD, attention-deficit–hyperactivity disorder; APD, antisocial personality disorder; CAARS, Conners Adult ADHD Rating Scale; PCL-R, Psychopathy Checklist–Revised; SIB, self-injurious behaviour; WURS, Wender Utah Rating Scale

* Fisher's exact test

[‡] F

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Table 2

APD subject characteristics according to ADHD subtype

Clinical characteristics	Inattentive (n = 22 n (%))	Hyperactive-Impulsive (n = 13) n (%)	Combined (n = 33 n (%))	Analysis P
Education level (≤/ >than elementary school)	12/10	9/4	17/16	1.1 [‡] 0.57
Marital status (single/married)	18/4	9/4	23/10	1.6 [‡] 0.80
Income status (low/moderate/high)	14/5/3	9/3/1	20/9/4	1.1 [‡] 0.89
Employed/unemployed	2/20	3/10	2/31	0.7 [‡] 0.69
Parental divorce	5/17	4/9	11/22	4.7 [‡] 0.032
Early separation	12 (55)	7 (54)	22 (67)	1.1 [‡] 0.58
Childhood physical abuse	14 (64)	11(84)	28 (85)	3.9 [‡] 0.14
Childhood sexual abuse	2(9.1)	0 (0)	4 (12.1)	1.7 [‡] 0.43
Childhood neglect	20 (91)	13 (100)	33 (100)	4.3 [‡] 0.14
Any SIB	20 (91)	13 (100)	31 (93.9)	1.2 [‡] 0.54
Any criminal record	21 (95)	12 (92)	31 (94)	0.02 [‡] 1.00
Suicide attempt	14 (64)	9 (69)	25 (76)	0.6 [‡] 0.76
Substance use	21 (95.5)	10 (76.9)	32 (97.0)	5.9 [‡] 0.053
WURS score	61.8 ± 13.2	58.0 ± 19.5	73.2 ± 14.3	6.3 [‡] 0.003
CAARS total score	79.6 ± 8.6	81.3 ± 7.3	85.8 ± 6.2	3.7 [‡] 0.03
PCL-R total score	27.8 ± 3.4	27.8 ± 4.0	28.1 ± 4.2	1.1 [‡] 0.35
PCL-R Factor 1 score	11.0 ± 2.2	11.4 ± 1.9	12.0 ± 1.9	1.3 [‡] 0.28
PCL-R Factor 2 score	14.9 ± 2.2	13.9 ± 2.0	14.1 ± 2.3	1.0 [‡] 0.37

ADHD, attention-deficit-hyperactivity disorder; APD, antisocial personality disorder; CAARS, Conners Adult ADHD Rating Scale; PCL-R, Psychopathy Checklist-Revised; SIB, self-injurious behaviour; WURS, Wender Utah Rating Scale

[‡]F

[‡]χ².

Table 3

Pearson correlation coefficients

	No. ADHD criteria	WURS total score	CAARS total score	PCL-R total score	PCL-R Factor 1 score	PCL-R Factor 2 score
Frequency of SIB	0.32**	0.38***	0.34***	0.27*	-0.27*	-0.39***
Age at onset of SIB	-0.03	-0.23*	-0.09	-0.39***	-0.27*	-0.27*
No. criminal records	0.13	0.26*	0.18	-0.02	-0.10	-0.07
Age of first criminal behaviour	0.01	-0.23*	-0.03	-0.33**	-0.34*	-0.30*
Age at onset of substance abuse	-0.13	-0.20*	-0.03	-0.23*	-0.16	-0.25*
No. suicide attempts	0.22	0.28*	0.32**	-0.03	0.14	-0.13
PCL-R total score	0.03	0.28*	0.02	-	-	-
PCL-R Factor 1 score	0.14	0.16	0.18	-	-	-
PCL-R Factor 2 score	0.01	0.36**	-0.07	-	-	-

ADHD, attention-deficit-hyperactivity disorder; APD, antisocial personality disorder; CAARS, Conners Adult ADHD Rating Scale; PCL-R, Psychopathy Checklist-Revised; SIB, self-injurious behaviour; WURS, Wender Utah Rating Scale

* p < 0.05

** p < 0.01

*** p < 0.001 (two-tailed).