

Associations of Past Oppositional Defiant Disorder in Adults with Attention-Deficit/Hyperactivity Disorder

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Abstract: *Objective:* While DSM-IV Attention-deficit/hyperactivity disorder (ADHD) comorbid with antisocial behaviours identified by DSM-IV conduct disorder (CD) has been claimed as a 'distinct subtype', there is less information about the validity of a subtype based on the more prevalent comorbidity of oppositional defiant disorder (ODD). The present study investigated the associations of past ODD with past and recent psychopathology in adults with ADHD.

Methods: 94 clinic-referred adults (73 male; 21 female) with DSM-IV ADHD, and their informants, completed questionnaires.

Results: 59% of males had past ODD (with or without past CD), 42% had past CD (with or without past ODD) and 36% had past ODD and past CD; for females, 57%, 33% and 29% respectively. In males with the DSM-IV ADHD 'combined' type (i.e. the most common presentation of ADHD), ratings of past ODD, when compared with those of past CD, were more strongly correlated with past and recent ADHD-related hyperactivity/impulsivity and with past and recent functional impairment. In females, ratings of past ODD, compared with those of past CD, also yielded stronger correlations with features of ADHD. In males and females, ratings of past CD (but not of ODD) were correlated with features of personality disorders.

Conclusions: The results indicated that ODD (and a history of ODD) is relevant in studies of the validity of ADHD subtypes based on comorbid antisocial behaviour. Identification of valid subtypes is important for studies of clinical course and response to treatment.

Keywords: Adult attention-deficit disorder; oppositional defiant disorder.

INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD)

It has been estimated that ADHD, as defined by DSM-IV [1] affects between 3-7% of children [2] and that clinically-significant features can persist into adulthood in up to two thirds of subjects [3]. Also, ADHD is associated with several comorbid disorders, in particular (in children), oppositional defiant disorder (ODD), conduct disorder (CD), depressive and anxiety disorders, bipolar disorder (BPD) and developmental co-ordination disorder [4-8].

Various gender-related differences have been reported, including higher ratings for hyperactivity/impulsivity and for comorbid antisocial behaviour in boys [9-11].

ADHD Subtypes

As defined by DSM-IV, ADHD includes three 'types' based on variation in the features of the syndrome, i.e., 'predominantly inattentive', 'combined' and 'predominantly hyperactive-impulsive' [1].

The validity of an ADHD subtype may involve various associations, e.g., with aetiology, with clinical course or with

response to treatment. Further subtypes have been claimed to show aspects of validity, in particular, if there is comorbid antisocial behaviour [6,7,12-22]. Moreover, the ICD-10 includes the category of 'hyperkinetic conduct disorder'. Various comorbid disorders or combinations of disorders have been used to define subtypes, i.e., comorbidity with ODD [23], anxiety or ODD [24], anxiety in the absence of comorbid antisocial behaviours, ODD and/or CD but no anxiety, anxiety and/or depression with ODD and/or CD [7,19] and antisocial disorders in the patient's family [13].

Comorbidity may occur by chance, while features of a comorbid disorder (e.g., antisocial behaviour) may be secondary to ADHD (or vice versa). Also, both syndromes may share some aetiological factors, while other specific aetiologies may underlie the comorbid presentation of both syndromes.

Prevalence and Associations of ODD and CD, when Comorbid with ADHD

DSM-IV syndromes involving antisocial behaviour which have been considered to be comorbid with ADHD beyond chance associations are ODD and CD in children and DSM-IV 'Cluster B' personality disorders (PDs) (in particular, antisocial PD) in adults [7]. Also, many studies have reported that CD predicts some adult psychiatric disorders, in particular antisocial PD [25].

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It has been claimed that between 45-85% of various samples of children with ADHD have comorbid ODD and/or CD, with ODD being the more prevalent if ODD is not considered to be excluded in the presence of CD [7]. Moreover, a recent review of clinic-referred adults with ADHD [26] found a history of ODD in 24-35% and of CD in 17-25%.

In a sample of 131 Swedish children with ADHD, 60% met criteria for ODD and only 7.6% had no features of ODD [27]. Also, in two studies in adults with ADHD [17,28], 43% and 46.3% respectively had a history of ODD. In the latter study, past ODD was not considered to be excluded by comorbid CD and the mean number of endorsed ODD criteria for all subjects was 3.59; the most frequently endorsed features were: 'defying', 'touchy or easily annoyed', 'arguing', 'losing temper' and being 'angry and resentful'. Also, in this study 25.9% of the adults with ADHD had a history of CD; the most frequently-endorsed features were 'lying', 'theft', 'staying out at night' and 'damaging property'.

Several studies have examined associations between ODD and CD when comorbid with ADHD. In a large prospective population study in Dutch children, 4% of males and 2% of females had CD, 6% had ODD and 5% had ADHD [29]. Moreover, the development of CD was predicted by ODD. In an analysis of cross-sectional data from a UK national sample of children (N=10,348) [30], it was noted that DSM-IV does not allow a diagnosis of ODD if CD is present, which has added to uncertainty about the prevalence of these syndromes. It was found that, in the absence of this constraint, ODD persisted at a similar level from early childhood to, at least, middle adolescence and that ODD and CD were often comorbid. Also, a greater prevalence of CD in boys than girls was confirmed. A report of 151 children with ADHD also found that ODD was a significant predictor of CD in adolescence [31], while a long-term study of boys with ADHD indicated that comorbidity with ODD showed differences in outcome compared with those comorbid with CD; ODD predicted major depression, while CD gave an increased risk of future antisocial personality disorder [32]. Another study of 140 children with ADHD involved assessments at baseline and four years later [33]. At baseline, 65% had comorbid ODD and 32% of these also had CD. Nearly all examples of CD had preceding ODD, usually involving several years, but some children with ODD did not develop CD. These findings indicated that there are two ODD subtypes, i.e., a precursor or not to CD. This is supported by other reports which have claimed that some children with ADHD and ODD show a decline in oppositional behaviour with age, without progressing to CD [7].

Relationships between features of ADHD and ODD have also been reported, for example, ratings of hyperactivity/impulsivity predicted subsequent development of ODD [34]. Also, subjects with the 'combined' ADHD type, compared with the 'inattentive' type, were more likely to have a history of ODD and other comorbidities; however, CD was not investigated [35]. Also, a distinction has been reported between the effects of these two syndromes when comorbid

with ADHD, in respect to the severity of ADHD; ADHD was more severe when combined with CD [36].

It has been suggested that the evidence of associations between ODD, CD and ADHD indicate: a) these syndromes share some genetic aetiology [37,38], b) there are additional genetic factors influencing ODD and CD [37,38], c) there is evidence for genetic differences between these disorders [18,37], d) a shared environmental factor also contributes to the covariation involving ADHD, ODD and CD [39] and e) genetic liability involves gender differences [9,38]. It should be noted that many DSM disorders, including ADHD, are statistical constructs, where characteristics can be revised in the light of new data and whose features may overlap with other syndromes.

Aims

As there is uncertainty about the relative validity of different presentations of antisocial behaviour in the definitions of subtypes of ADHD based on comorbidity, the aim of the present study was to investigate the validity (i.e., associations with other variables) of the subtypes of ADHD based on comorbidity with ODD, by comparing the associations of past ODD with those of past CD, in clinic-referred adults with ADHD. The identification of valid subtypes is important for future studies of clinical course and response to treatment.

MATERIALS AND METHODOLOGY

Subjects

Patients were sequentially recruited from referrals to a psychiatric outpatient clinic for the assessment and management of ADHD in adults aged 18-65. Patients received a DSM-IV diagnosis of ADHD as described below, based on informants' ratings in relation to childhood and subjects' and/or informants' ratings in relation to adult behaviour. Only a minority of potential subjects who attended the clinic (<10%) did not provide informants and were, therefore, excluded. Approximately 25% of referrals did not meet the present criteria for ADHD.

Further exclusion criteria were i) a verbal intelligence quotient (IQ) of ≤ 90 as estimated by the National Adult Reading Test (NART) [40], ii) significant visual or motor impairment, iii) history of pervasive developmental disorder, neurological disorders, (including brain injury and tic disorders), bipolar disorder, schizophrenia or other psychotic disorders, and iv) current major depressive disorder. These were evaluated within a semi-structured routine assessment by a psychiatrist.

Clinical Assessments

In addition to an assessment interview by a psychiatrist, questionnaires based on DSM-IV, described and evaluated by Barkley and Murphy [41], were completed by each patient, by an informant who had known the patient in childhood (usually a parent, but in a minority of cases another family member) and by an informant who had known the patient in the previous 6 months (usually a partner, parent, friend or sibling). The questionnaires included observer-

ratings and self-ratings for the two sets of DSM-IV criteria for ADHD [1], both in relation to the patient when aged between 5 and 12 years and to adult behaviour in the previous 6 months.

The informants' ratings for childhood also included ratings for the 15 DSM-IV CD criteria between the ages 5-18 and the 8 DSM-IV criteria for ODD between the ages of 5-12. Also, impaired ability to function was rated in 8 areas of life activities (e.g., home life, school, etc) and endorsements produced a 'Problem Score'. For ratings in adulthood, 10 areas of life activities were rated. For all these ratings (except for CD), each item was rated 'never or rarely', 'sometimes', 'often' or 'very often'. 'Often' or 'very often' were considered as endorsements. For CD, the informants' ratings for childhood were 'present/absent'.

All patients in the study received a DSM-IV diagnosis of ADHD using the following criteria: i) DSM-IV ratings from an informant in relation to childhood features endorsed a specified minimum number (see below) of the 9 criteria for the 'predominantly inattentive type' (PIT) and/or of the 9 criteria for the 'predominantly hyperactive-impulsive type' (PHIT), ii) DSM-IV ratings by the patient and/or informant in relation to behaviour in the previous 6 months endorsed a specified minimum number of the 9 criteria for the PIT and/or for the PHIT, which corresponded to endorsements in relation to childhood (see below), and iii) a judgement was made by a psychiatrist, based on all information, that the patient's symptoms often interfered with ability to function and were not explained by the presence of another disorder.

For the diagnosis of the PIT, PHIT or the 'combined' type of ADHD, a minimum number of 6 endorsed criteria were required for each of the relevant sets of 9 DSM-IV criteria in both childhood and adulthood. For a diagnosis of 'ADHD in partial remission', the minimum number of endorsed DSM-IV criteria relating to recent behaviour (but not related to childhood behaviour, where it remained at 6) was reduced to 3 in each set of 9 criteria. For the diagnosis of 'ADHD not otherwise specified', the minimum number of endorsed criteria for both childhood and adult behaviour was reduced to 3 in each of the sets of 9 criteria. Diagnosis of adult ADHD, for all diagnoses, was contingent on endorsement of the corresponding ADHD type (or specified minimum number of criteria) in relation to childhood behaviour which corresponded to the ADHD type related to adult behaviour, e.g., an 'inattentive' type diagnosis required at least 6 endorsed criteria for the informant's 'inattentive' ratings are childhood and at least 6 endorsed criteria for the subject's and/or informant's 'inattentive' ratings for recent behaviour. Patients were also assessed by the 'Attention-deficit Scales for Adults' (ADSA) [42]. The ADSA is a self-report instrument relating to symptoms of ADHD over the patient's recent adult life. A total score of ≥ 172 is considered 'much above average' in relation to ADHD characteristics. Patients also completed the self-report 'Brief Symptom Inventory' [43], which yielded a 'global severity index' (GSI). Clinically-significant symptoms, related to a range of psychopathology, are indicated by a value of 0.6 and above for males and 0.8 and above for females.

Features of DSM-IV PDs (but not PD diagnoses) were assessed by the self-report screening test for the Structured Clinical Interview for DSM-IV Personality Disorder (SCID II) [44,45]. This provided present/absent ratings for all the DSM-IV PD criteria, except for the antisocial PD criteria. (Although the SCID II includes self-ratings for past CD, these were excluded from the analyses).

Endorsement of a history of 3 or more CD criteria or 4 or more criteria for ODD by the informant in relation to childhood behaviour was considered to reflect a past history of CD and/or ODD.

The study's assessment procedures were approved by the Cambridge Local Ethics Committee. All subjects who were approached gave written informed consent.

Data Analysis

In view of multiple comparisons, a p value of ≤ 0.01 , two tailed, was considered to indicate significance. Pearson correlations were obtained when the assumptions of normal distributions for the two populations were met. Populations were evaluated by the Kolmogorov-Smirnov test using a significance level of $p \leq 0.05$. Otherwise, Spearman rank correlations were calculated.

RESULTS

Patient Characteristics

94 patients were recruited whose characteristics are shown in Table 1. 59% of males had past ODD (with or without CD), 42% had past CD (with or without ODD) and 36% had past ODD and CD; for females, 57%, 33% and 29% respectively.

In males of the 8 DSM-IV behavioural criteria for ODD, the most frequently endorsed was 5 ('often blames others...'), while all except 8 ('is often spiteful or vindictive'), which occurred in only 14%, were endorsed in 51-63% of the sample. In females, criterion 8 was also the least frequently endorsed (in 32%); criterion 3 ('often actively defies or refuses...') was endorsed in 95% and the remaining criteria between 53% and 79%.

Table 2 shows correlations between the number of endorsed criteria for past ODD and CD and i) features of ADHD rated by informants for childhood and recent adulthood and ii) self-rated features of PDs. (There were no significant correlations between ODD or CD ratings and GSI ratings). In view of reported gender differences in ADHD, males and females were studied separately. Also, as the DSM-IV claims that most children and adolescents with the disorder have the 'combined' type of ADHD (and most subjects with one of the other DSM-IV 'types' have symptoms of both inattention and hyperactivity), the subgroup of subjects in each gender with a 'combined' diagnosis were also studied (including the 'combined' type in partial remission).

In males with the DSM-IV 'combined' type of ADHD, past ODD, when compared with past CD, was more strongly correlated with past and recent ADHD-related hyperactivity/impulsivity and with the 'Problem Scores' for both childhood and adulthood. In females, past ODD (but not past CD)

Table 1. Characteristics (Means, SDs) of 94 Adult Subjects with DSM-IV Attention-Deficit/Hyperactivity Disorder (ADHD)

	Males		Females	
	Total	DSM-IV 'Combined Type'	Total	DSM-IV 'Combined Type'
Number	73	31	21	12
Age	29.0 (9.0)	30.7 (10.2)	31.1 (10.2)	29.3 (10.2)
NART Verbal IQ ^a	110.5 (8.8)	111.3 (8.6)	108.7 (7.0)	106.0 (6.6)
Past CD ^b +ODD ^c	26 (36%)	16 (52%)	6 (29%)	5 (42%)
Past ODD only	17 (22%)	6 (19%)	6 (29%)	5 (42%)
Past CD only	5 (7%)	2 (6%)	1 (5%)	0
No past ODD/CD	25 (34%)	7 (23%)	8 (37%)	2 (16%)
ADHD:				
'Combined'	29 (40%)	30 (94%)	12 (57%)	12 (100%)
'Inattentive'	26 (35%)	0	6 (27%)	0
'Hyperactive-Impulsive'	2 (3%)	0	1 (5%)	0
ADHD 'In partial remission':				
'Combined'	2 (3%)	2 (6%)	0	0
'Inattentive'	5 (7%)	0	1 (5%)	0
'Hyperactive -Impulsive'	0	0	0	0
ADHD 'Not otherwise specified'	9 (12%)	0	1 (5%)	0
ADSA ^d Total	204 (20)	209 (21)	211 (20)	214 (20)
GSI ^e	1.5 (.7)	1.6 (.7)	1.6 (.8)	1.8 (1.1)
Problem score ^f	5.5 (2.2)	6.4 (1.7)	5.5 (2.6)	6.7 (1.6)

^aNational Adult Reading Test; ^bConduct Disorder; ^cOppositional Defiant Disorder; ^dAttention-deficit Scale for Adults-Total Score; ^eGlobal Severity Index of the Brief Symptom Inventory; ^fInformants' ratings of subjects' childhood.

was also correlated with past and recent hyperactivity/impulsivity but also with adult inattention in the subgroup with the 'combined' type of ADHD. In males and females, past CD (but not ODD) was correlated with features of PDs.

DISCUSSION

Present Sample and Methods

The mean GSI ratings for males and females were above the thresholds for 'caseness', which is consistent with reports of a range of psychiatric comorbidity in adults with ADHD. The mean ADSA Total Scores for males and females indicate 'very considerable problems' related to ADHD [42]. Various aspects of the present methodology have been discussed previously [46,47].

Main Findings

The results indicate that ODD, as well as CD, is relevant to definitions of subtypes of ADHD based on comorbidity with antisocial behaviour.

ODD or CD comorbid with ADHD have been reported to be associated with some features of ADHD (i.e., increased impulsivity and reduced inattention), when compared with children with ADHD and anxiety disorders [48], while comorbid ODD has been associated with the severity of ADHD [27,36,49], social withdrawal [49], depression, anxiety,

school refusal [50], substance use disorders [17], personality disorder features [51], decreased psychosocial functioning [17,49], neuropsychological performance [52] (e.g., impaired impulse control) and reduced response to medication [24]. The present results, while consistent with these findings, indicate that an ADHD subtype based on ODD comorbidity may have greater validity in relation to features of ADHD and severity, when compared with CD comorbidity.

Follow-up studies of ADHD comorbid with CD, both during childhood and into adulthood, have reported associations of CD comorbidity with subsequent antisocial PD (and various antisocial behaviours) [34,50,53], poor prognosis [54], a range of subsequent psychiatric disorders and psychiatric admissions [23,27], criminality [55] and substance-use disorders [35]. Also, a study of the associations of past CD in adults with ADHD found correlations with a range of psychopathology, including the impulsivity features of ADHD and features of 'Cluster B' PDs [46]. The present findings, of correlations between past CD and features of PDs, are consistent with these reports and show that, in this respect, an ADHD subtype based on CD comorbidity has greater validity than one based on ODD comorbidity.

The interpretation of any research involving ADHD and antisocial comorbidity should take note of a potentially confounding variable, involving difficulty in the identification of

Table 2. Correlation Coefficients (Significant at ≤ 0.01 , Two-Tailed) Involving Informants' Ratings of Past ODD and CD in 94 Adults with ADHD

Correlated with:	Males		Females	
	Past ODD	Past CD	Past ODD	Past CD
Informants' ratings of childhood ADHD:				
Inattention A			.57 (.007)	
B				
Hyperactivity/ A	.39 (.001)	.35 (.002)	.76 (.001)	
Impulsivity B	.49 (.006)			
Problem Score A	.41 (<.001)			
B	.68 (<.001)			
Informants' ratings of adult ADHD:				
Inattention A				
B			.80 (.002)	
Hyperactivity/ A	.41 (<.001)	.37 (.001)	.56 (.009)	
Impulsivity B	.53 (.002)			
Problem Score A			.64 (.002)	
B	.58 (.001)		.71 (.009)	
Self-report				
PD features A		.35 (.01)		.62 (.01)
B (excluding antisocial PD)				

Abbreviations: PD = personality disorder and see Table 1. A = Total group; B = subgroup with 'combined' type ADHD. () = p value.

CD and ODD, when ADHD is considered to be comorbid with a bipolar disorder (BPD) in childhood or adolescence. Although the co-occurrence of ADHD and BPD beyond chance has been claimed for both children [56] and adults [57,58], this could reflect referral bias or mistaken diagnoses, as well as a degree of shared aetiology [59,60]. Associations between ADHD and BPD in children is a controversial topic, as is the diagnosis of childhood mania [61,62]. This is because mania can present differently in children and adults, so that hyperactivity, mood changes and aggression can represent overlap between mania, ADHD, CD and ODD in childhood [63]. This uncertainty has led to a claim that BPD is often not recognised only in children but also to a concern that BPD is being over-diagnosed [64]. Although there are reports of continuity between a diagnosis of mania in childhood and in subsequent adulthood [61], this has not always been confirmed [65,66]. Also, there have been conflicting claims for and against the validity of an ADHD subtype based on comorbidity with BPD [15,16]. However, in the present study, a past diagnosis of mania or BPD was an exclusion criterion.

While ADHD with comorbid antisocial behaviour has been proposed as a valid subtype [15], definitions of the antisocial behaviour have varied. Both ADHD with ODD or CD have been claimed to be subtypes [6,23], but some studies with antisocial comorbidity have not investigated more

than one syndrome involving antisocial behaviour. Although, in children with ADHD, ODD is the more prevalent syndrome compared with CD, there is a limited information about the associations of comorbid ODD with concurrent and subsequent psychopathology, compared with those of CD.

A previous study of adults with ADHD [46] (which did not separate the subjects on the basis of gender or DSM-IV ADHD 'type'), found that past CD was associated with a range of psychopathology including some features of ADHD (i.e., impulsivity, which was rated separately from hyperactivity), features of DSM-IV PDs (in particular 'Cluster B') and other psychopathology. However, in the present study, past ODD showed stronger correlations than past CD with ratings for both past and recent ADHD-related hyperactivity/impulsivity in both males and females. But ratings of past CD, compared with past ODD, showed stronger correlations with ratings of PD features in both males and females.

Various factors may have contributed to the differences between the correlations of ODD and CD. ODD may be a more sensitive and reliable indicator of any genetic aetiology shared by ODD, CD and ADHD, because the behaviours specified by ODD criteria are less specific examples of underlying antisocial behavioural traits. Also, there may be a greater degree of shared genetic aetiology involving ADHD and ODD, compared with ADHD and CD.

Limitations

Various factors could confound generalisations of the findings, such as the heterogeneity of the ADHD syndrome, limitations of current assessment methods and variation between studies involving recruitment, diagnostic procedures, gender, selection criteria, IQ, previous treatment and clinical characteristics. Also, there were relatively few females in the present study. Other possible factors include an uncertain relationship between some examples of the DSM-IV 'predominantly inattentive' type to other presentations of ADHD, evidence that DSM-IV criteria are less applicable to adults than children, any effects of medications and frequent comorbidity [46]. However, a degree of validity for adult assessments of past antisocial behaviour has been shown by a significant correlation (.78, $p < .001$, using the same questionnaires as in the present study), between subjects' and informants' ratings of the number of endorsed past CD criteria in adults with ADHD [46].

CONCLUSIONS

The results are relevant to the identification and study of ADHD subtypes based on comorbid antisocial behaviour. In adult males with the most common presentation of ADHD (i.e., the 'combined' type), past ODD had stronger associations with features of ADHD (hyperactivity/impulsivity), compared with past CD. In contrast, in males and females, ratings of past CD (but not of past ODD) showed associations with some features of PDs.

Further studies of ADHD subtypes based on antisocial comorbidity should involve ODD as well as CD.

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REFERENCES

- [1] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington DC: American Psychiatric Association 1994.
- [2] Barbaresi WJ, Katusic SK, Colligan RC, *et al.* How common is attention-deficit/hyperactivity disorder? Incidence in a population-based birth cohort in Rochester, Minn. *Arch Paediatr Adolesc Med* 2002; 156: 209-10.
- [3] Wender PH, Wolf LE, Wasserstein J. Adults with ADHD. An overview. *Ann NY Acad Sci* 2001; 931: 1-16.
- [4] Kadesjo B, Gillberg C. The comorbidity of ADHD in the general population of Swedish school-age children. *J Child Psychol Psychiatry* 2001; 42(4): 487-92.
- [5] Kirby A, Salmon G, Edwards L. Attention-deficit hyperactivity and developmental co-ordination disorders: knowledge and practice among child and adolescent psychiatrists and paediatricians. *Psychiatr Bull* 2007; 31: 336-8.
- [6] Pliszka SR. Patterns of psychiatric comorbidity with attention-deficit/hyperactivity disorder. *Child Adolesc Psychiatr Clin N Am* 2000; 9(3): 525-40.
- [7] Pliszka SR. Subtyping ADHD based on comorbidity. *ADHD Report* 2006; 14(6): 1-5.
- [8] Tirosh E, Cohen A. Language deficit with attention-deficit disorder: a prevalent comorbidity. *J Child Neurol* 1998; 13(10): 493-7.
- [9] Gershon J. A meta-analytic review of gender differences in ADHD. *J Atten Disord* 2002; 5(3): 143-54.
- [10] Levy F, Hay DA, Bennett KS, McStephen M. Gender differences in ADHD subtype comorbidity. *J Am Acad Child Adolesc Psychiatry* 2005; 44(4): 368-76.
- [11] Robinson RJ, Reimherr FW, Marchant BK, Faraone SV, Adler LA, West SA. Gender differences in 2 clinical trials of adults with attention-deficit/hyperactivity disorder: a retrospective data analysis. *J Clin Psychiatry* 2008; Jan 16 [Epub ahead of print].
- [12] Burns GL, Boe B, Walsh JA, Sommers-Flanagan R, Teegarden LA. A confirmatory factor analysis on the DSM-IV ADHD and ODD symptoms: what is the best model for the organization of these symptoms? *J Abnorm Child Psychol* 2001; 29(4): 339-49.
- [13] Faraone SV, Biederman J, Chen WJ, Milberger S, Warburton R, Tsuang MT. Genetic heterogeneity in attention-deficit hyperactivity disorder (ADHD). *J Abnorm Psychol* 1995; 104(2): 334-45.
- [14] Faraone SV, Biederman J, Jetton JG, Tsuang MT. Attention deficit disorder and conduct disorder: longitudinal evidence for a familial subtype. *Psychol Med* 1997; 27(2): 291-300.
- [15] Faraone SV, Biederman J, Mennin D, Russell R, Tsuang MT. Familial subtypes of attention deficit hyperactivity disorder: a 4-year follow-up study of children from antisocial-ADHD families. *J Child Psychol Psychiatry* 1998; 39(7): 1045-53.
- [16] Faraone SV, Biederman J, Monuteaux MC. Attention-deficit disorder and conduct disorder in girls: evidence for a familial subtype. *Biol Psychiatry* 2000; 48(1): 21-9.
- [17] Harpold T, Biederman J, Gignac M, *et al.* Is oppositional defiant disorder a meaningful diagnosis in adults? Results from a large sample of adults with ADHD. *J Nerv Ment Dis* 2007; 195(7): 601-5.
- [18] Jain M, Palacio LG, Castellanos FX, *et al.* Attention-deficit/hyperactivity disorder and comorbid disruptive behaviour disorders: evidence of pleiotropy and new susceptibility loci. *Biol Psychiatry* 2007; 61: 1329-39.
- [19] Jensen PS, Hinshaw SP, Kraemer HC, *et al.* ADHD comorbidity findings from the MTA study: comparing comorbid subgroups. *J Am Acad Child Adolesc Psychiatry* 2001; 40(2): 147-58.
- [20] Monuteaux MC, Fitzmaurice G, Blacker D, Buka SL, Biederman J. Specificity in the familial aggregation of overt and covert conduct disorder symptoms in a referred attention-deficit hyperactivity disorder sample. *Psychol Med* 2004; 34: 1113-27.
- [21] Thapar A, Harrington R, McGuffin P. Examining the comorbidity of ADHD-related behaviours and conduct problems, using a twin study design. *Br J Psychiatry* 2001; 179: 224-9.
- [22] Thapar A, Langley K, Fowler T, *et al.* Catechol O-methyltransferase gene variant and birth weight predict early-onset antisocial behaviour in children with attention-deficit/hyperactivity disorder. *Arch Gen Psychiatry* 2005; 62: 1275-9.
- [23] Gadow KD, Nolan EE. Differences between pre-school children with ODD, ADHD and ODD+ADHD symptoms. *J Child Psychol Psychiatry* 2002; 43(2): 191-201.
- [24] Goetz H, Back-Bennett O, Zelnick N. Differential stimulant response on attention in children with comorbid anxiety and oppositional defiant disorder. *J Child Neurol* 2007; 22(5): 538-42.
- [25] Loeber R, Burke JD, Lahey BB. What are adolescent antecedents to antisocial personality disorder? *Crim Behav Ment Health* 2002; 12: 24-36.
- [26] Barkley RA, Murphy KR. Comorbid psychiatric disorders in adults with ADHD. *ADHD Report* 2007; 15(2): 1-7.
- [27] Kadesjo C, Hagglof B, Kadesjo B, Gillberg C. Attention-deficit-hyperactivity disorder with and without oppositional defiant disorder in 3-to-7-year old children. *Dev Med Child Neurol* 2003; 45(10): 693-9.
- [28] Kooij JJS, Boonstra AM, Huijbrech I, Buitelaar JK. Co-existence of borderline and antisocial personality disorder and role of childhood sexual abuse in adults. In: Kooij JJS, Ed. *ADHD in Adults*, Harcourt Assessment BV. Amsterdam 2006: 95-111.
- [29] Van Lier PA, Van der Ende J, Koot HM, Verhulst FC. Which better predicts conduct problems? The relationship of trajectories of conduct problems with ODD and ADHD symptoms from childhood into adolescence. *J Child Psychol Psychiatry* 2007; 48(6): 601-8.
- [30] Maughan B, Rowe R, Messer J, Goodman R, Meltzer M. Conduct disorder and oppositional defiant disorder in a national sample: developmental epidemiology. *J Child Psychol Psychiatry* 2004; 45(3): 609-21.
- [31] Whittinger NS, Langley K, Fowler TA, Thomas HV, Thapar A. Clinical precursors of adolescent conduct disorder in children with attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 2007; 46(2): 179-87.

- [32] Biederman J, Petty CR, Dolan C, *et al.* The long-term longitudinal course of oppositional defiant disorder and conduct disorder in ADHD boys: findings from a controlled 10-year prospective longitudinal follow-up study. *Psychol Med* 2008; 38(7): 1027-36.
- [33] Biederman J, Faraone SV, Milberger S, *et al.* Is childhood oppositional defiant disorder a precursor to adolescent conduct disorder? Findings from a four-year follow-up study of children with ADHD. *J Am Acad Adolesc Psychiatry* 1996; 35(9): 1193-204.
- [34] Burns GL, Walsh JA. The influence of ADHD-hyperactivity/impulsivity symptoms on the development of oppositional defiant disorder symptoms in a 2-year longitudinal study. *J Abnorm Child Psychol* 2002; 30(3): 245-56.
- [35] Murphy KR, Barkley RA, Bush T. Young adults with attention deficit hyperactivity disorder: subtype differences in comorbidity, educational and clinical history. *J Nerv Ment Dis* 2002; 190(3): 147-57.
- [36] Connor DF, Doerfler LA. ADHD with comorbid oppositional defiant disorder or conduct disorder: discrete or nondistinct disruptive behaviour disorders? *J Atten Disord* 2008; 12(2): 126-34.
- [37] Dick DM, Viken RJ, Kaprio J, Pulkkinen L, Rose RJ. Understanding the covariation among childhood externalising symptoms: genetic and environmental influences on conduct disorder, attention deficit hyperactivity disorder and oppositional defiant disorder symptoms. *J Abnorm Child Psychol* 2005; 33(2): 219-29.
- [38] Nadder TS, Rutter M, Silberg JL, Maes HH, Eaves LJ. Genetic effects on the variation and covariation of attention deficit-hyperactivity disorder (ADHD) and oppositional-defiant disorder/conduct disorder (ODD/CD) symptomatologies across informant and occasion of measurement. *Psychol Med* 2002; 32(1): 39-53.
- [39] Burt SA, Krueger RF, McGue M, Iacono WG. Sources of covariation among attention-deficit/hyperactivity disorder, oppositional defiant disorder, and conduct disorder: the importance of shared environment. *J Abnorm Psychol* 2001; 110(4): 516-25.
- [40] Nelson H. National Adult Reading Test Manual. UK Windsor: NFER-Nelson 1982.
- [41] Barkley RA, Murphy KR. Attention deficit hyperactivity disorder. A clinical workbook. 2nd ed. New York: The Guilford Press 1998.
- [42] Triolo SJ, Murphy KR. Attention-deficit scales for adults (ADSA). Manual for scoring and interpretation. New York: Brunner/Maze 1996.
- [43] Derogatis LR. Brief Symptoms Inventory (BSI): administrative, scoring and procedural manual; 3rd edn. Minneapolis: National Computer Systems 1993.
- [44] First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS. Structured clinical interview for DSM-IV Axis II Personality Disorder. Washington DC: American Psychiatric Press 1997.
- [45] First MB, Gibbon M, Spitzer RL, Williams JBW, Benjamin LS. SCID-II Personality Questionnaire. Washington DC: American Psychiatric Press 1997.
- [46] Dowson JH. Characteristics of adults with attention-deficit/hyperactivity disorder and past conduct disorder. *Acta Psychiatr Scand* 2008; 117: 299-305.
- [47] Dowson JH, Blackwell AD, Turner DC, *et al.* Questionnaire ratings of attention-deficit/hyperactivity disorder (ADHD) in adults are associated with spatial working memory. *Eur Psychiatry* 2007; 22: 256-63.
- [48] Newcorn JH, Halperin JM, Jensen PS, *et al.* Symptom profiles in children with ADHD: effects of comorbidity and gender. *J Am Acad Child Adolesc Psychiatry* 2001; 40(2): 137-46.
- [49] Kuhne M, Schachar R, Tannock R. Impact of comorbid oppositional or conduct problems on attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry* 1997; 36(12): 1715-25.
- [50] Harada Y, Yamazaki T, Saitoh K. Psychosocial problems in attention-deficit hyperactivity disorder with oppositional defiant disorder. *Psychiatr Clin Neurosci* 2002; 56(4): 365-9.
- [51] May B, Bos J. Personality characteristics of ADHD adults assessed with the Millon Clinical Multiaxial Inventory-II: evidence of four distinct subtypes. *J Pers Assess* 2000; 75(2): 237-48.
- [52] Van der Meere J, Marzocchi GM, De Meo T. Response inhibition and attention deficit hyperactivity disorder with and without oppositional defiant disorder screened from a community sample. *Dev Neuropsychol* 2005; 28(1): 459-72.
- [53] Ford T, Goodman R, Meltzer H. The British Child and Adolescent Mental Health Survey 1999: the prevalence of DSM-IV disorders. *J Am Acad Child Adolesc Psychiatry* 2003; 42(10): 1203-11.
- [54] Avila C, Cuenca I, Felix V, Paroet MA, Miranda A. Measuring impulsivity in school-age boys and examining its relationship with ADHD and ODD ratings. *J Abnorm Child Psychol* 2004; 32(3): 295-304.
- [55] Kroes M, Kessels AG, Kalf AC, *et al.* Quality of movement as predictor of ADHD: results from a prospective population study in 5- and 6-year-old children. *Dev Med Child Neurol* 2002; 44(11): 753-60.
- [56] Galanter CA, Leibenluft E. Frontiers between attention deficit hyperactivity disorder and bipolar disorder. *Child Adolesc Psychiatr Clin N Am* 2008; 17(2): 325-46.
- [57] Wingo AP, Ghaemi SN. A systematic review of rates and diagnostic validity of comorbid adult attention-deficit/hyperactivity disorder and bipolar disorder. *J Clin Psychiatry* 2007; 68(11): 1776-84.
- [58] Tamam L, Karakus G, Ozpoyraz N. Comorbidity of adult attention-deficit hyperactivity disorder and bipolar disorder: prevalence and clinical correlates. *Eur Arch Psychiatr Clin Neurosci* 2008; Apr 24 (Epub ahead of print).
- [59] Greenwood TA, Schork NJ, Eskin E, Kelsoe JR. Identification of additional variants within the human dopamine transporter gene provides further evidence for an association with bipolar disorder in two independent samples. *Mol Psychiatry* 2006; 11(2): 125-33.
- [60] Masi G, Milone A, Manfredi A, Pari C, Paziante A, Millepiedi S. Comorbidity of conduct disorder and bipolar disorder in clinically referred children and adults. *J Child Adolesc Psychopharmacol* 2008; 18(3): 271-9.
- [61] Geller B, Tillman R, Bolhofner K, Zimmerman B. Child bipolar I disorder: prospective continuity with adult bipolar I disorder; characteristics of second and third episodes; predictors of 8-year outcome. *Arch Gen Psychiatry* 2008; 65(10): 1125-33.
- [62] Giedd JN. Bipolar disorder and attention-deficit/hyperactivity disorder in children and adolescents. *J Clin Psychiatry* 2000; 61 (Suppl 9): 31-4.
- [63] Holtmann M, Goth K, Wockel L, Poustka F, Bolte S. CBCL-pediatric bipolar disorder phenotype: severe ADHD or bipolar disorder? *J Neurol Transm* 2008; 115(2): 155-61.
- [64] Elia J, Ambrosini P, Berrettini W. ADHD characteristics: 1. Concurrent co-morbidity patterns in children & adolescents. *Child Adolesc Psychiatry Ment Health* 2008; 2(1): 15-21.
- [65] Harrington R, Myatt T. Is preadolescent mania the same condition as adult mania? A British perspective. *Biol Psychiatry* 2003; 53: 961-9.
- [66] Hazell PL, Carr V, Lewin TJ, Sly K. Manic symptoms in young males with ADHD predict functioning but not diagnosis after 6 years. *J Am Acad Child Adolesc Psychiatry* 2003; 42: 552-60.

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