

ATTENTION DEFICIT HYPERACTIVITY DISORDER: A PREDICTIVE MODEL OF COMORBIDITY WITH BEHAVIOUR DISORDER

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This paper examines the comorbidity profile of Attention Deficit Hyperactivity Disorder (ADHD) and Behaviour Disorder (BD), exploring the pattern that predicts this psychopathological association. A sample of 90 ADHD subjects aged 6 to 16 was analyzed. Using a differential methodology, ADHD+BD was compared with the absence of co-morbidity. ADHD was assessed according to DSM-IV criteria, and comorbidity by means of CSI. Intellectual profile (as measured by WISC-R), academic performance, the relational dimension, psychiatric antecedents and family conditions were taken into account. Descriptive and exploratory statistics were used and a logistic regression was carried out. The differential profile implies that ADHD+BD subjects present significantly higher deterioration in the relational dimension and academic performance and present higher percentage of separated parents. The pattern predicting ADHD+BD includes the relational dimension, whilst the pattern for ADHD + Dissocial Disorder includes the relational dimension and separated parents ($p < .05$).

El estudio analiza el perfil de comorbilidad del Trastorno por Déficit de Atención con Hiperactividad (TDAH) y trastornos del comportamiento (TC), explorando el modelo que predice esta asociación psicopatológica.

Metodología de investigación: Se analiza una muestra de 90 casos con TDAH (6-16 años). Mediante investigación diferencial se compara la agrupación TDAH+TC con la ausencia de esta comorbilidad. El caso de TDAH se valoró según criterios DSM-IV y la comorbilidad mediante el CSI. Se consideraron las variables perfil intelectual (WISC-R), resultados académicos, dimensión relacional, antecedentes psiquiátricos y núcleo de convivencia. Se utilizaron estadísticos descriptivos y exploratorios, implementando un procedimiento de regresión logística.

Resultados: El perfil diferencial implica que los casos TDAH+TC presentan, significativamente, mayor deterioro en dimensión relacional, resultados académicos y proporción de padres separados. El modelo que predice TDAH+TC está formado por el factor relacional, mientras que en TDAH + Trastorno Disocial incluye factor relacional y padres separados ($p < 0.05$).

The present study focuses on Attention Deficit Hyperactivity Disorder (ADHD) and its comorbidity with Disruptive Behaviour Disorders (BD), examining their nosological comorbidity profile and analyzing the cognitive, clinical and sociodemographic variables in ADHD cases that are relevant to an increase in the probability of developing BD, which includes oppositional defiant disorder and dissocial disorder, according to the DSM-IV criteria (APA, 1994, 2002).

ADHD is characterized by a consistent pattern of lack of attention and/or hyperactivity-impulsiveness which is more frequent and serious than that normally observed in subjects with a similar level of development. For its clinical distinction from other diagnoses the symptoms

must be present in two or more contexts, must appear before the age of seven, and must cause a clinically significant deterioration of social, academic or work-related activity (APA, 2002).

ADHD is one of the most frequent causes, among children, of referral to GPs, paediatricians, neuropaediatricians, psychologists and child psychiatrists (Lerner, 2002; Miranda, Roselló & Soriano, 1998), and is one of the most important clinical and public health problems in terms of morbidity and dysfunctionality; it affects children and adolescents, but can even persist into adulthood (Barkley, 1998; Biederman, Keenan & Faraone, 1991; Cabanyes & Polaino-Lorente, 1997). Rate of prevalence among schoolchildren is most commonly reported as between 3 and 7 percent (APA, 2002), though across the literature as a whole the figure ranges from 1.9% to 17.8%; on balance, the most reasonable estimation would be 5 to 10 percent (Scahill & Schwab-Stone, 2000).

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As regards the controversy over whether hyperactivity is a construct in its own right or whether it is in fact constituted by a set of symptoms that form part of other psychopathological conditions, this has been resolved by a considerable number of authors whose work supports the association of ADHD with comorbid diagnoses of separately defined syndromes (Hinshaw, 1987; Kaliaperumal, Khalilian & Channabasavanna, 1994; Titres & Laprade, 1983), arguing that it is the very characteristics of ADHD which increase the possibility of presenting other disorders in the area of mental health. The cases of children who present ADHD associated with other diagnoses are of a more clinically serious nature, given that the different areas of their family, social and academic life are more severely affected and the evolution of the disorder is less favourable than in children with ADHD without comorbidity; as a result, those with comorbidity require more complex therapy (Biederman Faraone, Mick, Moore, & Lelon, 1996; Michanie, 2000).

Recent studies support the existence of ADHD and BD as frequently associated but independent dimensions (Spencer, Biederman & Willens, 1999), whose relationship is not symmetrical, since there are more children with ADHD but no behaviour problems than children with BD who do not have ADHD (Frick, 1998). This comorbidity appears to exacerbate the course of ADHD and make it more persistent, more associated with family conflict, and more predictive of academic failure, delinquency and detention than ADHD without BD.

The association of ADHD with behaviour disorders is situated at between 30% and 60% (Althoff, Rettew & Hudziak, 2003; Arnold & Jensen, 1999; APA, 2002; Barkley, 1999; Burt, Krueger, McGue & Iacono, 2003; Goldstein, 1996; Gresham, Lane, & Lambros, 2000;

Neuman et al., 1999; NIMH, 1999; Satterfield & Schell, 1997; Spencer, Biederman & Wilens, 1999), and several studies report a higher rate of comorbidity with behaviour disorders than with anxiety or depression disorders, as shown in Table 1.

In general, children in whom ADHD is combined with aggression show higher rates of physical aggression, lying and stealing, as well as higher levels of rejection by colleagues. They are also found to present higher levels of family and parental psychopathology and social adversity than children with ADHD alone (Biederman, 1997; Faraone & Biederman, 1997).

The work of Gresham, Lane and Lambros (2000) refers to children with the combination of ADHD + BD as a group at high risk of developing a pattern of antisocial and delinquent behaviour that converts them into "Fledgling Psychopaths" (Lynam, 1996, 1997), which superimposes on the ADHD pattern dysfunctional behavioural features such as fighting, stealing, loafing, failure to fulfil obligations and frequent arguing. This clinical condition is highly resistant to therapy, so that its early identification and knowledge of its precursory and associated features are particularly important. Such children are extremely aggressive and agitated, with antisocial attitudes and beliefs that underpin violence against parents, colleagues and teachers (Walker & Gresham, 1997). Some 33% of clinical cases are represented by this group (Rogers, Johansen, Chang, & Salekin, 1997).

Children with ADHD plus dissociative disorders present high levels of family psychopathology in the form of antisocial disorders, substance abuse and depressive disorders (Faraone, Biederman, Jetton & Tsuang, 1997). In an interesting work with a clinical population, Faraone, Biederman, Mennin, Russell and Tsuang (1998) found that the presence of an antisocial personality disorder in the parents of children with ADHD has strong prognostic value for the course of their children's illness.

Children presenting ADHD without comorbidity have fewer problems relating to parents and teachers and with school adaptation in general than those with ADHD + aggression, even though they do have a similar profile as regards learning problems, lack of social skills and low self-control (Presentación, 1996).

Relationships with parents worsen when ADHD is accompanied by a behaviour disorder or problem of aggression (Gomes & Swanson, 1994; Johnston, 1996).

Table 1
Comorbidity with ADHD

AUTHOR	BD (%)	ANX./DEPRESS.(%)
Pelham et al, 1992	62,2	—
Baumgaertel et al,1995	19	—
August et al, 1996	44,2	41
Wolraich et al, 1996	45,8	21
Wolraich et al, 1998	36,1	20
Scahill et al, 1999	46,8	30
Roselló et al. 2000	47	33

The presence of a comorbid BD has been associated with increased levels of conflict with parents, as well as with maternal stress and psychopathology and marital difficulties (Barkley, 1998; Johnston, 1996). It has been observed that hyperactive children without BD tend to have more problems at school, whilst hyperactive-aggressives present problems both at school and at home (Millich & Landau, 1989).

Children with ADHD + BD were more frequently rejected by their classmates, in a proportion of 2/3, compared to just 1/3 in the case of those with ADHD alone and 1/8 in that of a control group (Gresham, MacMillan, Bocian, Ward & Forness, 1998).

In sum, the association ADHD/behaviour disorders has been proposed as a category representing a new subtype of ADHD in the DSM-IV (APA, 1994), and the CIE 10 (WHO, 1992) even reserves for it the label of hyperkinetic dissociated disorder. Research indicates that this combination, in contrast to the case of ADHD alone and controls, presents greater difficulties in social interaction in the form of more rejection by colleagues or classmates, more fighting and more problematic relationships with parents (Barkley, 2002; Gomes & Swanson, 1994; Gresham et al., 1998, 2000; Johnston, 1996; Lynam, 1997). Researchers have also studied the presence of greater parental psychopathology (Biederman, Mick, Faraone & Burback, 2001; Faraone & Biederman, 1997; Walter et al., 1987) and poorer academic performance (Barkley, 1998; Wilson & Marcotte, 1996), though there are also studies that find no significant differences in academic cognitive or psychosocial functioning (Faraone, Biederman et al., 1998).

In accordance with all of the above, we propose the following working hypothesis: the model that best predicts comorbidity of ADHD with BD would be made up of the variables that include more difficulties in social relations, poorer academic performance, more psychiatric antecedents and difficulties in parents' marital relationship, often reflected in the fact of the parents being separated.

The relevance of the analysis derives from the need, in the Spanish context, for multidimensional studies of comorbidity with ADHD, and which can make the following contributions: to serve as an instrument for gaining knowledge on the development of the psychopathology, to provide a potential tool for improving the nosology,

to improve knowledge on comorbidity that has implications for the primary disorder and affects chronicity, recovery and susceptibility to relapse, and/or to aid the design of programmes of intervention and/or prevention in the area of problems associated with ADHD.

RESEARCH METHODOLOGY

Procedure

In a clinical population context, we analyzed a sample of 90 cases of ADHD in children aged 6 to 16, from a bi-annual selection from all cases with the disorder attended at mental health centre, these cases having been referred from one urban and six rural health centres.

We used a differential multivariable/multigroup research methodology, comparing cases of ADHD + BD with cases without such comorbidity.

The ADHD cases were defined according to the ADHD (Attention Deficit Hyperactivity Disorder) section of the National Institute of Mental Health (NIMH) structured interview, called the Diagnostic Interview Schedule for Children, in its version for parents (DISC-IV), with some variations (Fisher, Lucas & Shaffer, 1997; Shaffer, Fisher, Lucas, Dulcan & Schwab, 2000).

The case definition of ADHD was basically clinical. The first step consisted in inquiring in a general way about symptoms of hyperactivity, impulsiveness and attention deficit. When a positive response was obtained, parents were asked to fill out, in relation to their child, a questionnaire that described the ADHD items according to the DSM-IV. Subsequently, a psychologist with clinical experience and accustomed to making diagnoses with the DSM classification reviewed the results together with the parents, stressing to them that all the items began with the frequency adverb "often" and clearing up any doubts over meanings. If there was positive identification of ADHD, parents were asked whether any of the symptoms were present before the age of seven; if they had noticed, as a result of the symptoms, any relevant alteration in social or academic activity; and if the alterations provoked by the symptoms appeared in more than two contexts, such as home, with peers, or school. As regards this procedure, we consider that assessment by means of scales reinforces that obtained through clinical interview, and that either of them used in isolation can result in over-diagnosis (Weiler, Bellinger, Marmor, Rancier & Waber, 1999).

When the result of the above diagnostic process was clinically positive for ADHD, the teacher of the child in question was asked to fill out a questionnaire with the description of the ADHD items from the DSM-IV. The questionnaire was passed on to the teacher by the parents, and the teacher was required to send it completed to the mental health unit in a pre-paid envelope. In our view, this facilitates a more unrestricted response by the teacher. After this second survey, the child was discarded as an ADHD case if the teacher failed to indicate a sufficient number of items, according to the DSM-IV diagnostic criteria (APA, 1994). Studies by Mitsis, McKay, Schulz, Newcorn and Halperin (2000) with clinical populations suggest that the validity of the diagnosis decreases when a single informant is used, and stress the need for multiple informants, and for each informant to report on that which occurs in his/her particular context.

Finally, we indicated that we would exclude those patients diagnosed with ADHS according to the DSM-IV who presented mental retardation, organic brain disorder, organic auditory or visual alterations that justified the disorder, or who were on medication at the time of the survey.

The case definition of ADHD was complemented with the *EDAH* questionnaire for teachers (Farre & Narbona, 1998), which assesses ADHD, its typology and its behaviour alterations according to dimensional criteria and adapted to the Spanish population. This questionnaire was also passed on to the teacher by parents, and the teacher was required to send it to the Mental Health Unit in a pre-paid envelope.

Comorbidity with behaviour disorders was studied using the Child Symptom Inventory (CSI), by Kenneth D. Gadow and Joyce Sprafkin (1997), which includes an analysis of diagnostic conditions in line with the DSM-IV criteria. This questionnaire was filled out by the parents and subsequently reviewed with the psychologist attending their child, with the aim of clarifying questions of terminology and resolving doubts.

Intellectual profile was analyzed by means of the WISC-R (Wechsler, 1999), considering the factors of Freedom from Distraction, Verbal Comprehension and Perceptual Organization.

As regards the academic dimension, this was studied using the "Academic Results Factor" which reflects effectiveness in school results. The factor is made up of the number of failed subjects in the last school year, the number of repeated school years¹, and the teacher's opinion on the child's academic performance; it was extracted using factor analysis. Teachers' opinion on academic performance was obtained through their responses to the questions whether the child "had learning difficulties" and whether he/she "had poor academic results", on scales of 0-3 points for each question; total score thus ranged from 0 to 6 points, with six representing maximally affected academic performance.

The relational dimension was studied through the "Relational Factor", reflecting interpersonal relations in general (it covers relations with classmates/colleagues, parents and teachers), and which was also extracted through factor analysis. Relationships with colleagues was obtained through parents' and teachers' responses to questions whether the child "when playing, finds it hard to follow the rules", "fights a lot" and "is not accepted by colleagues", on scales of 0-3 points for each question; total score thus ranged from 0 to 9 points, with nine representing maximally affected relationship with peers.

Relations with parents and teachers was obtained through responses to the questions whether the child is "is disobedient", "easily gets angry", "cannot bear to be denied something" and "lies a lot", on scales of 0-3 points for each question; total score thus ranged from 0 to 12 points, with twelve representing maximally affected relationship with parents and teachers.

The set of questions emerged from theoretical discussion, and a Spearman correlation of over -0.5 and significant ($p < 0.000$) was observed between each one of the variables (relations with peers, parents and teachers) and the Scale for the assessment of social and work activity (APA, 1994).

Finally, we considered the psychiatric antecedent variables of ADHD and other psychiatric antecedents in first- or second-degree relatives, the child's immediate family conditions (taking special note of whether or not parents were separated), parents' education, gender, and age.

¹ In Spain (at the time of the study), children who failed a given number of subjects in a school year were required to repeat the year's course.

Sample description

The sample was made up of 90 children and adolescents with ADHD (mean prevalence of ADHD being estimated at around 4% [APA, 1994], this represents a review of 24.45% of the ADHD population in the area of reference); 82.8% were boys and 17.2% were girls, and range was 6 to 16 years; 65.5% came from urban areas and the rest from rural areas. In 75.9% of cases participants lived with both parents, and in 23% their parents were separated.

A total of 64.28% of the parents of the cases analyzed were from the economically active population, as against 35.7% from the economically inactive population. The makeup of the economically active group was as follows: 7.3% worked in agriculture, 20.18% in industry, 13.7% in construction, and 55% in the service sector; 3.6% were unemployed.

As regards parents' education, 8.1% had only a basic education, 62.6% education to age 11 or 16, 25.3% high-school or equivalent technical education, and 4% university education.

Data analysis

We used descriptive and exploratory analyses applied to the different cognitive, clinical and sociodemographic variables.

Two factor analyses were carried out using the Principal Components procedure (reduction of the dimensionality of the data), considering the Kaiser-Meyer-Olkin measure of sampling adequacy and the Bartlett Sphericity Test.

Taking into account the factor analyses and adapting our analysis to the aims of our study and its hypotheses, we used the logistic regression multivariate analysis method, in which the parameters were estimated using the maximum-likelihood method. The model's fit

to the data was determined using the Deviation (-2 log of the likelihood), and the proportion of uncertainty of the data explained by the adjusted model was represented by Nagelkerke's R^2 . For significance of the model we used the likelihood-ratio test, by means of the chi-squared statistic; and for significance of the model's parameters, the Wald test, accepting a significance level ≤ 0.05 . Maximum-likelihood estimations (coefficients) were made for each factor of the model, in which we determined the "odds ratio" and calculated the corresponding confidence intervals at a level of 95%. In the logistic regression multivariate predictive model the variables were selected using a reverse stepwise process controlled by the researcher, beginning with the complete theoretical model. In this predictive model the reverse stepwise process reaches its culmination when the change in significance of the model is significant (≤ 0.05), according to the likelihood-ratio test.

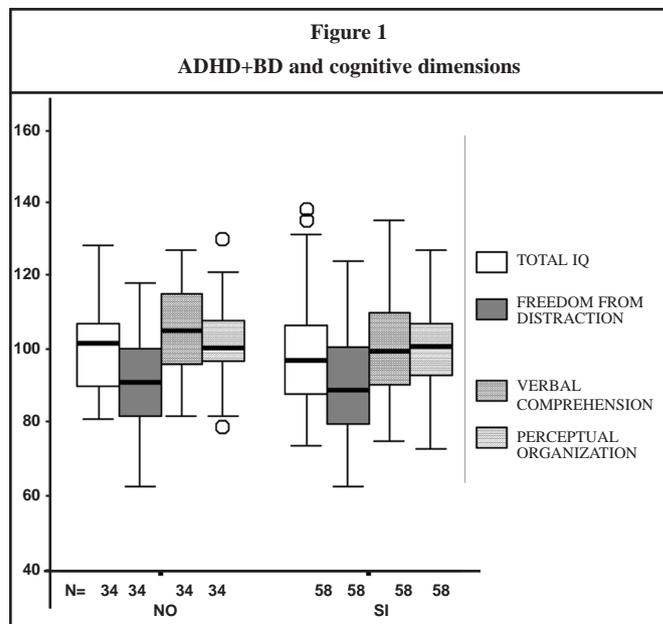


Table 2
ADHD+BD and Relational Dimension factor

RELATIONAL DIM. F	N	Mean	SD	Stand. Error	Confidence interval for the mean at 95%	
					Lower limit	Upper limit
NO ADHD+BD	34	-,5177663	,8592044	,1473523	-,8175569	-,2179757
ADHD+BD	56	,3143581	,9533631	,1273985	5,904582E-02	,5696704
Total	90	3,95E-17	1,0000000	,1054093	-,2094459	,2094459

RESULTS

ADHD + BD COMORBIDITY PROFILE

The ADHD+BD combination accounts for 56 cases (which can be broken down into 42 with comorbid diagnosis of oppositional defiant disorder and 14 with dissociative disorder), which is 62% of the total sample of ADHD (90 cases), with highest representation in males (78.6%) and in the 9-12 years age group.

INTELLECTUAL PROFILE: Total IQ and the WISC-R factors Verbal Comprehension, Perceptual Organization and Freedom from Distraction present similar scores in the ADHD+BD group compared to the rest of the sample, as shown in Figure 1.

RELATIONAL PROFILE: The ADHD+BD participants obtain higher mean scores in the Relational Dimension factor in comparison to the rest of the sample, as shown in Table 2. We found that higher scores in this factor implied poorer relationships of ADHD+BD with peers and authority figures.

ACADEMIC PROFILE: ADHD+BD present poorer mean academic results than the rest of the sample (Table 3). It was found that higher scores in this factor implied higher average number of school subjects failed by ADHD+BD in the last year, more repeated school years and worse teacher's rating of their academic performance.

	ADHD+BD	NO ADHD+BD
ANTECEDENTS ADHD	37 (66%)	16 (47%)
ANTECEDENTS PSQ	34 (61%)	19 (56%)
PARENTS SEPARATED	19 (34%)	3 (9%)
BASIC EDUC. PARENTS	41 (74%)	28 (67%)

	N	Mean	SD	Stand. Error	Confidence interval for the mean at 95%	
					Lower limit	Upper limit
ACADEMIC RESULTS F						
NO ADHD+BD	34	-,3879291	,7984295	,1369295	-,665143	-,1093438
ADHD+BD	56	,2355284	1,0421978	,1392695	-4,35740E-02	,5146308
Total	90	5,92E-17	1,0000000	,1054093	-2094459	,2094459

PROFILE OF OTHER DIMENSIONS: Table 4 shows the variables antecedents of ADHD, psychiatric antecedents, separated parents and parents' basic education (primary or less); number of cases with ADHD+BD is compared with numbers for the rest of the sample. In brackets is the percentage of cases that contain each variable in each ADHD group.

By means of the chi-squared test, considering a significance level of $p \leq 0.05$, we observed a relationship only between the variables separated parents (YES/NO) and ADHD+BD (YES/NO); significant differences emerged, with a larger proportion of separated parents in ADHD+BD ($\chi^2 [1] = 7.21$; $p = 0.007$).

Results: Predictive model of ADHD +BD

In order to test the basic hypothesis, we considered the problem as one of logistic regression whose dichotomous dependent variable is ADHD+BD (YES/NO) and the predictor variables are psychiatric antecedents (YES/NO), separated parents (YES/NO), Relational Factor, Academic Results Factor and Total IQ. As control variables in the model we used sex and age.

Within the context of a predictive model, and in an effort to find the model that best predicts ADHD+BD,

Variables not in the equation						
Step	Variables		Score	df	Sig.	
0	ANTECEDENTS OTHER		,204	1	,651	
	PARENTS SEP.		7,220	1	,007	
	RELATIONAL F		14,813	1	,000	
	ACADEMIC F		8,316	1	,004	
	TOTAL IQ		,814	1	,367	
	AGE		,555	1	,456	
	SEX		1,351	1	,245	
Global statistics			21,537	7	,003	

we observed the influence on the probability of ADHD+BD of the presence of these variables, as well as their value and direction.

We applied the algorithm that introduces all the predictor variables in combination, including the following data: the number of cases in the analysis was 90; the result of step 0 in which the variables selected for the analysis are shown; the measure to determine whether the coefficient is different from zero according to the change in the log-likelihood associated with the effect; and the significance level of this measure (Table 5).

At this step 0 we observed that the most statistically relevant variables at the level of $p < 0.05$, which influence the probability of the presence of ADHD+BD, are separated parents, Relational Factor and Academic Results Factor.

By the likelihood coefficient logarithm test the complete model is significant ($\chi^2 [7] = 24.947$; $p = .001$), we find goodness of fit of the data according to the Hosmer-Lemeshow test ($\chi^2 [8] = 9.155$; $p = .329$), the reduction of the proportion of uncertainty of the data explained by the adjusted model is .330 (Nagelkerke's R^2), and the

classification table indicates 70% of cases correctly classified, using a probability cut-off value of 0.5 to consider the case of ADHD+BD as correctly classified. The results of the COR curve indicate that the best cut-off point would correctly classify 78.6% of the cases of ADHD+BD.

The coefficients that permit that the results are the most probable in each one of the predictor variables when all the others are present in the model, through an iterative algorithm of maximum likelihood, are those corresponding to the variables shown in Table 6.

We can see that the Relational Factor variable (poorer social relations) has a positive significant effect on the increase in the probability (log-odds) of the existence of ADHD + BD ($p < .05$), and the one-point increase in the Relational Factor (CI: 90%) raises by 123% the odds ratio for ADHD+BD, all the other variables remaining constant.

Selection of the model that best predicts the ADHD+BD variable was made by eliminating variables one by one, following the criterion of beginning with that with the highest significance level and terminating

Table 6
Multivariable logistic regression on ADHD+BD

Variables in the equation		B	SE	Wald	df	Sig.	CI 95% for EXP(B)		
							Exp(B)	Lower	Upper
Step									
1 ^a	ANTEDECENTS PSQ	-.206	.525	.153	1	.695	.814	.291	2,280
	PARENTS SEP.	1,224	.763	2,572	1	.109	3,400	.762	15,167
	RELATIONAL F.	.848	.304	7,758	1	.005	2,335	1,286	4,239
	ACADEMIC F.	.590	.371	2,525	1	.112	1,804	.871	3,734
	TOTAL IQ	.024	.022	1,132	1	.087	1,024	.980	1,070
	AGE	-.003	.102	.001	1	.977	.997	.816	1,218
	SEX	-.766	.769	.992	1	.319	.465	.103	2,099
	Constant	-1,178	2,252	.274	1	.601	.308		

a. Variable(s) introduced at step 1: ANTECED. OTHERS, PARENTS SEP, RELAT.F, ACAD. F., TIQ, AGE, SEX.

Table 7
Logistic regression: Selection of the model that best predicts ADHD+BD

Variables in the equation		B	SE	Wald	df	Sig.	CI 95% for EXP(B)		
							Exp(B)	Lower	Upper
a	RELATIONAL F.	1,006	.281	12,791	1	.000	2,734	1,576	4,745
	Constant	.618	.247	6,289	1	.012	1,856		

a. Variable(s) introduced at step 1: RELATIONAL F.

when a significant change in the model ($p \leq 0.05$) was observed. For each variable we analyzed the change in the deviation (-2 log-likelihood), significance of the model from the likelihood coefficient logarithm test (chi-squared), and its validity obtained from its calibration and discrimination.

The final model we decided to accept is an improvement on the maximum model in significance and goodness of fit, being similar in discrimination and more parsimonious on containing just one variable (Table 7).

By the likelihood coefficient logarithm test, the complete model is significant to a greater extent than the maximum model proposed ($\chi^2 [1] = 16.213$; $p < .000$). The classification table indicates similar discrimination to that of the maximum model, with 70% of cases well classified, using a probability cut-off value of 0.5 to consider the case of ADHD+BD as correctly classified. The Hosmer-Lemeshow test obtains better results ($\chi^2 [8] = 6.542$; $p = .587$), and the reduction of the proportion of uncertainty of the data explained by the adjusted model is slightly lower than for the maximum model (Nagelkerke's $R^2 = .224$), the deviation being similar.

The Relational Factor variable (poorer social relations) represents the best model, which has a positive effect on the increase in the probability (log-odds) of the existence of ADHD + BD, and its elimination would result in a significant change in the model at the $p \leq 0.05$ level.

The Relational Factor is made up of relationship with peers according to parents' opinion, relationship with peers according to teachers' opinion, relationship with parents and relationship with authority figures. All of these dimensions significantly correlate among themselves at the $p < 0.01$ level. In parallel with these analyses, we decided to carry out an individual logistic regression of each one of the dimensions on the variable ADHD + BD; we found that in all cases there is a positive signifi-

cant effect on the increase in the probability (log-odds) of the existence of ADHD + BD at the $p < 0.01$ level.

After testing our hypothesis, we considered it relevant to replicate precisely the analyses carried out by means of logistic regression on ADHD+BD, exploring dissociative disorder, which is the most serious form included in this grouping.

We found that the variables Relational Factor (poorer social relations) and separated parents have a significant positive effect on increase in the probability (log-odds) of the existence of ADHD + dissociative disorder ($p \leq .05$), and form part of the model that best predicts increase in the probability of the presence of ADHD + dissociative disorder (Table 8).

The one-point increase in the Relational Factor (CI: 95%) raises by 526% the odds ratio for ADHD+ dissociative disorder, all the other variables remaining constant; and having separated parents presents an odds ratio of ADHD+BD 4.2 times higher than not having separated parents (CI: 95%).

Comparison of this model with the model for behaviour disorders indicates that it is more significant ($\chi^2 [2] = 28.135$; $p < .000$), the classification table shows better discrimination (90%), the Hosmer-Lemeshow test obtains better results ($\chi^2 [8] = 3.561$; $p = .894$), the reduction in the proportion of uncertainty is higher (Nagelkerke's $R^2 = 0.464$), and the deviation of the optimum model is smaller (-2 log-likelihood: 49.665). The model is parsimonious, on including just two variables, and predicts well the combination ADHD + Dissociative Disorder.

DISCUSSION

The analysis of the association between ADHD and behaviour disorders is of both nosological and clinical interest. The study of these profiles, in conjunction with the findings of previous studies, can make a useful con-

Table 8
Multivariable logistic regression on ADHD+ Dissocial Disorder

Variables in the equation		B	SE	Wald	df	Sig.	CI 95% for EXP(B)		
							Exp(B)	Lower	Upper
a	PARENTS SEP.	1,452	,740	3,851	1	,050	4,272	1,002	18,221
	RELATIONAL F.	1,836	,532	11,915	1	,001	6,268	2,211	17,774
	Constant	-3,151	,671	22,070	1	,000	,043		

a. Variable(s) introduced at step 1: PARENTS SEP., RELATIONAL F.

tribution, with the identification of pathologies with their own characteristics and different risk factors, prognosis, clinical course and treatment. At the same time, this type of analysis can permit us to observe psychopathology comorbid with ADHD, with origin subsequent to the base disorder, and associated dimensions accessible to preventive intervention.

We have initially focused on the association ADHD+BD, proposed as a category representing a new type of ADHD in the DSM-IV (APA, 1995), and with its own category in the CIE-10 (WHO, 1992). This association has been frequently cited, and estimates are that it accounts for between 30% and 60% of ADHD cases (Arnold & Jensen, 1999; APA, 2002; Barkley, 1999; Burt et al., 2003; Gresham, Lane, & Lambros, 2000; Neuman et al., 1999; NIMH, 1999; Satterfield & Schell, 1997; Spencer, Biederman & Wilens, 1999). The figures found in our study are slightly higher, with 62% of clinical cases presenting ADHD+BD – a substantial degree of association.

The results indicate that the association ADHD+BD does not present cognitive differences with regard to the rest of the sample, and that the most parsimonious model predicting ADHD+BD is based on the Relational Factor (poorer relations with peers and authority figures). We should point out that the separated parents variable does not conclusively affect the model that best predicts ADHD+BD at the significance level selected prior to the analyses carried out (≤ 0.05); however, and even though we do not have unequivocal empirical evidence, it is possible that with other samples it could predict the comorbid association analyzed, since it comes close to significance ($B=1.25$; $SE: 0.699$; $p: 0.07$), its elimination would represent a significant change in the model if we had opted for a significance level of ≤ 0.054 , and the possibility is theoretically coherent. The result obtained is in line with part of the hypothesis proposed and with studies that refer to the social interaction problems of this comorbid grouping in relation to peers and authority figures (Barkley, 2002; Gomes & Swanson, 1994; Gresham et al., 2000; Johnston, 1996; Lynam, 1997).

The analysis by means of logistic regression, seeking the most parsimonious model that predicts ADHD+BD, does not include academic performance in the final model when the rest of the variables are present; however, the analyses carried out exclusively on this variable indicate the greater difficulties in the academic area for the

ADHD+BD group, a finding that concurs with those of other authors (Barkley, 1998; Wilson & Marcotte, 1996).

The hypothesis proposed on the greater presence of psychiatric antecedents is not supported by our results, probable due to the fact that we are dealing with a clinical population in which the groups compared present substantial percentages in this aspect (ADHD+BD: 61%; NO ADHD+BD: 56%).

The most important general reflection on these results concerns, from the nosological perspective, the existence of variables that discriminate between the ADHD+BD grouping and the rest of the sample; and from the more clinical perspective, issues of prevention of the behaviour alterations associated with ADHD, which would probably involve the design of programmes focusing on the dimensions that best predict comorbidity.

Having made the initial analyses on the ADHD+BD group, we decided to split it up and make a complementary study, with the same logistic regression procedure, of the association ADHD + dissocial disorder, as the most serious form of BD. It is fairly widely accepted that comorbidity with oppositional defiant disorder is problematic, even if the degree of deterioration is lower than in the case of comorbidity with dissocial disorder (Biederman et al., 1996; Pfiffner, McBurnett, Lahey, Loeber, Green, Frick & Rathouz, 1999; Satterfield & Schell, 1997); this leads Faraone, Milberger et al. (1996) to suggest two subtypes of ADHD + oppositional defiant disorder comorbidity, one that produces dissocial disorder and another that rarely progresses in this direction. In parallel, Gresham, Lane and Lambros, (2000) refer to the combination of ADHD + behaviour disorders as that which would include a group of children at high risk of developing a pattern of antisocial behaviour and delinquency that earns them the label of “Fledgling Psychopaths” (Lynam, 1996,1997), and which is especially serious since it increases the risk of tobacco and alcohol abuse (Weiss & Hechtman, 1993) and antisocial activities in adolescence (Biederman et al., 1996; Claude & Firestone, 1995; Satterfield & Schell, 1997; Weiss, 1994; Weiss & Hechtman, 1993).

The cases of ADHD + dissocial disorder analyzed represented 15% of the sample, and the results indicate that the most parsimonious model includes the variables Relational Factor and separated parents, with a positive

significant effect on the increase in the probability (log-odds) of the existence of ADHD + dissocial disorder. The results, more extreme in the comparisons, but in the same line as that discussed above, lead us to similar reflections in the clinical and nosological contexts.

The research project and its results are based on the study of a clinical sample of Spanish participants, so that any implications emerging from it should be considered within that context, and are subject to further clinical and community research in the Spanish culture that may support and corroborate our data. With this limitation in mind, we can summarize the two most relevant implications of our results from the clinical and nosological perspectives:

First, the high rate of comorbidity with behaviour alterations observed in clinical population suggest, given its seriousness, the need for early recognition of the disorder, a state of alertness to it and preventive intervention programmes; such aspects should form an integral part of specific health programmes that consider the dimensions which best predict comorbidity. This would be in response to the concerns of various authors who claim that the associated pathology is frequently more stressful and harmful in the long term, and that, moreover, it probably predisposes patients to dysfunction to a greater extent than the symptoms of ADHD itself (Carey, 1999, Barkley, 1998; Levine, 1999).

And second, the results constitute support, in a clinical sample, for the nosological hypothesis of a discriminant group formed by ADHD+BD.

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