

# Anxiety and depression in parents of a Brazilian non-clinical sample of attention-deficit/hyperactivity disorder (ADHD) students

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Higher prevalence rates of anxiety and depression have been reported in parents of children with attention-deficit/hyperactivity disorder (ADHD). The interaction between the burden of ADHD in offspring, a higher prevalence rate of this highly inherited disorder in parents, and comorbidities may explain this finding. Our objective was to investigate levels of ADHD, anxious and depressive symptomatology, and their relationship in parents of ADHD children from a non-clinical sample using a dimensional approach. The sample included 396 students enrolled in all eight grades of a public school who were screened for ADHD using the SNAP IV rating scale. Positive cases were confirmed through a semi-structured interview. Parents of all 26 ADHD students and 31 paired controls were enrolled. A sample of 36 parents of ADHD children (21 mothers, 15 fathers) and 30 parents of control children (18 mothers, 12 fathers) completed the Adult Self Report Scale, State-Trait Anxiety Inventory, and Beck Depression Inventory in order to investigate anxious and depressive symptomatology. Probands' mothers presented a higher level of ADHD symptomatology (with only inattention being a significant cluster). Again, mothers of ADHD children presented higher depressive and anxiety levels; however, these did not correlate with their own ADHD symptomatology. Only trait-anxiety levels were higher in ADHD mothers. Our findings suggest that: 1) anxious and depressive symptoms might be more prevalent in mothers of ADHD students; 2) anxious and depressive symptomatology might be independent of impairment associated with ADHD symptoms; 3) anxious and depressive symptoms are independent of the presence of ADHD.

Key words: Attention-deficit/hyperactivity disorder; ADHD; Anxiety; Depression

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## Introduction

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common mental disorders of childhood and adolescence, and is characterized by inattention, hyperactivity, and impulsivity symptomatology (1). The presence of the disorder is officially recognized in children and the persistence of the symptoms into adulthood has been shown in several studies (2). However, the diagnosis in adults may be somewhat difficult due to the paucity of studies validating the number of symptoms for the cutoff, which was first established in field trials with children and adolescents (3). Since the frequency of ADHD symptoms declines substantially with age, the use of a fixed threshold will cause the diagnostic criteria to be less sensitive to the disorder with aging, as has been noted in previous DSM field trials.

The use of dimensional models may contribute to a better understanding of excessive diagnosis of comorbidity and subsyndromic cases often seen in clinical practice. In neuropsychological studies, relatives of probands seem to present deficits in control inhibition in a manner similar to that of the probands, even though they do not present the number of symptoms necessary to justify a clinical diagnosis of the disorder (4). Kooij et al. (5) demonstrated that adults with four or more symptoms presented higher psychosocial impairment than those with three symptoms or less, even after controlling for other disorders and socio-demographic variables. This corroborates the concept of a dimensional disorder. Others have found that there is no equivalence between symptom presentation and severity and presentation of functional impairments (6).

Clinical and epidemiological studies have shown the

burden of ADHD in offspring for parents, who display higher levels of depression, especially mothers (7). On the other hand, ADHD frequently displays comorbidity with anxiety, depression, or both (8). Considering that ADHD has one of the highest heritability rates among behavioral disorders, this aspect should be taken into consideration when interpreting higher anxious and depressive symptomatology in probands' parents. Studies evaluating the genetic contribution of the development of the disorder have demonstrated that probands' parents were more likely to have an ADHD diagnosis than parents of adopted ADHD children and biological parents of non-ADHD children (9). Recent studies have shown that at least seven genes are associated with ADHD (10). The low odds ratios of these associations are consistent with the notion that vulnerability is mediated by several genes of slight effect and is associated with the high phenotypic heterogeneity seen in ADHD. Braaten et al. (11) presented three hypotheses regarding this phenomenon. The first hypothesis suggests that ADHD and anxious disorders are different expressions of the same genetic risk factor. The second suggests that individuals with comorbid ADHD and anxious disorders compose a distinct ADHD subtype. The third hypothesis suggests that ADHD and anxious symptoms have independent transmission. The findings of Braaten et al. (11) corroborate this last hypothesis and are in agreement with the findings of Biederman et al. (12), but in contrast to those of Jensen et al. (13), which suggested

that there is an ADHD subtype with comorbid anxiety.

The aim of the present study was to evaluate current symptoms of inattention and hyperactivity-impulsivity in parents of a non-clinical sample of students with ADHD. The correlations among ADHD symptomatology, anxiety, and depression were also investigated.

## Subjects and Methods

In the first phase of the study, the sample included all 396 students enrolled in the 1st to the 8th grade of a public school, Colégio de Aplicação, Universidade Federal do Rio de Janeiro (CAP/UFRJ). Student ages ranged from 7.8 to 16.8 years. The study was approved by the Ethics Committee of the Psychiatry Institute, Federal University of Rio de Janeiro. One parent of each subject gave informed written consent for the subject to participate in the study.

All parents received the Swanson, Nolan, and Pelham, Version IV (SNAP-IV) Parent and Teacher Rating Scale, which had been validated for Brazilian Portuguese (14), and a questionnaire of socioeconomic classification in Brazil (IBGE) in a paper and pencil format. One teacher, selected by other teachers, also answered the SNAP-IV in the same format. All students with at least six positive symptoms of inattention and/or hyperactivity were considered to be positive and were then submitted to a semi-structured interview using DSM-IV criteria for ADHD (Children's Interview for Psychiatric Syndromes: Parent Version, P-ChIPS) (15). Only children who displayed all of the criteria for ADHD in this interview were included in the ADHD group. Students who needed medical and psychological care were referred to specialized centers. A paired control group was obtained from SNAP-IV-negative cases from the same school and was submitted to the same diagnostic procedures. The prevalence of ADHD found in this sample was 8.6% (see Pastura et al. (16) for more information). None of the children were receiving treatment for ADHD. The socioeconomic characteristics of ADHD and control students are shown in Table 1.

The second phase of the study was performed 1 year after the students' evaluation. Parents of confirmed ADHD cases and those of the control group completed the self-report scale of evaluation of ADHD symptoms validated for Brazilian Portuguese (Adult Self Report Scale, version 1, ASRS) (17). This scale lists the 18 DSM-IV Criterion A items, offering five answer options for each symptom, classified according to the frequency in which they occur. The severity of each cluster (inattention and hyperactivity-impulsivity) was calculated using scores associated with each frequency (never = "0", rarely = "1", sometimes = "2", often = "3", and very often = "4"). The global score was

**Table 1.** Demographic characteristics of the students studied.

Variable	ADHD students (male: 88%)	Control students (male: 77%)
Age (years)	12 (10-13)	12 (9-14)
Parents' schooling		
High school incomplete	4%	-
High school complete	4%	4%
College	42%	48%
Pos-graduate degree	50%	48%
Income		
0-2	-	-
2-3	4%	-
3-5	4%	3%
5-10	4%	17%
10-20	58%	37%
20 or more	30%	43%

Age is reported as median (interquartile interval). Income levels are reported as minimum salaries. One minimum salary corresponds to US\$205.75. ADHD = attention-deficit/hyperactivity disorder. Categorical data were analyzed by the chi-square test or the Fisher exact test and numerical data by the Mann-Whitney test. There were no significant differences between groups.

obtained by calculating the sum of the scores on all 18 items. The inattention score was calculated using the nine inattention items and the hyperactivity score was calculated using the nine hyperactivity-impulsivity items (17).

Anxiety and depressive symptomatology was evaluated through self-report using the STAI (18) and Beck Depression Inventory (BDI) (19), respectively. The STAI was chosen because it provides evaluation of both present and trait anxiety levels. All parents received an envelope with the instruments and completed the measures in the order of their choosing. Questionnaires were completed individually.

Parents were then divided into four groups: a) fathers of children with ADHD, b) fathers of control children, c) mothers of children with ADHD, and d) mothers of control children.

Data obtained from the questionnaires and the interviews were analyzed statistically using the SPSS version 13 software. Mean rank was used as a measure of central trend. The Mann-Whitney U-test was used to compare groups and Spearman's rank correlation test was used to calculate correlations among ADHD, anxious, and depressive symptomatology. The level of significance was set at 0.05 for all analyses.

## Results

After the first phase of the study, which lasted more than one year, 50 of the 57 cases initially evaluated (26 from ADHD students and 31 from control comparison students) could be reached by telephone or regular mail for participation in the second phase (parents' evaluation). Of a total sample of 100 individuals (50 fathers and 50 mothers), 22 refused to participate in the research, 7 had moved out of the city, 3 could not be located, and 2 had passed away. The final sample consisted of 66 individuals, with 39 mothers (18 control mothers and 21 mothers of probands) and 27 fathers (12 control fathers and 15 fathers of probands). Mothers of ADHD and control children did not differ in formal schooling (mean: 14.90 and 14.53 years, respectively) or age (mean: 44.67 and 44.83 years, respectively); likewise, fathers of ADHD and control children did not differ in formal schooling (mean: 15.60 and 15.00 years, respectively) and age (mean: 47.73 and 47.33 years, respectively).

Using a cutoff of six symptoms of inattention and/or hyperactivity (as suggested by the DSM-IV), we divided parents into two groups: those presenting clinically significant symptomatology (above the cutoff) and those without such symptomatology. We found that 33.3% of the probands' mothers presented clinically significant symptoms while none of the mothers of the control group revealed such symptoms. Among the fathers, 33.3% of the pro-

bands' fathers and only 8.3% of fathers of the control group presented clinically significant symptoms.

In a second analysis, using a cutoff of four symptoms of inattention and/or four symptoms of hyperactivity/impulsivity (as suggested by Kooij et al., 5), the number of mothers with clinically significant symptomatology increased to 52.4% in the probands' group and to 16.7% in the control group. Among the fathers, 33.3% of the probands' fathers remained in the clinically significant group, while fathers of the control group presented clinically significant symptoms in 16.7% of cases.

Using the mean rank of ASRS global scores as a measure of ADHD symptomatology, we found that probands' mothers presented more symptoms than did the mothers of the control group ( $P = 0.015$ ). Probands' mothers, as a group, had a mean rank approximately 12% higher on ASRS global score when compared to controls' mothers (15.22 compared to 24.10 of a total of 72 points for ASRS global score). When mean ranks of probands' fathers and fathers of the control group were compared, this difference was much smaller and not statistically significant (see Table 2).

When mean ranks of inattention and hyperactivity-impulsivity ASRS symptoms were compared separately among groups, only the former was significantly higher in both mothers and fathers of probands, being statistically significant for mothers ( $P = 0.004$ ) and nearly significant for fathers ( $P = 0.057$ ).

**Table 2.** Comparisons of scores between mothers and fathers of control and ADHD children.

Variable	Control	ADHD
Mothers	(N = 21)	(N = 18)
ASRS global score	15.22	24.10*
ASRS inattention score	13.79	24.12*
ASRS hyperactivity score	16.21	22.17
STAI trait score	16.39	24.98
STAI state score	20.03	21.84
BDI	15.84	25.45*
Fathers	(N = 15)	(N = 12)
ASRS global score	11.92	15.67
ASRS inattention score	10.75	16.60
ASRS hyperactivity score	11.96	15.63
STAI trait score	12.23	14.43
STAI state score	13.40	11.84
BDI	12.21	14.61

Data are reported as mean rank scores. N = number of subjects in each group; ADHD = attention-deficit/hyperactivity disorder; ASRS = Adult Self Report Scale; STAI = State-Trait Anxiety Inventory; BDI = Beck Depression Inventory score. \* $P < 0.05$  compared to control (Mann-Whitney U-test).

Depression levels were higher in probands' mothers ( $P = 0.01$ ), but not in fathers, when the groups were compared to mothers and fathers of controls (Table 2). When anxiety levels were compared between groups, only trait-anxiety (not state-anxiety) mean rank scores were higher in probands' mothers than in control mothers. Among fathers, there was no statistically significant difference in any STAI score.

ASRS scores were then correlated to anxiety and depression scores provided by the STAI and BDI, respectively (Spearman). There was no correlation for probands' mothers regarding trait-anxiety, state-anxiety, or depression ( $P > 0.05$ ).

## Discussion

Studies conducted with non-clinical samples present many advantages since they eliminate the potential biases of more severe cases, higher prevalence of comorbidities, and higher levels of functional impairment that are seen in clinical samples. The use of the ASRS allowed us to measure the severity of ADHD symptoms using a dimensional construct.

Results indicated that current ADHD symptomatology was higher in parents of children with ADHD, as expected from the wide literature on the genetic inheritance of this disorder (20). In our study, only inattentive symptoms were more prevalent in parents of children with ADHD. Inattention symptomatology was significantly higher in probands' mothers ( $P = 0.004$ ) and reached borderline significance in probands' fathers ( $P = 0.057$ ). Some studies on the influence of gender on the ADHD phenotype have demonstrated a higher prevalence of the Predominantly Inattentive Type in females, a result that has recently been challenged (21).

To the best of our knowledge, the present study is the first to report a higher prevalence of ADHD symptomatology in mothers, but not in fathers. A higher prevalence rate of ADHD symptomatology should be expected in fathers since a heightened paternal transmission, relative to maternal transmission, has been demonstrated, suggesting genomic imprinting (22). Smaller samples, such as that of the current study, might explain these results.

Depressive and anxious symptomatology was higher in mothers of ADHD children, in agreement with other studies (23). It is noteworthy that depressive and anxious symptomatology was not correlated with mothers' own ADHD severity. In addition, since we did not find higher state-anxiety levels, having a child with ADHD did not necessarily result in higher anxiety levels. Lau et al. (24) suggested that state-anxiety was highly influenced by

environmental issues whereas trait-anxiety was particularly influenced by genetics and by the environmental issues that were not common among first-degree relatives. Because only lifetime anxiety symptoms (trait-anxiety) were discrepant between the mothers' groups, our results might suggest that higher levels of anxiety among mothers might not be specifically related to current environmental stressors (i.e., offspring behavior and its consequences in school, familial, and social environments). In a recent review, Modesto-Lowe et al. (25) showed that mothers of ADHD children might present higher levels of distress in comparison to control children's mothers. These results agree with our findings, but do not clarify if the distress could be only explained by parenting children with ADHD.

Since the present study used a non-clinical sample, it is reasonable to argue that such children presented a somewhat lower impairment than those from clinical samples, with a corresponding lower burden on mothers. However, trait-anxiety was higher in probands' mothers and this result agrees with other studies (12), suggesting that such symptoms may have a similar or somewhat related endophenotype with independent transmission.

The present findings suggest that anxious and depressive symptoms: a) are more prevalent among probands' mothers, but not fathers; b) might be independent of the impairment associated with offspring ADHD and its impact on family life, in agreement with previous findings; c) might be independent of the presence of ADHD symptoms (and their impairment). It is reasonable to assume that symptoms of inattention and hyperactivity and those of anxiety and depression have similar or related endophenotypes, but with independent transmission.

Our findings agree with those reported by Braaten et al. (11) and Biederman et al. (12), which suggested that ADHD and anxiety have independent transmission. This finding is of special interest for clinicians because of the high rates of comorbid anxiety and depressive symptomatology commonly found among ADHD adults. Moreover, the findings that anxiety and depressive symptomatology did not correlate with offspring ADHD and its impairments may be important for clinicians given that anxiety symptoms might present with inattention and/or hyperactivity, which is a differential diagnosis that often demands following the patient until anxious symptomatology reaches lower levels.

Our findings should be understood in light of some limitations. First, we evaluated a sample of small size, which might be an important limitation when considering the diversity of variables investigated. Second, we studied a group of high socioeconomic level, corresponding to only 10% of the Brazilian population. This suggests that the findings might not be generalizable. Third, we did not

investigate past symptomatology of ADHD in parents; thus, current ADHD symptoms might be associated with other etiologies. Fourth, we did not consider the presence of comorbid conditions among students, which could be a confounding factor. Future studies using large samples

and prospective designs should be conducted in order to better investigate the genetic and environmental relationships between ADHD, depressive and anxious symptomatology.

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